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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 7, NUMBER 13
JULY 1, 1974

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SELECTED WATER RESOURCES ABSTRACTS is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the National Technical Information Service (NTIS), U.S. Department of Commerce. NTIS was established September 2, 1970, as a new primary operating unit under the Assistant Secretary of Commerce for Science and Technology to improve public access to the many products and services of the Department. Information services for Federal scientific and technical report literature previously provided by the Clearinghouse for Federal Scientific and Technical Information are now provided by NTIS.

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SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

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VOLUME 7, NUMBER 13
JULY 1, 1974

W74-06501 -- W74-07050

The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

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FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

CONTENTS

FOREWORD_____iii

SUBJECT FIELDS AND GROUPS

(Use Edge Index on back cover to Locate Subject Fields and Indexes in the journal.)

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Non-Water Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A. General

LABORATORY EXPERIMENTS WITH SURFACE RUNOFF,
Alberta Dept. of Environment, Edmonton. Div. of Technical Services.
For primary bibliographic entry see Field 2E.
W74-06737

HYDROGEOMORPHOLOGY,
Technische Hochschule, Vienna (Austria). Institut fuer Geophysik.
A. E. Scheidegger.
Journal of Hydrology, Vol 20, No 3, p 193-215, November 1973. 4 fig, 75 ref.

Descriptors: *Geomorphology, *Reviews, *Erosion, Stream erosion, Degradation(Slope), *Hydrogeology, Degradation(Stream), Earthquakes, Seepage, Landslides, Slope stability, Pore water, Karst, Subsidence, Consolidation, Beach erosion, Sea level, Tsunamis, Turbidity currents.
Identifiers: *Hydrogeomorphology.

The current state of knowledge of the mechanical effects caused by water on the morphology of the Earth is reviewed. The mechanical interaction of surface water and groundwater with landscapes and the mechanical effects of the sea on coastal regions and on the ocean bottom are discussed. (Knapp-USGS)
W74-06891

ASSESSING SYSTEMATIC ERRORS IN RAINFALL-RUNOFF MODELS,
Snowy Mountains Engineering Corp., Cooma (Australia).
A. P. Aitken.
Journal of Hydrology, Vol 20, No 2, p 121-136, October 1973. 3 fig, 5 tab, 9 ref.

Descriptors: *Rainfall-runoff relationships, *Mathematical models, *Statistical methods, Correlation analysis.
Identifiers: *Error analysis.

The errors in estimated monthly flows from seven deterministic rainfall-runoff models were studied using results published in the literature. Various commonly used statistical tests were examined, but they did not disclose systematic errors which, by the application of other tests, were often found to exist. It was therefore concluded that hydrologists should test their results by applying a simple sign test and a measure of the reproduction of the residual mass curve referred to as the residual mass curve coefficient. (Knapp-USGS)
W74-06893

WALDEN'S WAY REVEALED,
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 2H.
W74-06925

USE OF WASTE HEAT FOR SOIL WARMING IN NORTH CAROLINA,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering; and North Carolina State Univ., Raleigh. Dept. of Horticultural Science.
For primary bibliographic entry see Field 5D.
W74-07000

2B. Precipitation

CLIMATIC DATA OF THE HIGH ALTITUDE METEOROLOGICAL STATIONS OF THE GENEVA REGION FOR 1970, (IN FRENCH),
Conservatoire Botanique, Geneva (Switzerland).
For primary bibliographic entry see Field 7C.
W74-06532

COMPUTED ATMOSPHERIC EFFECTS ON ERTS OBSERVATIONS,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
R. S. Fraser.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1567-1573, 1973. 7 fig, 3 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Calibrations, Radiation, *Aersols, *Water vapor, Solar radiation, Albedo.
Identifiers: *ERTS, *Radiance(Atmospheric).

The nadir radiances of many models of the earth-atmosphere system were computed for a fixed solar zenith angle. These data indicate that the standard deviations of the ERTS multispectral scanner responses to changes in water vapor and aerosols would be small on a continental-wide basis. (See also W74-06619) (Knapp-USGS)
W74-06694

AUTOMATIC PROCESSING AND VERIFICATION OF METEOROLOGICAL OBSERVATIONS.
Hydrometeorological Service of the USSR, Moscow.
Available from the National Technical Information Service as TT-72 50087, $3.75 in paper copy $1.45 in microfiche. Proceedings of the International Symposium of Hydrometeorologists from the Socialist Countries, 1971. 77 p. Translated from Russian, Jerusalem, Israel. Program for Scientific Translations Technical Translation. TT-72-50087, 1973.

Descriptors: *Data processing, Hydrologic data, *Climatic data, *Meteorological data, Computer programs, Data collections, Quality control, *Automatic control.
Identifiers: *USSR.

The Moscow symposium is the first international conference devoted to the automatic control of climatological data. As a result of work undertaken by the WMO, this problem was first discussed at an international symposium on climatological data processing, held in 1968 at Asheville (USA). Climatologists have turned their attention to the problem only in recent years, when computers were used to solve climatological problems. (See W74-06723 thru W74-06733).
W74-06722

MACHINE CONTROL OF THE QUALITY OF OBSERVATIONS IN AUTOMATED HYDROMETEOROLOGICAL-DATA PROCESSING,
N. K. Klyukin.
In: Automatic Processing and Verification of Meteorological Observations; Proceedings of the International Symposium of Hydrometeorologists from the Socialist Countries: Jerusalem, Israel Program for Scientific Translations Technical Translation TT-72 50087, p 1-3, 1973. 1 fig.

Descriptors: *Data processing, *Hydrologic data, *Quality control, Data collections, *Meteorological data, Computer programs.
Identifiers: USSR.

In an automated data processing system quality control should be implemented at the beginning of the technological process, after a sufficient amount of data have been received. In most cases doubtful data detected by the computer will have to be analyzed by specialists, insuring to some extent that subsequent processing stages will employ only reliable data. Until objective computer-based control methods are fully developed and assimilated it will be necessary to control the quality of key data at subsequent processing stages, particularly when conducting statistical investigations. (See also W74-06722) (Knapp-USGS)
W74-06723

FUNDAMENTALS OF AUTOMATIC CONTROL OF METEOROLOGICAL DATA,
V. V. Filippov.
In: Automatic Processing and Verification of Meteorological Observations; Proceedings of the International Symposium of Hydrometeorologists from the Socialist Countries: Jerusalem, Israel Program for Scientific Translations Technical Translation TT-72 50087, p 4-11, 1973.

Descriptors: *Data processing, *Hydrologic data, *Quality control, Data collections, *Meteorological data, Computer programs, *Automatic control.
Identifiers: USSR, *Errors.

Computer control of the quality of meteorological data is implemented by means of programs which compare observed values of meteorological elements with independent estimates. The quality of information is estimated by the measure of the admissible discrepancy between the observed values and their independent estimates determined numerically or by means of other measurement techniques. The ideal program must satisfy the following basic conditions: (1) all observed parameters must be checked with the same degree of reliability; (2) control must be absolute, i.e., discovery of all errors independently of their size and origin; and (3) automatic control must be more thorough and cheaper than manual control. Besides their immediate value, the results of quality control can be very useful in the inspection of a meteorological network. (See also W74-06722) (Knapp-USGS)
W74-06724

AUTOMATIC CHECK AND CORRECTION OF METEOROLOGICAL DATA IN EAST GERMANY,
H. Kase, and B. Antonik.
In: Automatic Processing and Verification of Meteorological Observations; Proceedings of the International Symposium of Hydrometeorologists from the Socialist Countries: Jerusalem, Israel Program for Scientific Translations Technical Translation TT-72 50087, p 12-19, 1973. 2 fig, 4 ref.

Descriptors: *Data processing, *Hydrologic data, *Quality control, Data collections, *Meteorological data, Computer programs, Automatic control.
Identifiers: *Germany.

Meteorological information is collected and processed in accordance with specific instructions and programs. Such repetitive processes are very convenient for automation. The data control and correction subsystem used in East Germany is described. The following meteorological quantities are measured by the automatic remote-control meteorological station: mean wind speed (integration time 10 minutes); maximum wind speed (integration time 1.5 sec); average wind direction (integration time 10 minutes); total rainfall; rain duration; number of lightning discharges in a 15-km radius; global radiation; air temperature; soil temperature at depths of 5, 10, 20, and 50 cm; air pressure; dew point; and psychrometric difference. In computer control by means of logi-

cal relations, data contained in the meteorological journal serve as initial data. The check is based on specified limiting values or combinations determined by observations. The control input parameters are air temperature, water vapor content in air, air pressure, horizontal visibility at ground level, cloudiness, soil state, weather state, and wind. (See also W74-06722) (Knapp-USGS)
W74-06725

COMPUTER MONITORING OF PRECIPITATION IN HUNGARY,
L. Adami.
In: Automatic Processing and Verification of Meteorological Observations; Proceedings of the International Symposium of Hydrometeorologists from the Socialist Counties: Jerusalem, Israel Program for Scientific Translations Technical Translation TT-72 50087, p 20-21. 1973.

Descriptors: *Data processing, *Hydrologic data, *Quality control, Data collections, *Meteorological data, Computer programs, *Climatic data, Monitoring, Precipitation(Atmospheric).
Identifiers: *Hungary.

The rainfall data supplied by the comparatively dense network of stations covering the territory of Hungary are controlled daily and processed manually, and precipitation charts are prepared. This processing is time- and labor-consuming: each month it is necessary to copy and calculate about 40 million items of data, and at times to recalculate them. Accordingly, the data processing section of the Hungarian Meteorological Service has been conducting numerical experiments in computer control and processing of daily precipitation data since November 1966. The computer not only implements control, but also plots daily precipitation charts and prepares tables containing the results of statistical processings. The output includes the following data: checked sum of daily and monthly precipitation for each station; deviations from the norms; chart of distribution of precipitation by days and months; days with given sums of precipitation; days with snow and with storms and hail; and yearly conclusions. (See also W74-06722) (Knapp-USGS)
W74-06726

AUTOMATIC MONITORING OF DAILY RESULTS OF BASIC METEOROLOGICAL OBSERVATIONS,
I. V. Nazarova.
In: Automatic Processing and Verification of Meteorological Observations; Proceedings of the International Symposium of Hydrometeorologists from the Socialist Countries Jerusalem, Israel Program for Scientific Translation Technical Translation TT-72 50087, p 22-30, 1973. 3 fig, 5 tab.

Descriptors: *Data processing, *Hydrologic data, *Quality control, Data collections, *Meteorological data, Computer programs, *Automatic control, Climatic data, Monitoring.
Identifiers: *USSR.

Methods were developed in the USSR for automatically monitoring basic meteorological observations: air temperature (periodical, maximum, minimum), soil surface temperature (periodical, maximum, minimum), atmospheric humidity, dew point, atmospheric pressure, wind direction and speed, aurora duration, snow cover, precipitation, amount the form of clouds, atmospheric effects, visibility, weather and soil surface state. Random errors are found by examining the daily data. Methods of detecting random errors and coarse blunders are discussed. Each observed quantity is first compared with the boundaries of climatic limits and the codes. If these conditions are not fulfilled, the given quantity is no longer controlled, and the computer prints the number of the error which is analyzed and corrected by specialists. If the conditions are fulfilled, a more accurate control, different for the various meteorological elements, is conducted. (See also W74-06722) (Knapp-USGS)
W74-06727

AUTOMATIC METHOD OF MONITORING THE QUALITY OF MEAN MONTHLY METEOROLOGICAL DATA,
D. P. Bespalov, and I. A. Berlin.
In: Automatic Processing and Verification of Meteorological Observations; Proceedings of the International Symposium of Hydrometeorologists from the Socialist Countries: Jerusalem, Israel Program for Scientific Translations Technical Translation TT-72 50087, p 31-35, 1973. 1 tab.

Descriptors: *Data processing, *Hydrologic data, *Quality control, Data collections, *Meteorological data, Computer programs, *Automatic control, Monitoring.
Identifiers: *USSR.

In the automated monitoring of data at the USSR Hydrometeorological Service, all meteorological data to be recorded on a carrier for later utilization pass necessarily through two control stages. The first stage involves examination of coarse errors (miscalculations and distortions) in routine data, which were caused mainly by data distortion in the communication lines, and also during punching and data decoding. In the second stage the results are analyzed for uniformity and compatibility and searched for systematic errors. This stage represents quality analysis of the observation results. Random errors, technical miscalculations, and distortions in the communication channels are usually detected fairly simply by a careful examination of the observation results, and are either corrected or eliminated from subsequent use while preparing the results for monthly generalizations. (See also W74-06722) (Knapp-USGS)
W74-06728

AUTOMATIC MONITORING OF PROCESSING OF DAILY RADIOSONDE DATA ON TEMPERATURE AND GEOPOTENTIAL,
I. V. Khanevskaya.
In: Automatic Processing and Verification of Meteorological Observations; Proceedings of the International Symposium of Hydrometeorologists from the Socialist Countries: Jerusalem, Israel Program for Scientific Translations Technical Translation TT-72-50087, p 36-49, 1973, 2 fig, 4 tab, 7 ref.

Descriptors: *Data processing, *Hydrologic data, *Quality control, Data collections, *Meteorological data, Computer programs, *Automatic control, Monitoring, *Radiosondes, Temperature.
Identifiers: *USSR.

At present the Hydrometeorological Service of the USSR implements a scheme of automatic processing of daily aerological observations. Aerological observations, punched on paper tape, are received during the first days of each following month at the Regional Centers. The results are read into the computer, decoded, and formed into a matrix. Control and correction of erroneous values of the elements in the matrices are followed by calculation of the required overall monthly characteristics with printout of daily and overall data and their recording on a permanent carrier. (See also W74-06722) (Knapp-USGS)
W74-06729

AUTOMATIC MONITORING AND PROCESSING OF HOURLY HYDROMETEOROLOGICAL INFORMATION,
Z. M. Makhover, and V. V. Ovsyannikov.
In: Automatic Processing and Verification of Meteorological Observations; Proceedings of the International Symposium of Hydrometeorologists from the Socialist Countries Jerusalem Israel Program for Scientific Translations Technical Translation TT-72 50087, p 50-58, 1973. 4 fig, 4 tab, 3 ref.

Descriptors: *Data processing, *Hydrologic data, *Quality control, Data collections, *Meteorological data, Computer programs, *Automatic control, Monitoring
Identifiers: *USSR

Hourly meteorological observations are conducted at the meteorological stations of airports in the USSR for operational purposes and cover the main characteristics necessary for serving aircraft. These observations are also of great scientific value since they yield the most detailed time structure of the series of observations. The computer system for automatic control and processing of hourly meteorological information includes the following main stages: Punching of observation results on teleprinter tape, which is then forwarded monthly to the Regional Center for processing; input of the punched tape into a computer, which processes and monitors the data; and output of tables of hourly observations, summary tables, and data recording on microfilm for lengthy storage. About 45-50 minutes machine time are taken for monitoring and processing of the monthly file of hourly data of a given station; when microfilming is included in the process this time increases to 1.5 hr. The following advantages are achieved by the automation of monitoring and processing: no manual labor is needed for filling and checking tables; monitored and processed data are obtained, including summary data; monitored data are recorded on a permanent medium (microfilm); the time taken for processing and recording data on the permanent medium is reduced considerably; considerable savings are achieved. This system was tested at the Belorussian Territorial Center and the Western Siberian Regional Center and was found viable and easy to operate. (See also W74-06722) (Knapp-USGS)
W74-06730

SOME PRINCIPLES OF OBJECTIVE CONTROL OF MARINE METEOROLOGICAL INFORMATION,
B. A. Birman, and A. S. Kaganskii.
In: Automatic Processing and Verification of Meteorological Observations: Proceedings of the International Symposium of Hydrometeorologists from the Socialist Countries: Jerusalem, Israel Program for Scientific Translations Technical Translation TT-72 50087, p 59-61, 1973. 1 ref.

Descriptors: *Data processing, *Hydrologic data, *Quality control, Data collections, *Meteorological data, Computer programs, *Marine air masses.
Identifiers: *USSR.

Marine meteorological observations, unlike other standard meteorological observations, are irregular with the exception of data originating from a small number of weather ships and lighthouses. Marine meteorological information is received at the Center of Statistical Data Processing and Storage of the USSR in the form of synoptic telegrams and observer's logs, and is processed and controlled automatically. Due to the irregularity of marine meteorological observations, spatial control is best implemented according to some quasi-homogeneous regions within which differences between the meteorological elements are of a random nature. A study conducted for the Gulf Stream convergence zone and the Labrador currents established that in a square of 10 deg X 10 deg a fully homogeneous air temperature field was recorded in 12% of cases, and in a square 5 deg X 5 deg in 26% of cases. The air mass propagating over a 2 deg X 2 deg square was in 50% of cases fully temperature-homogeneous in the marine surface layer, while in a 1 deg X 1 deg square this was true in 70 cases out of 100. Analysis of the homogeneity of the air temperature field on the basis of long-

term data established that a 2 deg X 5 deg area forms a quasi-homogeneous water area in this part of the Atlantic Ocean. (See also W74-06722) (Knapp-USGS)
W74-06731

AUTOMATIC PROCESSING OF RAINFALL DATA,
R. L. Kagan, and A. I. Polishchuk.
In: Automatic Processing and Verification of Meteorological Observations; Proceedings of the International Symposium of Hydrometeorologists from the Socialist Countries: Jerusalem, Israel Program for Scientific Translations Technical Translation TT-72-50087, p 62-68, 1973. 2 fig, 12 ref.

Descriptors: *Data processing, *Hydrologic data, *Quality control, Data collections, Meteorological data, Computer programs, *Weather data, Climatic data, *Rainfall, *Automatic control.
Identifiers: *USSR.

Systematic errors in meteorological data may be found with sufficient reliability by spatial interpolation. However, there are meteorological elements, such as the amount of rainfall, for which the results are less satisfactory. Control of meteorological data by spatial interpolation/may be reduced to the determination of the discrepancy between the observed value of the element and that obtained by interpolation from data of the surrounding stations. If this discrepancy exceeds some specified value, the observation is considered doubtful. This specified value must be much higher than the discrepancies caused by the natural spatial variability in error-free observations. For the monthly precipitation sums the mean square discrepancy of the interpolation is near to the tolerance adopted at present, and as a result roughly one-third of the data lie beyond its limits. Thus, for the monthly rainfall over the territory of the central regions of European USSR it represents 32% of the mean value. Similar results were also obtained for the territory of Belorussia. The density of the rainfall-measuring network in the Soviet Union is not uniform, but a density of 1 station per 2,000 sq km can be considered near its average density over the whole territory. (See also W74-06722) (Knapp-USGS)
W74-06732

AN ALGORITHM FOR MONITORING HYDROMETEOROLOGICAL INFORMATION,
I. A. Dyubkin.
In: Automatic Processing and Verification of Meteorological Observations; Proceedings of the International Symposium of Hydrometeorologists from the Socialist Countries: Jerusalem, Israel Program for Scientific Translations Technical Translation TT-72 50087, p 69-75, 1973. 1 tab, 10 ref.

Descriptors: *Data processing, *Hydrologic data, *Quality control, Data collections, *Meteorological data, Computer programs, *Algorithms, Monitoring.
Identifiers: *USSR.

Studies on the automation of all stages of hydrometeorological data flow, starting with the observations and ending with the delivery of data to the customer, are conducted at the Hydrometeorological Service of the USSR. One component of the automation system is data control, the correction or rejection of erroneous data. The most widely used methods of automatic control are static methods, based on the barometric height formula, and optimal interpolation, involving data on the statistical structure of analyzed hydrometeorological elements. This method is quite efficient in regions with a dense network of stations. One shortcoming of this objective control of observational results is the subjectivity in selecting the critical discrepancy between observed and controlled values. One possible algorithm for finding coarse observation errors in related hydrometeorological series is based on the mathematical-statistical principle of the impossibility of implementing a phenomenon with a small occurrence probability in a single test. The statistical structure of the observed quantities and their derivatives is examined. The diurnal and seasonal cycle is eliminated. The quasi-steady averaging periods and the locally-homogeneous regions are determined. The control algorithms are constructed allowing for the characteristics of the variability of the analyzed element by seasons and regions. The suggested control algorithms for hydrometeorological elements were constructed with allowance for data on the natural variability of the analyzed parameters and are applicable to a sparse network of nonuniformly distributed stations. (See also W74-06722) (Knapp-USGS)
W74-06733

ANALYSIS OF THE CONCENTRATION OF MICROPARTICLES IN THE LONG ICE CORE FROM BYRD STATION,
Ohio State Univ., Research Foundation, Columbus. Inst. of Polar Studies.
For primary bibliographic entry see Field 2C.
W74-06931

UNIVERSITY OF CHICAGO CONTRIBUTION TO PROJECT METROMEX-I.
Chicago Univ., Ill. Dept. of the Geophysical Sciences.
Available from NTIS, Springfield, Va. 22151 as PB-218 678; $3.00 printed copy, $1.45 microfiche. Cloud Physics Laboratory Technical Note 45 (Final technical report to the National Science Foundation), R. R. Braham, Jr., editor, December 15, 1972. 101 p. NSF Grant GA 28190X1.

Descriptors: *Cities, *Precipitation(Atmospheric), *Weather modification, *Chemistry of precipitation, Aerosols, Urban hydrology, Nucleation, *Missouri.
Identifiers: Urban precipitation anomaly, *St. Louis(Mo).

Measurements made over and around St. Louis, Missouri show that the city markedly affects several atmospheric parameters important in the formation of clouds and weather. The city acts as a source of cloud condensation nuclei (CCN) with a source strength of 5000 to 50,000 per cc per sec. This increase in CCN concentrations results in downwind clouds with smaller, more numerous drops at cloud base. Vertical cross-sections of state parameters and aerosol were used to study the vertical structure of the urban heat island and urban aerosol plume. Radar mapping of precipitation echoes verifies the presence of an urban precipitation anomaly. (See W74-06938 thru W74-06941) (Knapp-USGS)
W74-06937

RADAR STUDIES OF URBAN PRECIPITATION ANOMALY,
Chicago Univ., Ill. Dept. of the Geophysical Sciences.
M. Dungey, and T. R. Morris.
In: University of Chicago Contribution to Project Metromex-I: Chicago University Cloud Physics Laboratory Technical Note 45 (Final technical report to the National Science Foundation), p 25-33, December 15, 1972. 4 fig, 3 tab.

Descriptors: *Cities, *Precipitation(Atmospheric), *Weather modification, *Chemistry of precipitation, Aerosols, Urban hydrology, Nucleation, *Missouri, *Remote sensing, Radar.
Identifiers: Urban precipitation anomaly, *St. Louis(Mo).

Radar data show that precipitation initiation in the St. Louis are during June-August 1972 was predominantly through drop coalescence. The area over and downwind of the city had about 2.4 times the frequency of precipitation initiation of the non-city area. A larger fraction of the city echoes grew after formation. On the average the First Echo (FE) base and top heights were about equal over the city and non-city, although the cumulative frequency distribution show a skewing toward higher bases and tops for city FE. The frequency of no-echo observations is about three times higher over the city than over the non-city. This fact combined with more frequent FE formation suggests that a combination of two urban agents is at work--one of which increases the likelihood of precipitation formation over the downwind of the city, and a second reduces the total area over which precipitation reaches the ground. (See also W74-06937) (Knapp-USGS)
W74-06938

OBSERVATIONS OF THE CLOUD NUCLEUS CONCENTRATION AROUND THE ST. LOUIS URBAN COMPLEX,
Chicago Univ., Ill. Dept. of the Geophysical Sciences.
P. Spyers-Duran.
In: University of Chicago Contribution to Project Metromex-I: Chicago University Cloud Physics Laboratory Technical Note 45 (Final technical report to the National Science Foundation), p 35-52, December 15, 1972. 10 fig, 2 tab, 16 ref. NSF Grant GA 28190X1.

Descriptors: *Cities, *Precipitation(Atmospheric), *Weather modification, *Chemistry of precipitation, Aerosols, Urban hydrology, Nucleation, *Missouri.
Identifiers: Urban precipitation anomaly, *St. Louis(Mo).

In summer 1971, winter 1972, and summer 1972, a highly industrialized and populated area (St. Louis) produces cloud condensation nuclei (CCN) significantly above background concentrations. Downwind, the CCN plume is identifiable for at least one diameter of the urban area. Maximum concentrations typically were found immediately downwind; a secondary maximum might exist 30-35 miles downwind of the city. The production rates of CCN are similar to those of other cities including Denver and Buffalo, and lower production rates exist on Sundays. (See also W74-06937) (Knapp-USGS)
W74-06939

UPWIND AND DOWNWIND CLOUD-BASE MICROSTRUCTURE,
Chicago Univ., Ill. Dept. of the Geophysical Sciences.
P. Spyers-Duran.
In: University of Chicago Contribution to Project Metromex-I: Chicago University Cloud Physics Laboratory Technical Note 45 (Final technical report to the National Science Foundation), p 53-71, December 15, 1972. 15 fig, 3 tab, 11 ref. NSF Grant GA 28190X1.

Descriptors: *Cities, *Precipitation(Atmospheric), *Weather modification, *Chemistry of precipitation, Aerosols, Urban hydrology, Nucleation, *Missouri.
Identifiers: Urban precipitation anomaly, *St. Louis(Mo).

Cloud base microstructure is controlled to a large extent by the updraft speed and the subcloud condensation nuclei (CCN) spectra. Clouds forming in high CCN concentrations form a narrow spectra of small drops compared with those forming from low CCN concentrations. The ability of clouds to produce precipitation through coalescence is related to their cloud drop spectra. In general the initial 'breakout' of precipitation elements is delayed in narrow spectrum clouds. Because St. Loius typically serves as a source of CCN, the microstructure of clouds around the city was studied to verify that they show response to the urban-induced cloud condensation nuclei. Over the city and

downwind, clouds are composed of smaller and more numerous droplets and have smaller dispersion than the upwind clouds. This increase in continentality of the microstructure in the effected clouds results in colloidal stability and hence could lower the probability of producing precipitation. Downwind clouds, in about a distance of the city diameter, approach again the upwind cloud microstructure. (See also W74-06937) (Knapp-USGS)
W74-06940

METROMEX TEMPERATURE AND AEROSOL DATA REDUCTION: ANALYSIS OF THE URBAN ANOMALY,
Chicago Univ., Ill. Dept. of the Geophysical Sciences.
H. E. Dytch.
In: University of Chicago Contribution to Project Metromex-I: Chicago University Cloud Physics Laboratory Technical Note 45 (Final technical report to the National Science Foundation), p 73-90, December 15, 1972. 12 fig. NSF Grant GA 28190XI.

Descriptors: *Cities, *Precipitation(Atmospheric), *Weather modification, *Chemistry of precipitation, Aerosols, Urban hydrology, Nucleation, *Missouri.
Identifiers: Urban precipitation anomaly, *St. Louis(Mo).

Flights over the St. Louis area were designed to study in detail the influence of an urban center upon its meteorological environment, continuously measuring state parameters and aerosol distribution in vertical cross-sections at selected flight levels over the city. Infrared surface temperature measurements were also conducted during the winter of 1972, mapping in detail an approximately 2,500 sq km region centered on the St. Louis metropolitan area. A high temperature pocket, centered on downtown St. Louis just west of the Gateway Arch stands out clearly, with a maximum temperature difference from the outlying northern rural area in excess of 5 deg C. Topographical effects, associated possibly with cold-air drainage, also are evident but close to the city the temperature field appears to be dominated by the urban effect. In terms of both particle concentration and density the urban area appears as a strong source of contamination, and the confining effect of the upper level inversion is marked. (See also W74-06937) (Knapp-USGS)
W74-06941

THE ROLE OF DEW IN THE SEASONAL MOISTURE BALANCE OF A SUMMER-DRY CLIMATE,
Victoria Univ. (British Columbia). Dept. of Geography.
S. E. Tuller, and R. Chilton.
Agric Meteorol. Vol 11, No 1, p 135-142. 1973.
Identifiers: *Dew, *Dry climates, Evapotranspiration, *Moisture balance, Seasonal, Summer, Transpiration.

The role of dew in the moisture balance of a summer-dry climate was investigated. Dew was measured by means of the optical technique employing Duvdevani dew blocks during 3 summer months and one fall month in 1970. Results were compared with rainfall and potential evapotranspiration. Dew amounted to 12-14% of normal monthly rainfall in mid-summer. In the unusually dry year of 1970 it reached 154% of the rainfall in Aug. Dew was seen to increase with the number of clear nights and thus, increased as clouds and precipitation decreased. Although dew was an available source of evaporative moisture until approximately 09h30 on the morning after a clear night, its total was only about 2% of monthly potential evapotranspiration. The amount of dew increased outward from a vertical forest edge as longwave cooling and wind effects increased.--Copyright 1973, Biological Abstracts, Inc.
W74-07037

ENERGY FLOWS IN THE BIOSPHERE: THE IMPACT OF MAN,
Australian National Univ., Canberra. Research School of Biological Sciences.
R. O. Slatyer.
Proc Linn Soc N S W. Vol 97, No 3, p 225-236. 1972.
Identifiers: *Biosphere, Climates, Cycling, Electric power, *Energy flows, Food, Insulation, Photosynthesis, Planned obsolescence, Power production, Solar energy, *Ecosystems, *Energy balance.

The way in which energy underlies the workings of the biosphere, the workings of the natural ecosystems and the workings of human societies is discussed. Solar energy is of fundamental importance to the global environment, and the patterns of weather and climate reflect a delicate balance between the inflows, outflows and redistributions. National ecosystems are powered by solar energy through photosynthesis, and there is a tendency for their energy storage and species diversity to increase with succession. Human activity is linked to energy consumption, and the tendency is to use more and more energy per person. Any significant change in the energy balance is likely to affect the climate, and small effects on climate could have serious effects on food production. The challenge for the future is to produce and use energy as efficiently as possible, and with the least possible ecological disturbance. Some possible methods to do this include: recycling, extensive use of hydro-electric power, better insulation in structures and a change of the Western life style with its emphasis of endless production and planned obsolescence.--Copyright 1973, Biological Abstracts, Inc.
W74-07043

DRY AND WET, JULY-AUGUST RAINFALL AREAS IN IOWA,
Iowa State Univ., Ames. Dept. of Agronomy.
R. H. Shaw, and P. J. Waite.
Iowa State J Res. Vol 47, No 3, p 191-198. 1973. Illus.
Identifiers: Clouds, *Crop production, Dry season, *Iowa, *Rainfall, Seeding, Wet season.

July and Aug. rainfalls in Iowa, coinciding with the peak of heating and evapotranspiration, are especially critical for crop production. Consequently, areal and temporal evaluations of the characteristics of rainfall in Iowa during those months in 1931-1970 was undertaken to provide a climatological analysis for the potential effects of cloud seeding on crop production. Dry areas during July-Aug. in Iowa were observed in 27 of 40 yr (i.e., 2 of 3) and wet areas were observed in 35 of 40 yr (7 of 8); both wet and dry areas were present in more than half the years (22 of 40). Iowa does not experience an increased number of low-rainfall days during dry spells, but experience an actual decreased number of rain days at all rainfall threshold values of 0.01, 0.1, 0.25 and 0.5 in.--Copyright 1973, Biological Abstracts, Inc.
W74-07045

2C. Snow, Ice, and Frost

NEW INSIGHTS INTO THE INFLUENCE OF ICE ON THE COASTAL MARINE ENVIRONMENT OF THE BEAUFORT SEA, ALASKA,
Geological Survey, Menlo Park, Calif. Office of Marine Geology and Hydrology.
P. W. Barnes, and E. Reimnitz.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1307-1314, 1973. 5 fig, 11 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Sea ice, *Alaska, *Geomorphology, Surveys, Data collections, Water circulation, Sedimentation, Sediment transport
Identifiers: *ERTS

Areal patterns from field data and ERTS 1 imagery show a close relationship between geomorphic processes and the influence of sea ice along Alaska's northern coast, perhaps the nation's least known continental margin. Ice acts as (1) a bottom-gouging agent, (2) an influence on water circulation, (3) a carrier of sediments, and (4) an influence on water types. (See also W74-06619) (Knapp-USGS)
W74-06669

USE OF ERTS DATA FOR MAPPING ARCTIC SEA ICE,
Environmental Research and Technology, Inc., Lexington, Mass.
J. C. Barnes, and C. J. Bowley.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1377-1384, 1973. 7 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Sea ice, *Mapping, Surveys, Monitoring, Data collections, Icebergs, Ice, Arctic, Glaciers, Snowpacks.
Identifiers: *ERTS.

ERTS data were evaluated for detecting and mapping Arctic sea ice. The specific objectives are to determine the spectral bands most suitable for detecting ice, to measure the scale and types of ice features that can be detected, and to develop interpretive techniques for differentiating ice from clouds and for mapping ice concentrations. Sea ice is detectable in all of the ERTS MSS spectral bands and can be distinguished from clouds through a number of interpretive keys. The MSS-4 (0.5 to 0.6 micron) and MSS-5 (0.6 to 0.7 micron) bands appear to be better for mapping ice boundaries, whereas the MSS-7 (0.8 to 1.1 micron) band provides greater detail in the ice features. Considerable information on ice type can be derived from the ERTS data. Ice types that appear to be identifiable include: ice flows of various categories, pack ice of various concentrations, ice belts, brash ice, rotten ice, fast ice, leads, fractures, cracks, puddles, thaw holes and flooded ice. The multispectral analysis of the ERTS MSS-4 and MSS-7 bands provides much information on ice type and ice surface features that cannot be derived from a single spectral band. For example, thaw holes can often be distinguished from puddles because of their different appearances in the two bands. These surface features can be indicative of ice age. Furthermore, snow lines on glaciers can be reliably mapped through the joint use of the MSS-4 and MSS-7 data. (See also W74-06619) (Knapp-USGS)
W74-06676

SNOW COVER SURVEYS IN ALASKA FROM ERTS-1 DATA,
Alaska Univ., College.
C. S. Benson.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1593-1595, 1973.

Descriptors: *Remote sensing, Satellites(Artificial), *Snow cover, *Ice, *Glaciers, Snowpacks, *Alaska, Surveys, Melting, Mapping, Data collections.
Identifiers: *ERTS.

September and October, 1972, ERTS data were analyzed to delineate snow cover patterns in northern Alaska's Brooks Range and on Mt. Wrangell, an active volcano in south central Alaska. Snow on the northern foothills of the Brooks Range is significantly more affected by katabatic wind action than on the southern foothills. Aufeis deposits along artic rivers also can be identified in late summer. A survey of such aufeis deposits could identify additional summertime sources of freshwater supplies. Images of Mt. Wrangell monitor the interaction between volcanic heat and the mass balance of glaciers. Significant melting of new snow from an extensive storm on August 18 was seen. Digital analysis of data from subsequent passes over the summit on September 7, 23 and 24 reveal considerable bare rock exposed by melting, which is virtually impossible from solar heating at this altitude and date. (See also W74-06619) (Knapp-USGS)
W74-06697

RECENT ACTIVITY OF GLACIERS OF MOUNT RAINIER, WASHINGTON,
Geological Survey, Reston, Va.
R. S. Sigafoos, and E. L. Hendricks.
Available from Sup Doc, GPO, Washington, D C 20402, Price $5.70. Geological Survey Professional Paper 387-B, 1972. 24 p, 13 fig, 7 plate, 10 tab, 21 ref.

Descriptors: *Glaciers, *Washington, *Dendrochronology, *Paleoclimatology, Glacial drift, Quaternary period, Pleistocene epoch, Dating, Glacial sediments, Geomorphology.
Identifiers: *Mount Rainier(Wash).

Moraines on Mt. Rainer, Washington, can be dated by knowing the ages of trees. Knowing past glacial activity aids understanding of past climatic variations. There are modern moraines of different age around the mountain; some valleys contain only one modern moraine; others contain as many as nine. The evidence indicates a sequence of modern glacial advances terminating at about the following A.D. dates: 1525, 1550, 1625-60, 1715, 1730-65, 1820-60, 1875, and 1910. Nisqually River valley near Nisqually Glacier contains one moraine formed before A.D. 1842; Tahoma Creek valley near South Tahoma Glacier contains three moraines formed before A.D. 1528, 1843, and 1864; South Puyallup River valley near Tahoma Glacier, six moraines, A.D. 1544, 1761, 1841, 1851, 1863, 1898; Puyallup Glacier, one moraine, A.D. 1846; Carbon Glacier, four moraines, 1519, 1763, 1847, 1876; Winthrop Glacier, four moraines, 1655, 1716, 1760, and 1822; Emmons Glacier, nine moraines, 1596, 1613, 1661, 1738, 1825, 1850, 1865, 1870, 1901; and Ohanapecosh Glacier, three moraines, 1741, 1846, and 1878. Outwash in three areas was deposited by melt-water of Tahoma Glacier before A.D. 1862, 1873, and 1910, respectively. Flood channels or melt-water channels on either side of Carbon River near Carbon Glacier dated from about 1901 to 1907. Melt-water channels of three different ages cut through Emmons Glacier moraines were dated as being abandoned before 1865, 1871, and 1917, respectively. (Knapp-USGS)
W74-06713

INVESTIGATIONS PERFORMED ON THE ARCTIC ICE DYNAMICS JOINT EXPERIMENT, MARCH 1971,
Cold Regions Research and Engineering Lab., Hanover, N.H.
S. F. Ackley, W. D. Hibler, III, A. Kovacs, W. F. Weeks, and A. Hartwell.
Research Report 315, December 1973. 66 p.

Descriptors: *Sea ice, *Ice cover, *Cryology, Deformation, Topography, Strain, Stress, Movement, Winds, Currents(Water), Plastic deformation, Aerial photography.
Identifiers: *Pack ice, *Beaufort Sea, Ice dynamics.

Mesoscale strain measurements were made on the Beaufort Sea pack ice. Fracture (lead and crack) orientations in first-year ice indicate correlation with the orientation of the strain rate ellipse. A qualitative relation is suggested between the fracture density and the long-term divergence rate. Correlation was also observed between the divergence of the wind field, as computed from the surface pressure field, and the ice divergence. Three transverse profiles were measured across a large pressure ridge in the Beaufort Sea. The ridge sail extended 4 m above sea level and the keel 13 m below. The cross sections of the keel were roughly semicircular, suggesting that form drag coefficients for flow transverse to the long axes of multiyear ridges may be as high as 0.8. A spectral study of the snow and ice topography of a multiyear floe showed that the snow cover attenuates the roughness amplitude of the ice surface but does not cover it completely. The ice sheet as a whole is in free-floating, isostatic equilibrium, but pronounced local deviations from isostatic equilibrium are common. The time, direction and magnitude of deformational motion in the Beaufort Sea were determined by combining observations of the changes in features related to ice deformation (leads, fractures, pressure ridges) with mesoscale measurements of strains and strain rates on the ice. Measurements of the size of ice blocks in newly formed pressure ridges and measurements of salinity and temperature are presented. (See W74-06717 thru W74-06721) (Knapp-USGS)
W74-06716

MESOSCALE STRAIN MEASUREMENTS ON THE BEAUFORT SEA PACK ICE,
Cold Regions Research and Engineering Lab., Hanover, N.H.
W. D. Hibler, III, W. F. Weeks, S. Ackley, A. Kovacs, and W. J. Campbell.
In: Investigations Performed on the Arctic Ice Dynamics Joint Experiment, March 1971: Army Cold Regions Research and Engineering Laboratory Research Report 315, Part 1, p 3-22, December 1973. 12 fig, 2 tab, 21 ref.

Descriptors: *Sea ice, *Ice cover, *Cryology, Deformation, Topography, Strain, Stress, Movement, Winds, Currents(Water), Plastic deformation, Aerial photography.
Identifiers: *Pack ice, *Beaufort Sea, Ice dynamics.

The deformation of a strain triangle approximately 6 x 8 x 11 km located on first-year ice in the Beaufort Sea was observed over a 2-week period in March 1971. Significant strain events were observed during short (6-hour) time periods. The long-term (one day or more) divergence rate varied between 0.04 and 0.00008 per hour. Short-term divergence rates showed values as high as 0.00029 per hour. The floes to the east were moving south relative to the floes to the west. This agrees with the shear pattern that might be expected, considering the location of the station in the Pacific Gyre. Studies of fracture (lead and crack) orientations in the vicinity of the strain triangle indicate reasonable correlations with the orientation of the strain rate ellipse. A qualitative relation is suggested between the fracture density and the long-term divergence rate. Correlations were also observed between the divergence of the wind field as computer from the surface pressure field and the ice divergence. (See also W74-06716) (Knapp-USGS)
W74-06717

STRUCTURE OF A MULTIYEAR PRESSURE RIDGE,
Cold Regions Research and Engineering Lab., Hanover, N.H.
A. Kovacs, W. F. Weeks, S. Ackley, and W. D. Hibler, III.
In: Investigations Performed on the Arctic Ice Dynamics Joint Experiment, March 1971: Army Cold Regions Research and Engineering Laboratory Research Report 315, Part 2, p 23-33, December 1973. 11 fig, 12 ref.

Descriptors: *Sea ice, *Ice cover, *Cryology, Deformation, Topography, Strain, Stress, Movement, Winds, Currents(Water), Plastic deformation, Aerial photography.
Identifiers: *Pack ice, *Beaufort Sea, Ice dynamics.

Three transverse profiles were measured across a large pressure ridge located in the Beaufort Sea. The ridge sail extended 4 m above sea level and the ridge keel 13 m below. The cross sections of the ridge keel are roughly semicircular, suggesting that form drag coefficients for flow transverse to the long axes of multiyear ridges may be as high as 0.8. Much of the ice in the ridge has a very low salinity and is quite strong. All the interblock voids that initially existed in the ridge at the time of its formation have been completely filled with ice. These observations, coupled with icebreaking experience, indicate that multiyear ridges are obstacles to even the largest icebreaking ship and should be avoided if possible. A very large first-year ridge with a sail height of 12.8 m is also described. This is the largest free-floating ridge yet recorded. (See also W74-06716) (Knapp-USGS)
W74-06718

TOP AND BOTTOM ROUGHNESS OF A MULTIYEAR ICE FLOE,
Cold Regions Research and Engineering Lab., Hanover, N.H.
W. D. Hibler, III, S. F. Ackley, W. F. Weeks, and A. Kovacs.
In: Investigations Performed on the Arctic Ice Dynamics Joint Experiment, March 1971: Army Cold Regions Research and Engineering Laboratory Research Report 315, Part 3, p 35-44, December 1973. 8 fig, 1 tab, 9 ref.

Descriptors: *Sea ice, *Ice cover, *Cryology, Deformation, Topography, Strain, Stress, Movement, Winds, Currents(Water), Plastic deformation, Aerial photography.
Identifiers: *Pack ice, *Beaufort Sea, Ice dynamics.

A spectral study of the snow and ice topography on a multiyear ice floe shows that the snow cover, although attenuating the roughness amplitude of the ice surface, does not cover it completely. In general the snow surface variance is lower by a factor of one-third to one-fourth than the ice surface variance. The correlation between snow and ice surface roughness is highly significant for long wavelengths (> 8 m), but fails to be significant for short wavelengths (< 4 m). Although the ice sheet as a whole is in free-floating, isostatic equilibrium, pronounced local deviations from isostatic equilibrium are common. The trend is for ice drafts to deviate more than expected from isostasy for thin ice and less than expected for thick ice. Estimates are also made of the number of ice thickness measurements required to obtain the mean thickness of the multiyear floe to any specified accuracy. (See also W74-06716) (Knapp-USGS)
W74-06719

AIRPHOTO ANALYSIS OF ICE DEFORMATION IN THE BEAUFORT SEA,
A. D. Hartwell.
In: Investigations Performed on the Arctic Sea Ice Dynamics Joint Experiment, March 1971: Army Cold Regions Research and Engineering Laboratory Research Report 315, Part 4, p 45-60, December 1973. 18 fig, 1 tab, 6 ref.

Descriptors: *Sea ice, *Ice cover, *Cryology, Deformation, Topography, Strain, Stress, Movement, Winds, Currents(Water), Plastic deformation, Aerial photography.
Identifiers: *Pack ice, *Beaufort Sea, Ice dynamics.

Ice deformation in a 175 sq km area of the Beaufort Sea was analyzed by means of sequential aerial photographs. The approximate time, direction and magnitude of deformational motion were determined by combining observations of the changes in features related to ice deformation, such as leads, fractures and pressure ridges, and mesoscale measurements of strains and strain rates on the ice. During this period a series of compressions, extensions and shearing motions occurred, producing numerous changes in ice morphology. The entire area was apparently under considerable lateral constraint with no observable rotation or rounding of floes. No leads wider than about 150 m were present. Shearing motion along one individual lead of up to 280 m was documented by the photographs. Relative motion along shear zones was nearly always dextral or right lateral in accord with the clockwise rotation of the Pacific Gyre. (See also W74-06716) (Knapp-USGS)
W74-06720

DATA ON MORPHOLOGICAL AND PHYSICAL CHARACTERISTICS OF SEA ICE IN THE BEAUFORT SEA,
Cold Regions Research and Engineering Lab., Hanover N. H.
S. F. Ackley, A. Kovacs, W. F. Weeks, and W. D. Hibler, III.
In: Investigations Performed on the Arctic Ice Dynamics Joint Experiment, March 1971: Army Cold Regions Research and Engineering Laboratory Research Report 315, Part 5, p 61-63, December 1973. 3 fig, 3 tab.

Descriptors: *Sea ice, *Ice cover, *Cryology, Deformation, Topography, Strain, Stress, Movement, Winds, Currents(Water), Plastic deformation, Aerial photography.
Identifiers: *Pack ice, *Beaufort Sea, Ice dynamics.

Two measurements were made of block sizes in newly formed pressure ridges in ice of the Beaufort Sea. Block size measurements assist in the calculation of the fracture energy necessary to build pressure ridges. Two vertical profiles were also obtained, as well as some near-surface salinities in thick first-year ice and in newly formed ice measured in concurrence with ground-based microwave ellipsometer studies. (See also W74-06716) (Knapp-USGS)
W74-06721

AN EXPANDING ROLE FOR SUBARCTIC WATERSHED RESEARCH,
Cold Regions Research and Engineering Lab., Fairbanks, Alaska.
For primary bibliographic entry see Field 4D.
W74-06884

CHEMICAL PROFILE OF THE ROSS ICE SHELF AT LITTLE AMERICA V, ANTARCTICA,
Cold Regions Research and Engineering Lab., Hanover, N.H.
C. C. Langway, Jr., M. Herron, and J. H. Cragin.
Research Report 316, January 1974. 5 p, 1 fig, 1 tab, 17 ref. NSF AG-212, AG-394.

Descriptors: *Glaciers, *Cations, *Provenance, *Antarctic, Sodium, Potassium, Magnesium, Calcium, Movement, Glaciation, Geochemistry, Ions, Water chemistry.
Identifiers: *Ross Ice Shelf(Antarctica).

Measurements of the concentrations of Na, K, Mg, and Ca were made on 28 samples from the 255-m-deep ice core from Little America V, Antarctica. All concentrations decrease sharply with depth from the firn-ice transition at 52 m to somewhere between 125 m and 150 m. From 150 m to 250 m the cationic concentrations are relatively constant. This shows that the ice above 125 m fell as snow on the Ross Ice Shelf and that ice below 150 m originated inland on Marie Byrd Land. (Knapp-USGS)
W74-06921

FOLDING OF COLD ICE,
Ohio State Univ. Research Foundation, Columbus. Inst. of Polar Studies.
M. J. McSaveney.
Antarctic Journal, Vol 8, No 6, p 344-346, November-December 1973. 2 fig, 3 ref. NSF Grant GV-28804.

Descriptors: *Glaciers, *Glaciology, *Antarctic, *Folds(Geologic), Plasticity, Ice, Rheology, Strain, Movement.

Many glaciers in southern Victoria Land, Antarctica, have conspicuous trains of undulations, known as wave ogives, on their surfaces. Perhaps the most extreme example is Bartley Glacier in Wright Valley. Deformation of ice in ogives on Meserve Glacier is an ongoing process. Folding occurs in cold ice and need not relate to a warmer time. Folding and ogive formation are related to the internal stress regime and viscous properties of glacier ice. In glaciers with appreciable concentrations of sand, viscous properties of the ice and sand layers may strongly influence the nonhomogeneous strain observed as folds. (Knapp-USGS)
W74-06928

ANALYSIS OF IODINE IN ANTARCTIC SNOW,
Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 5B.
W74-06929

SILVER CONCENTRATIONS IN ANTARCTIC SNOW AND FIRN,
Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 5A.
W74-06930

ANALYSIS OF THE CONCENTRATION OF MICROPARTICLES IN THE LONG ICE CORE FROM BYRD STATION,
Ohio State Univ., Research Foundation, Columbus. Inst. of Polar Studies.
L. G. Thompson, W. L. Hamilton, and C. Bull.
Antarctic Journal, Vol 8, No 6, p 340-341, November-December 1973. 2 fig, 8 ref. NSF Grant GV-32899.

Descriptors: *Dusts, *Antarctic, *Ice, *Climatology, *Oxygen isotopes, Stratigraphy, Glaciology.

During 1973 measurements were made of the concentrations and size distributions of microparticles in 15 representative sections, averaging 1 meter in length, taken from the 2164-meter-long ice core from Byrd Station. The study was designed to clarify relationships between microparticle concentrations and climate, by comparing the concentrations and size distributions with 0-18 values of ice from the same depths. Relationships were established over seasonal, decennial, and millenial time intervals. The total concentration of microparticles (defined as the number of particles greater than 0.65 micron diameter in a 500 microliter sample of meltwater) is greatest in the samples with the largest negative 0-18 values. If annual positive balance remained constant, the vertical strain rate calculated from the thinning of annual layers is -0.000028 per yr. (Knapp-USGS)
W74-06931

PB-210 CONCENTRATION IN ICE MEASURED AT SOUTH POLE STATION,
Centre National de la Recherche Scientifique, Gif-sur-Yvette (France). Centre des Faibles Radioactivities.
For primary bibliographic entry see Field 5A.
W74-06932

2D. Evaporation and Transpiration

EVAPORATION SUPPRESSION, A BIBLIOGRAPHY.
Office of Water Resources Research, Washington D C
For primary bibliographic entry see Field 3D
W74-06501

EVAPORATION FROM BRINE STORAGE RESERVOIRS,
Oklahoma State Univ., Stillwater Dept of Agricultural Engineering
F. R. Crow.
Available from the National Technical Information Service as PB-231 187, $3.25 in paper copy, $1.45 in microfiche. Oklahoma Water Resources Research Institute, Stillwater, Final Technical Completion Report, March 1, 1974. 46 p, 15 fig, 10 tab, 8 ref. OWRR A-029-OKLA (1) 14-31-0001-4036.

Descriptors: *Evaporation, *Reservoir storage, Seepage, Chemical analysis, Sodium chlorides, Electrical conductance, Temperature, Saline water, Great Plains, *Oklahoma, Brines, *Salinity, Dissolved solids, Salts.
Identifiers: *Brine storage reservoirs, Arkansas River, Red River, *Brine evaporation.

The broad objective was to determine the relationships between saline concentration and the rate of evaporation of brine solutions. Relationships thus established would be applicable to evaporation design problems in brine storage reservoirs that have been proposed for abatement of natural and man-made salt pollution of major portions of the waters of Arkansas and Red Rivers whereby the effluent from highly concentrated brine springs, marshes and salt flats would be stored and ultimately evaporated, if possible. The experiments were conducted in four sunken evaporimeters, 6.5 ft. diameter by 2 ft deep, insulated at the sides and bottom with 12 in. of urethane foam. Liners were used to prevent corrosion and seepage. The original custom installed liners of fiber glass and epoxy resin were unsatisfactory. Two thicknesses of 6 mil. black polyethylene sheet plastic formed a satisfactory liner. Frequent seepage tests were made to detect leaks. Brine evaporation tests were conducted from August 2, 1972 until August 30, 1973. Brines were constituted to desired strength by mixing tap water with granular salt from a commercial salt works near Erick, Oklahoma, one of the major sources of natural brine pollution on the Red River. Four long duration tests in the summer and fall months of 1972 and '73 showed evaporation was inversely proportional to amount of total dissolved solids. Compared with fresh water, evaporation from a brine solution with an average 234,000 ppm total dissolved solids was 19.2% less than from fresh water.
W74-06517

STUDIES OF THE FOREST ENERGY BUDGET,
Oregon State Univ., Corvallis. Dept. of Forest Engineering.
L. W. Gay, and H. R. Holbo.
Available from the National Technical Information Service as PB-231 221; $3.25 in paper copy, $1.45 in microfiche. Oregon Water Resources Research Institute, Corvallis, Project Completion Report, March 1974. 34 p, 7 fig, 2 tab, 73 ref. OWRR A-010-ORE (7).

Descriptors: *Energy budget, Evapotranspiration, *Forest management, Energy conversion, *Canopy, *Washington, Model studies, Reviews, *Douglas fir trees.
Identifiers: *Cedar River(Wash), Forest energy analysis, Bowen ratio model.

Application of the mean-profile energy budget analysis to forests is discussed, with regard to limitations imposed by the forest environment.

These limitations are primarily associated with the diffuse structure and aerodynamically rough nature of forest canopies, which contrast with the dense and relatively smooth canopies of agricultural crops. Results of the few forest energy budgets that have been completed are reviewed by country of origin and number of articles. The results from these studies are compared with a clear weather energy budget for a second-growth Douglas-fir site on the Cedar River, Seattle, Washington. Despite obvious limitations upon interpretation of variability from the two estimates made, this appears to be the first forest study to replicate the energy budget measurements. The variability found here confirms the necessity for replication in future experiments. Literature review confirmed that among mean-profile methods, the Bowen ratio was the most widely used model for forest energy budget analysis. Results are based on the Bowen ratio model.
W74-06518

UPWARD FLOW FROM SHALLOW WATER TABLES,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 2F.
W74-06844

FIELD MEASUREMENT OF EVAPORATION FROM SOIL SHRINKAGE CRACKS,
Agricultural Research Service, Temple, Tex. Blackland Conservation Research Center.
J. T. Ritchie, and J. E. Adams.
Soil Science Society of America Proceedings, Vol 38, No 1, p 131-134, January-February 1974. 3 fig, 2 tab, 9 ref.

Descriptors: *Evaporation, *Soil water, *Soil moisture, *Cracks, Lysimeters, Expansive soils, Unsaturated flow, Soil water movement.
Identifiers: Shrinkage cracks.

Evaporative fluxes from a natural shrinkage crack and from an artifically induced soil shrinkage crack were measured. Evaporation from the soil surface, except at the crack opening, was prevented by covering the lysimeter with plastic film. Evaporation rates from the natural and induced crack averaged about 0.6 mm/day. The horizontal soil water flux in the liquid phase to the crack wall was quite low, indicating that most of the measured evaporation resulted from vapor transport from some distance in the soil pores to the crack walls. Diurnal variations in evaporation rates were closely related to diurnal changes in vapor pressure deficit of the atmosphere above the soil surface. Evaporation rates from the natural crack experiment were practically the same when the crack and soil surface were exposed to the atmosphere as when only the crack opening was exposed. Therefore, most evaporation from cracked, dry clay soil occurs because of the presence of skrinkage cracks. These results suggest a possibility for conserving water by partially filling the skrinkage cracks with dry soil or mulch to reduce evaporation. (Knapp-USGS)
W74-06900

THE EVAPORATION FROM A WATER PAN--ITS LIMITED SIGNIFICANCE (L'EVAPORATION D'UN BAC D'EAU LIBRE--SA SIGNIFICATION RESTREINTE),
Institut Royal Meteorologique de Belgique, Brussels.
F. Bultot, and G. L. Dupriez.
Journal of Hydrology, Vol 20, No 1, p 83-95, September 1973. 2 fig, 2 tab, 9 ref.

Descriptors: *Evaporation, *Evapotranspiration, *Evaporimeters, *Calibrations, *Evaporation pans, Turbulence, Instrumentation, Heat transfer, Diffusion, Solar radiation.

There is no simple relation nor even a strong correlation between daily evaporation measured by means of a water pan and potential evapotranspiration from neighboring natural surfaces. Generally evaporation from the pan is reduced due to the fact that the incident global solar radiation penetrates partially into the water and consequently a portion of the radiant energy flux is not caught by the surface. The evaporation from the pan may also be increased sometimes as a result of fast transfer of heat from underlying water layers towards the surface by turbulent diffusion. (Knapp-USGS)
W74-06908

INTERCEPTION LOSS IN THE HUMID FORESTED AREAS (WITH SPECIAL REFERENCE TO SUNGAI LUI CATCHMENT, WEST MALAYSIA),
Malaya Univ., Kuala Lumpur (Malaysia). Dept. of Geography.
L. K. Sim.
Malay Nat J. Vol 25, No 2, p 104-111, 1972. Illus.
Identifiers: Catchments, *Forested areas, Humid, *Interception loss, *Evaporation, *Malaysia(Sungai-Lui catchment).

A comparison of precipitation measurements on top of the forest canopy with those at ground level was made by installing a rain-gauge funnel above the trees and 3 check gauges under the trees. Measuring the throughfall with 3 gauges which were randomly shifted under the leaf canopy avoided a biased catch. The water lost in transit is called interception loss and in the area tested ranged from 25% to 80%. The intercepted amount of water is higher proportionately from smaller storms. Interception is a temporary phenomenon and the water is subsequently evaporated from the leaves and branches. Evaporation and interception are important components in the hydrologic cycle and together these may reduce to one half the total input of water in the forested areas studied.--Copyright 1973, Biological Abstracts, Inc.
W74-07015

PHYSICAL MICROCLIMATES OF EROSION-CONTROL STRUCTURES IN A SALT DESERT AREA,
Alberta Univ., Edmonton. Dept. of Botany.
For primary bibliographic entry see Field 2G.
W74-07029

THE ROLE OF DEW IN THE SEASONAL MOISTURE BALANCE OF A SUMMER-DRY CLIMATE,
Victoria Univ. (British Columbia). Dept. of Geography.
For primary bibliographic entry see Field 2B.
W74-07037

2E. Streamflow and Runoff

CHANGES IN WATER YIELD OF SMALL WATERSHEDS BY AGRICULTURAL PRACTICES,
Agricultural Research Service, Riesel, Tex.
C. W. Richardson.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 3, p 591-593, May-June, 1972. 7 fig, 5 ref.

Descriptors: Hydrology, *Flow, Precipitation(Atmospheric), Reservoir yield, *Runoff, Surface waters, Watersheds(Basins), *Small watersheds.

Agricultural practices can have a significant effect on on-site runoff from small watersheds. A simple statement that improved agricultural practices alter by a given percentage the runoff that would have occurred if the practices were not in effect is insufficient for water yield design purposes. The effect of conservation practices on water yield is highly dependent on the management level that is associated with the structural measures. Poor management practices on terraced areas may actually result in increases in water yield. The effect of conservation practices diminishes as watershed size becomes larger. On areas larger than about 300 acres, little effect of conservation practices has been noted. (Skogerboe-Colorado State)
W74-06597

OCEANOGRAPHIC FEATURES IN THE LEE OF THE WINDWARD AND LEEWARD ISLANDS: ERTS AND SHIP DATA,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
K. J. Hanson, F. Hebard, and R. Cram.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1357-1363, 1973. 9 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Oceanography, *Atlantic Ocean, Waves(Water), Turbidity, Plankton, Data collections, Pollutant identification.
Identifiers: *ERTS, Windward Islands, Leeward Islands.

Analysis of the ERTS data in portions of the eastern Caribbean is presented for October 1972 showing features which are, as yet, not explained. The sea state and/or swell is modified in a wind shadow of the island; the runoff of island rainfall carries high turbidity water in the mixed layer downstream of the island; or the phytoplankton in the mixed layer of the ocean has increased due to increased nutrients associated with upwelling. Ground truth data obtained in that area during November 1972 are presented. These include vertical temperature structure in the mixed layer and thermocline, and surface measurements of salinity, temperature, and chlorophyll. (See also W74-06619) (Knapp-USGS)
W74-06674

WATER DEPTH ESTIMATION WITH ERTS-1 IMAGERY,
International Imaging Systems, Mountain View, Calif.
For primary bibliographic entry see Field 2L.
W74-06680

CALCULATIONS OF WATER DEPTH FROM ERTS-MSS DATA,
Environmental Research Inst. of Michigan, Ann Arbor.
F. C. Polcyn, and D. R. Lyzenga.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1433-1441, 1973. 3 fig, 4 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Oceanography, *Bathymetry, *Depth, Data collections, Mapping, Surveys, Sounding, Topography.
Identifiers: *ERTS, *Little Bahama Bank.

ERTS-1 MSS data taken on October 10, 1972 of the Little Bahama Bank are being used to demonstrate the use of ERTS-1 data for mapping of shallow water features for the purpose of upgrading world navigation charts. Marked reflectance differences occur for the shallow water areas in bands 4, 5, and 6. Digital processing of two adjacent data tapes within the ERTS frame covering an area of about 40 by 40 miles is complete. Correlation of depth measurements to 5 meters was successful. A mathematical model for depth measurements using ratio of voltages in band 4 and 5 was successfully developed and is being tested for

accuracy. Satellite data can provide geographical evidence for verifying existence or nonexistence of doubtful shoal waters now appearing on world charts and considered to be hazardous to shipping. (See also W74-06619) (Knapp-USGS)
W74-06681

LABORATORY EXPERIMENTS WITH SURFACE RUNOFF,
Alberta Dept. of Environment, Edmonton. Div. of Technical Services.
I. Muzik.
Journal of the Hydraulics Division, American Society of Civil Engineers Vol 100, No HY4, Paper 10463, p 501-516, April 1974. 12 fig, 1 tab, 22 ref, append.

Descriptors: *Overland flow, *Rainfall-runoff relationships, *Hydraulic models, *Mathematical models, Surface runoff, Unit hydrographs, Equations, Rainfall intensity.
Identifiers: *Kinematic waves.

Kinematic wave and instantaneous unit hydrograph concepts were used to predict the overland flow of hydraulic models. Laboratory conditions satisfied idealized assumptions of the tested mathematical models: that the hydrographs correspond to direct runoff resulting from rainfall distributed uniformly in time and space over a runoff plane with a constant slope. Time to peak, peak value, and total time base of the instantaneous unit hydrograph are dependent on the rainfall intensity. Predicting runoff by means of a convolution integral leads to erroneous results. Satisfactory results are obtained by analytical solution of the kinematic wave formulation of overland flow equations. Time to equilibrium predicted by the kinematic wave model as a function of rainfall intensity is in good correlation with empirically determined apparent time to equilibrium. Nonlinearity of the rainfall-runoff relationship is not affected by the slope or roughness of the runoff surface. (Knapp-USGS)
W74-06737

NUMERICAL MODEL OF ST. LAWRENCE RIVER ESTUARY,
Institute of Coastal Oceanography and Tides, Birkenhead (England).
For primary bibliographic entry see Field 2L.
W74-06738

DEVELOPING REGION IN SELF-AERATED FLOWS,
Karlsruhe Univ. (West Germany). Institut fuer Hydromechanik, Staunanlagen und Wasserversorgung.
For primary bibliographic entry see Field 8B.
W74-06739

DETERMINATION OF THE CONFIDENCE INTERVALS OF THE PEARSON III LAW USING ORDER STATISTICS (DETERMINATION DES INTERVALLES DE CONFIANCE DE LA LOI PEARSON III PAR LES STATISTIQUES D'ORDRE),
National Inst. of Scientific Research, Quebec.
B. Bobee, and G. Morin.
Journal of Hydrology, Vol 20, No 2, p 137-153, October 1973. 8 fig, 1 tab, 6 ref.

Descriptors: *Probability, *Statistical methods, Forecasting, Time series analysis, Streamflow forecasting, Flood forecasting, Distribution.
Identifiers: *Pearson law.

The distribution functions of the order statistics for the Pearson III law and its derived forms were used to determine the confidence intervals associated with this law. Tables and graphs show the confidence intervals and derived forms of the Pearson law. (Knapp-USGS)
W74-06906

ON FLOOD PROBABILITIES OF EAST ALPINE RIVERS,
Zentralanstalt fuer Meteorologie und Geodynamik, Vienna (Austria).
K. Cehak.
Journal of Hydrology, Vol 20, No 1, p 65-82, September 1973. 12 fig, 4 tab, 19 ref.

Descriptors: *Flood frequency, *Alpine, *Probability, Europe, Statistics, Statistical methods, Flood data, Flood recurrence interval, Flood forecasting, Variability.
Identifiers: Flood probability, *Alps.

The flood data of five stations in the East Alps with relatively long observation series were represented by means of Fisher-Tippett II or III distributions. The observations of the longest observation periods were fitted well by the type II curves. A comparison of calculations with only a part of the observations shows that the magnitude of the curvature parameter k of the Fisher-Tippett curves increases with increasing observation period. The series at hand are not long enough to see if there is a convergence to a limiting value of k. A trend test shows an increasing trend in all of the Danube stations after about 1860 and nearly no trend at all in the observations from the southern rivers. The variance spectra show that the series may be considered as realizations of autoregressive processes of the first order. Superposed to the red-noise spectra there are waves with periods of 2.35 and 8 years in the case of the Danube stations and 5.7 and 6.7 years in the case of the southern rivers. (Knapp-USGS)
W74-06909

ON SQUIRE'S THEOREM IN THE STUDY OF HYDRODYNAMIC STABILITY OF PLANE-PARALLEL FLOWS OF INCOMPRESSIBLE FLUIDS ABOUT DEFORMING BOUNDARIES,
For primary bibliographic entry see Field 8B.
W74-06911

EIGHT YEARS OF OBSERVATIONS ON THE WATER LEVEL AT QUEBEC AND GRONDINES 1962-1969: PART I--ANALYSIS OF THE TIDAL SIGNAL,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
G. Godin.
Manuscript Report Series, No 31, 1973. 145 p, 17 fig, 17 tab, 13 ref, append.

Descriptors: *Tides, *Surges, *Water level fluctuations, *St. Lawrence River, Bores, Ice jams, *Canada, Storm surge, Stage-discharge relations.
Identifiers: Quebec, Grondines.

Water levels for Quebec and Grondines are recorded hourly on punched cards since 1962. Saltwater does not reach the stations at Quebec and Grondines although they are both strongly affected by the tide which travels from the Gulf of St. Lawrence and the Atlantic and makes itself felt as far as Montreal. The mean tidal range at Quebec is over 13 feet while at Grondines it exceeds 6 feet. Fluctuations in river discharge affect the level at Grondines markedly while at Quebec, the larger capacity of the river bed diminishes their importance. Besides these sources of variability (tide and discharge), there occur sudden and dramatic changes in level which are obviously related to the atmospheric disturbances, especially cold fronts. Ice jams and ice accumulations upstream cause water level fluctuations during the winter season. (Knapp-USGS)
W74-06926

FLOOD OF OCTOBER 1972 AT PETERSBURG AND COLONIAL HEIGHTS, VIRGINIA,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 7C.
W74-06957

STREAM TEMPERATURES IN WASHINGTON STATE,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-06962

2F. Groundwater

CAPILLARY PROPERTIES OF SOILS - INFLUENCE UPON SPECIFIC YIELD,
Agricultural Research Service, Fort Collins, Colo.
H. R. Duke.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 4, p 688-691, July-August, 1972. 6 fig, 2 tab, 9 ref.

Descriptors: *Specific yield, *Capillary action, Subsurface drainage, *Groundwater movement, Groundwater availability, Retention, Safe yield, Dug wells, *Porous media, Soil properties.

Capillary properties of a porous medium are important hydrologic parameters for situations of groundwater flow in which capillary effects are generally considered negligible. Although the utility of the specific yield concept has been proved many times under practical field conditions, the hydrologist should be aware of the limitations of the data he has collected. Of particular importance is an awareness of the errors introduced by using specific yields determined under one set of experimental conditions to predict ground water movement under completely different conditions. The primary purpose has been to show that specific yield as classically defined is not a unique property of the porous medium in which it is measured. (Skogerboe-Colorado State)
W74-06584

UNSTEADY RADIAL FLOW IN PARTIALLY SATURATED SOILS,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W74-06587

A PHYSICAL MODEL FOR PREDICTION AND CONTROL OF SALTWATER INTRUSION IN THE FLORIDAN AQUIFER,
Florida Univ., Gainesville. Dept. of Civil and Coastal Engineering.
B. A. Christensen, and A. J. Evans, Jr.
Available from the National Technical Information Service as PB-231 377, $4.00 in paper copy, $1.45 in microfiche. Florida Water Resources Research Center, Gainesville, Publication No. 27, Jan. 29, 1974. 88 p, 51 fig, 4 tab. OWRR A-022-FLA(1). 14-31-0001-3809.

Descriptors: *Florida, *Saline water intrusion, Water demand, Aquifers, Wells, Recharge, *Forecasting, *Model studies, Groundwater, Aquifer characteristics, *Artificial recharge, Pumping, *Drawdown.
Identifiers: *Hele-Shaw model.

Continuing development of the coastline zone in the middle Gulf area of Florida is increasing the demand for ground water supplies, and in turn increasing the probability of salt-water intrusion. Methods must be developed to make long-range predictions on the effects of increased demands on the Floridan aquifer. A Hele-Shaw model is a physical model which fits the requirements for long-range planning. It is well suited to handling anisotropic aquifers, difficult boundary conditions and can simulate years of field conditions in minutes of model time. The section selected for study lies in a line from the Gulf coast near Tarpon Springs to a point near Dade City and passes through the Eldridge-Wilde well field. The Eldridge-Wilde well field is the major water producer for Pinellas County. This region has experienced several years of dry weather, and pump-

ing has lowered the water levels in the aquifer by a significant amount. This loss of fresh-water head is certain to induce salt-water intrusion. A Hele-Shaw model has been built for this section, and all pertinent geological and hydrological features of the area are included. Steady-state characteristics of the aquifer system have been considered. In particular, the long-term effects due to pumping and artificial recharge were examined. (Morgan-Florida)
W74-06609

HYDROLOGIC DATA FROM THE PICEANCE BASIN, COLORADO.
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4B.
W74-06714

GROUND-WATER RECHARGE STRIP BASIN-EXPERIMENTS,
California State Univ., Fullerton. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W74-06740

UPWARD FLOW FROM SHALLOW WATER TABLES,
Colorado State Univ., Fort Collins.
P. Hamaker.
Available from the National Technical Information Service as PB-231 480 $12.25 in paper copy, $1.45 in microfiche. Ph D Thesis, September 1972. 169 p, 30 fig, 15 tab, 22 ref, append. OWRR B-013-COLO(3).

Descriptors: *Soil water movement, *Groundwater movement, *Evaporation, Water table, Drying, Water levels, Equations.

Upward flow from shallow water tables was studied by application of the flow theory; this leads to a differential equation which describes the interrelationship between the soil properties, the water table depth, the pressure head at the soil surface, and the rate of upward flow. The solution to the equation predicts that for a given soil and water table depth, the upward flux should increase and approach a finite limit as the pressure head at the soil surface becomes more negative. In one series of experiments, upward flow was induced by suction from the soil surface. For a given water table depth, the measured pressure head and hydraulic head distribution and the rate of upward flow as a function of the pressure head at the soil surface were in agreement with flow theory. The upward flux approached a limiting value as the pressure head at the soil surface became sufficiently negative. Moreover, close agreement was obtained between the theoretically predicted and experimentally observed magnitudes of the limiting fluxes. In a second series of experiments, upward flow was induced by evaporative removal of the liquid from the soil surface. The observed behavior of the upward flux was not predicted by theory. A maximum rather than a limiting flux was obtained in most cases as the soil surface dried. The experimental observations could be explained by assuming that the water content-pressure head relationship of the soil during drying was not single valued. (Knapp-USGS)
W74-06844

GROUND-WATER HYDROLOGY OF NORTHERN NAPA VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
R. E. Faye.
Water-Resources Investigations 13-73, November 1973. 64 p, 19 fig, 5 tab, 36 ref.

Descriptors: *Hydrogeology, *Groundwater resources, *Aquifer characteristics, *Water quality, *California, Basic data collections, Water wells, Water yield, Groundwater movement, Hydrology, Groundwater recharge, Water utilization, Forecasting, Model studies, Water analysis, Chemical analysis, Transmissivity.
Identifiers: *Napa Valley(Calif).

The alluvium of northern Napa Valley, California, is the principal aquifer of the area and is capable of yielding as much as 3,000 gallons per minute to wells. Recharge is chiefly by percolation from streams and infiltration of precipitation. Discharge is chiefly flow to the Napa River, evapotranspiration, and pumpage from wells. About 190,000 acre-feet of water is presently (1972) stored in the alluvium of northern Napa Valley. Future annual water use in the project area will probably vary between 12,000 and 35,000 acre-feet and, for most purposes, can be supplied by the alluvial aquifer even during extended periods of limited rainfall. Low transmissivities in the alluvium, however, limit the opportunity for obtaining sustained, large yields from wells in much of the valley. Sustained drought conditions in the Napa Valley accompanied by expected increases in the use of groundwater will probably cause significant reductions in the base flow of the Napa River and cause many shallow wells in the area to dry up. Sodium chloride groundwater occurs near Calistoga and in the vicinity of Oakville and in some places is not suitable for irrigation. Model studies indicate that limited migration of sodium chloride water into intensively pumped parts of the aquifer probably will not be a serious problem. (Woodard-USGS)
W74-06880

THE PROBLEM OF DIRECT GROUNDWATER DISCHARGE TO THE SEAS,
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
I. S. Zektzer, V. A. Ivanov, and A. V. Meskheteli.
Journal of Hydrology, Vol 20, No 1, p 1-36, September 1973. 2 fig, 2 tab, 126 ref.

Descriptors: *Springs, *Groundwater, *Discharge(Water), *Reviews, *Submarine springs, Oceans, Oceanography, Bottom sediments, Water chemistry, Water balance, Tracers, Geochemistry, Hydrogeology.

Studies of groundwater discharge to the seas and oceans are reviewed. They include studies of the role of submarine groundwater discharge in the world water balance, the effect of groundwater on forming the water and salt balances of the seas, the interrelationship between sea and groundwaters in coastal areas, the effect of groundwater discharge on forming mineral deposits at sea and ocean floors, and points of fresh groundwater discharge on the sea floor for water-supply purposes. The methods of investigating groundwater outflow to the seas and oceans are divided into two large groups: those based on studying coastal drainage areas and those based on studying the sea. The coastal techniques are subdivided into the hydrodynamic method, the average long-term water-balance method, the combined hydrological and hydrogeological method, and the analog-simulation method. The sea techniques include those based on studying seawater and those based on studying the sea bottom. The seawater methods incorporate investigations of the electric conductivity, the distribution of temperature, the anomalies of salt composition of seawater and groundwater discharge studies with tracers. The sea-bottom methods include locating groundwater discharge from data on physical or chemical anomalies in bottom sediments/geothermal and geochemical techniques) and investigating structural features of the sea bottom (geophysical method, geomorphological method and observations by divers and submersibles). Experience in studying submarine springs and groundwater discharge to the Baltic and Caspian Seas is discussed. (Knapp-USGS)
W74-06881

A DISCRETE SPACE CONTINUOUS TIME MODELING APPROACH TO NONSTEADY FLOW IN A LEAKY AQUIFER SYSTEM OF FINITE CONFIGURATION,
California Univ., Davis.
M. A. Marino, and W. W-G. Yeh.
Journal of Hydrology, Vol 20, No 3, p 255-266, November 1973. 5 fig, 11 ref.

Descriptors: *Mathematical models, *Artesian aquifers, Drawdown, Groundwater movement, Equations, Finite element analysis.
Identifiers: Leaky artesian aquifers.

A technique is presented that treats a leaky confined aquifer system of finite configuration. By means of a discrete space continuous time modeling approach, the partial differential equation governing the flow system is transformed into a set of ordinary differential equations that can be easily integrated numerically on a high speed digital computer using available subroutines. The finite difference formulation is in effect an explicit scheme. A criterion is developed for which the scheme is computationally stable. A numerical example is presented. (Knapp-USGS)
W74-06887

ON THE LEAKAGE ASSUMPTION APPLIED TO EQUATIONS OF GROUNDWATER FLOW,
Birmingham Univ. (England). Dept. of Civil Engineering.
T. D. Streltsova.
Journal of Hydrology, Vol 20, No 3, p 237-253, November 1973. 3 fig, 24 ref.

Descriptors: *Artesian aquifers, *Groundwater movement, Water table, Equations, *Seepage, Percolation, Water yield, Recharge.
Identifiers: *Leaky artesian aquifers.

The behavior and the delayed response of flow to a well in an unconfined aquifer was studied with consideration of the variable vertical movement of flow inherent in unconfined flow. The effect of elastic storage was also taken into account. The typical S-shaped form of the characteristic time-drawdown curve of an unconfined aquifer was analyzed. The vertical components of flow are a significant factor in the delayed response of an unconfined aquifer while the contribution of the unsaturated zone is essentially subordinate. An equation including allowance for the drainage from the unsaturated zone was derived. (Knapp-USGS)
W74-06888

GROUNDWATER TRACING WITH POST SAMPLING ACTIVATION ANALYSIS,
Pennsylvania State Univ., University Park.
J. K. Schmotzer, W. A. Jester, and R. R. Parizek.
Journal of Hydrology, Vol 20, No 3, p 217-236, November 1973. 10 fig, 1 tab, 20 ref.

Descriptors: *Tracers, *Bromine, Neutron activation analysis, Karst hydrology, Groundwater movement, Sampling, Tracking techniques.

A tracing technique uses low concentrations of a nonradioactive tracer, the bromide ion. Concentrations may be so low that they do not constitute a health or pollution problem. The tracer is detected by activation analysis. No chemical separation techniques are required. The technique is safe, and tracers can be detected as low as 20 parts per billion over background concentrations. The bromide ion does not appear to be lost by precipitation, absorption or adsorption and is biologically stable. The technique was tried on sinkhole, conduit and spring systems in a carbonate terrain, in central Pennsylvania. Ammonium bromide was added in a conduit 500 ft. from its discharge point. Tracer first appeared at the discharge point 1 h after injection (0.11 ppm vs/an average background of 0.03 ppm). The maximum passed at 1 h 30 min and the spread of the spike was estimated to be over 5 h. For a peak maximum of 0.1 ppm, only 3 g of ammonium bromide would have been required. The inlet concentration would have been only 2.8 ppm,

indicating the sensitivity of the method. (Knapp-USGS)
W74-06889

ON THE SOLUTION OF TRANSIENT FREE-SURFACE FLOW PROBLEMS IN POROUS MEDIA BY THE FINITE ELEMENT METHOD,
State Univ. of New York, Buffalo. Faculty of Engineering and Applied Sciences.
R. T-S. Cheng, and C-Y. Li.
Journal of Hydrology, Vol 20, No 1, p 49-63, September 1973. 9 fig, 15 ref. NSF Grant GK-11687.

Descriptors: *Groundwater movement, *Water table, *Finite element analysis, *Numerical analysis, Drawdown, Unsteady flow, Seepage, Dams, Drainage, Porous media.
Identifiers: Free-surface flow.

A numerical procedure is presented to deal with solution of transient free-surface flows in porous media. The governing boundary-value problem for the piezometric potential is solved by the finite element method. The initial-value problem which describes the transient motion of the free-surface is solved by the method of quasi-lineraization. The numerical scheme was applied to isotropic and anisotropic earth dam problems and also to a ditch drainage problem. Excellent agreements were obtained compared with known solutions. This computational procedure is stable and suitable for this class of problems. (Knapp-USGS)
W74-06890

CONSERVATION EQUATIONS FOR NONISOTHERMAL FLOW IN POROUS MEDIA,
Case Western Reserve Univ. Cleveland, Ohio. Div. of Fluid, Thermal and Aerospace Sciences.
A. Dybbs, and S. Schweitzer.
Journal of Hydrology, Vol 20, No 2, p 171-180, October 1973. 23 ref.

Descriptors: *Porous media, *Groundwater movement, *Mass transfer, *Heat flow, Heat transfer, Darcys law, Energy transfer, Equations, Leaching, Sorption.
Identifiers: Nonisothermal flow.

Mass, momentum and energy equations that can be applied to nonisothermal flow in porous media are derived by taking a suitable volume average of the microscopic equations. The resulting macroscopic equations are then appropriate for experimental comparison. These equations can be related to measurable physical quantities of porous media. The energy equation contains a term which may be considered as an 'effective thermal conductivity' due to convection. In most cases this term must be considered and evaluated experimentally. (Knapp-USGS)
W74-06892

A COMPARISON OF HYDRAULIC CONDUCTIVITIES CALCULATED WITH MORPHOMETRIC AND PHYSICAL METHODS,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W74-06899

KARST HYDROLOGY--A REVIEW,
Geological Survey, Raleigh, N.C.
H. E. LeGrand, and V. T. Stringfield.
Journal of Hydrology, Vol 20, No 2, p 97-120, October 1973. 3 fig, 1 tab, 59 ref.

Descriptors: *Karst hydrology, *Karst, *Hydrogeology, *Reviews, Groundwater movement, Erosion, Water chemistry, Limestones, Gypsum, Geomorphology, Solubility, Structural geology.

Interest in karst hydrology has increased greatly in the past decade; this interest has resulted in the international exchange of numerous published reports on local areas and on special topical karst problems. Many of these reports have been used in preparing this review paper, which synthesizes results of many workers and focuses attention on: (1) the development of karst features through hydrologic processes; and (2) hydrologic systems of karst terranes. Karst regions of the world are characterized by limestones and other soluble rocks at or near land surface that have been modified by solutional erosion. Such surface features as sinks, long dry valleys, sparse streams, and bare rock and such subsurface features as caverns, arterial solution openings leading to large springs, and a deep water table are typical of karst terranes. These features result in an uneven distribution of permeability in karst systems and surface and subsurface hydrologic conditions that require special hydrogeologic studies. Local high permeability at shallow depth in mature karst regions leads to an ecology associated with a soil-less and water-scarce surface environment. Many practical problems result from this high permeability, including: (1) scarcity and poor predictability of groundwater supplies; (2) scarcity of surface-water supplies; (3) instability of the ground; (4) leakage of surface reservoirs; and (5) an unreliable waste-disposal environment. (Knapp-USGS)
W74-06907

ELECTRO-OSMOTIC EFFECTS IN A BENTONITE-WATER SYSTEM,
Harcourt Butler Technological Inst., Kanpur (India). Dept. of Chemistry.
For primary bibliographic entry see Field 2K.
W74-06910

GROUND WATER POLLUTION FROM SUBSURFACE EXCAVATIONS: PART II--POLLUTION FROM WELLS.
For primary bibliographic entry see Field 5B.
W74-06933

PROCEDINGS NINTH BIENNIAL CONFERENCE ON GROUND WATER.
For primary bibliographic entry see Field 5B.
W74-06942

AVAILABILITY OF GROUND WATER IN THE GRANTS PASS AREA, JOSEPHINE COUNTY, OREGON,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 7C.
W74-06959

QUALITY OF GROUND WATER IN THE LOWER COLORADO RIVER REGION, ARIZONA, NEVADA, NEW MEXICO, AND UTAH,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 7C.
W74-06960

WATER RESOURCES OF NORTHWESTERN MISSOURI,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-06961

2G. Water In Soils

A SIMPLE AUTOMATIC SOIL PERCOLATOR,
Hawaii Univ., Honolulu.
For primary bibliographic entry see Field 7B.
W74-06531

WHEAT AND GRAIN SORGHUM IRRIGATION IN A WIDE BED-FURROW SYSTEM,
Agricultural Research Service, Bushland, Tex.
For primary bibliographic entry see Field 3F.
W74-06580

A LARGE UNDISTURBED, WEIGHING LYSIMETER FOR GRASSLAND STUDIES,
Wyoming Univ., Laramie. Dept. of Agricultural Engineering.
J. D. Armijo, G. A. Twitchell, R. D. Burman, and J. R. Nunn.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 5, p 827-830, September-October, 1972. 6 fig, 7 ref.

Descriptors: *Lysimeters, *Moisture meters, *Evapotranspiration, Moisture content, Runoff, Water loss, Tunneling machines, *Colorado.

A large weighing type lysimeter was installed in the high plains of northeastern Colorado. The unit consists of a steel tank 10 feet in diameter and 4 feet deep. The container is made of 1-inch thick steel plate. The unit rests on a weighing mechanism consisting of a counter balance and electronic load cells. The soil in the lysimeter is undisturbed with native vegetation. This was accomplished using the tank as a large coring tube to cut out the undisturbed core. All of the related apparatus is placed underground except for a small access manhole located 18 feet from the edge of the unit. Data collection has just begun. Total cost for the unit and installation was $51,000. (Skogerboe-Colorado State)
W74-06581

DEVELOPMENT OF ASPHALT MOISTURE BARRIER EQUIPMENT,
International Harvester Co., Hinsdale, Ill.
For primary bibliographic entry see Field 3F.
W74-06586

UNSTEADY RADIAL FLOW IN PARTIALLY SATURATED SOILS,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
D. W. Fitzsimmons.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 5, p 912-918, September-October, 1972. 9 fig, 1 tab, 13 ref.

Descriptors: *Groundwater movement, Hydrology, *Capillary conductivity, *Soil moisture, Soil water, Groundwater, Moisture tension, Permeability, Soil physics, Darceys law, Base flow, *Unsteady flow, *Saturated soils, *Mathematical models, Simulation analysis.
Identifiers: *Imbibition.

A numerical model for simulating horizontal imbibition in a radially symmetric flow system was developed. Unsteady radial flow from a cylindrical source into a partially saturated soil was studied in the laboratory and with the model to determine the effects of boundary and initial conditions on this type of flow. The model is based on the solution of the nonlinear partial differential equation for unsteady radial flow. A predictor-corrector modification of the Crank-Nicholson implicit difference method was used to solve the equation subject to the appropriate boundary and initial conditions. Imbibition was studied in the laboratory by allowing liquid to flow into a radially symmetric, soil-filled flow system at pressures which were below atmospheric. Tensiometers along the length of the flow system were used, in conjunction with a pressure transducer-indicator system, to measure the space-time distribution of capillary pressure head in the flow system. A balance was used to monitor the inflow during each test. (Skogerboe-Colorado State)
W74-06587

EVALUATION OF A FURROW MODIFYING DEVICE,
Agricultural Research Service, Auburn, Ala.
For primary bibliographic entry see Field 3F.
W74-06588

DEEP PLOWING - AN ENGINEERING APPRAISAL,
Agricultural Research Service, Beltsville, Md.
For primary bibliographic entry see Field 3F.
W74-06590

A SIMULATED ENVIRONMENTAL MODEL OF TEMPERATURE, EVAPORATION, RAINFALL, AND SOIL MOISTURE,
Agricultural Research Service, State College, Miss.
For primary bibliographic entry see Field 3F.
W74-06591

HYDRODYNAMICS OF BORDER IRRIGATION ADVANCE,
Nebraska Univ., Mitchell. Scotts Bluff Experiment Station.
For primary bibliographic entry see Field 3F.
W74-06592

PERFORMANCE OF A TILE DRAINAGE SYSTEM: AN EVALUATION OF A TILE DESIGN AND MANAGEMENT,
Agricultural Research Service, Urbana, Ill.
For primary bibliographic entry see Field 3F.
W74-06596

DEEP PLOWING AND CHEMICAL AMENDMENT EFFECT ON A SODIC CLAYPAN SOIL,
Agricultural Research Service, Mandan, N. Dak.
For primary bibliographic entry see Field 3F.
W74-06598

APPLICATION OF MONTE CARLO METHOD TO SOIL WATER MOVEMENT,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
S-F. Shih, and G. J. Kriz.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 5, p 897-901, September-October, 1972. 5 fig, 4 tab, 8 ref.

Descriptors: *Soil water movement, *Soil physics, *Drainage, Porosity, Permeability, Percolation, Darcey's law, Soil water, Soil moisture, *Monte Carlo method.

An approach for determining approximate solutions to problems of water movement in soils called the Monte Carlo method was presented and demonstrated. The basic concepts of the method are probability distribution, random number generations, and sampling techniques. The method was applied to solve problems of steady state and transient flow with and without recharge. Solutions were obtained directly by Monte Carlo techniques without analytically solving the flow equation. Using the method of solution described, the hydraulic head or potential at any isolated point in the region can be obtained without solving for the hydraulic head or potential at the other mesh points. Comparisons of results obtained using the Monte Carlo method were made with values previously obtained by others. These comparisons indicate that the method is applicable to problems of water movement in soils. (Skogerboe-Colorado State)
W74-06599

IDENTIFICATION OF SOIL ASSOCIATIONS IN WESTERN SOUTH DAKOTA ON ERTS-1 IMAGERY,
South Dakota State Univ., Brookings. Dept. of Plant Science; and South Dakota State Univ., Brookings. Remote Sensing Inst.
F. C. Weston, and V. I. Myers.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 965-972, 1973. 6 fig, 3 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Soil surveys, *Mapping, *South Dakota, Data collections, Data processing, Soil investigations.
Identifiers: *ERTS, Soil associations.

Film color composites of ERTS bands 4, 5, and 7 show the soil association of western South Dakota, and in addition several new soil association areas have been brought to light. In semiarid western South Dakota, landscape features are well defined. Steep valley sides, broad interfluves, and contrasting textures are present in this area and all are clearly visible on ERTS color composites. The 8-million-acre scene that can be scanned on one frame allows for comparisons of soil associations usually over their entire extent. This is an advantage since anomalies immediately become apparent. (See also W74-06619) (Knapp-USGS)
W74-06629

IN SITU SPECTRORADIOMETRIC QUANTIFICATION OF ERTS DATA,
Long Island Univ., Greenvale, N.Y. Science Engineering Research Group.
E. F. Yost.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1253-1258, 1973. 5 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, *Playas, *Soil moisture, Vegetation, Calibrations, Radiation, Albedo, Wavelengths, Data collections.
Identifiers: *ERTS, *Spectroradiometry.

A method of additive color analysis of a single multispectral band taken on different dates indicates that ERTS-1 bulk images have sufficient spatial and spectral fidelity to show indications of the presence of soil moisture in desert playas and changes in soil moisture with time. Synthesizing the narrow band imagery by projecting the two visible bands as blue and red and the near-infrared band as green shows a distinct difference between pine trees and the other two species. (See also W74-06619) (Knapp-USGS)
W74-06663

GAMMA RADIATION MEASUREMENTS OF BULK DENSITY CHANGES IN A SOIL PEDON FOLLOWING IRRIGATION,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
R. J. Reginato.
Soil Science Society of America Proceedings, Vol 38, No 1, p 24-29, January-February 1974. 3 fig, 4 tab, 14 ref.

Descriptors: *Bulk density, *Expansive soils, *Nuclear moisture meters, Gamma rays, Irrigation effects, Soil physical properties.

Bulk density in a soil pedon was measured with a gamma-ray transmission technique utilizing Cs-137 and Am-241. Both gamma-ray sources could not be used simultaneously. By alternating sources for each scan down the soil profile, bulk density was found to decrease in the top 6 cm of soil about 30 minutes after water was ponded on the soil surface. As soon as the water drained from the surface, bulk density values approached preirrigation levels. Changes in height of the soil surface upon irrigation corresponded with changes in bulk density. (Knapp-USGS)
W74-06715

GRAVITY CORRECTION DUE TO A VARIATION OF PRESSURE HEAD WITHIN A CAVITY,
Connecticut Agricultural Experiment Station, New Haven.
J-Y. Parlange.
Soil Science Society of America Proceedings, Vol 38, No 1, p 15-17, January-February 1974. 1 fig, 12 ref.

Descriptors: *Infiltration, *Soil water movement, Percolation, *Pressure head, Moisture content, Unsaturated flow, Tension.

The infiltration of water from small cavities filled with water is affected by gravity, both within and without the cavity and these two effects are of the same order. The effect within the cavity is assessed quantitatively for small spherical cavities that are entirely or partially buried in the soil. As an example, the case of a cavity entirely buried in the soil is discussed in detail. (Knapp-USGS)
W74-06734

MEASUREMENT OF HYDRAULIC CONDUCTIVITY BY MEANS OF STEADY, SPHERICALLY SYMMETRIC FLOWS,
Agricultural Research Service, Madison, Wis. Soil and Water Conservation Research Div.
C. Dirksen.
Soil Science Society of America Proceedings, Vol 38, No 1, p 3-8, January-February 1974. 5 fig, 1 tab, 20 ref.

Descriptors: *Hydraulic conductivity, *Unsaturated flow, *Tensiometers, *Soil water movement, Instrumentation, Tension, Infiltration, Percolation, Pressure head, Moisture content.

The dependence of hydraulic conductivity upon pressure head can be determined from a series of steady, spherically symmetric flows: at any point the hydraulic conductivity is equal to the rate of change of the steady flux per unit solid angle with respect to the pressure head of that point, divided by its radial distance from the center of the water source. This method is useful for in-situ measurements in the field because it requires only one controlled boundary condition, and does not require one-dimensional flow. Hydraulic conductivity values derived from the pressure head in the source cavity in field tests were the same as those derived from tensiometer measurements near the source. A range of hydraulic conductivity values can be obtained faster with a series of different, steady pressure heads in the source cavity, rather than by measurements on a series of tensiometers located at several distances from the source. Gravity tends to distort the spherical symmetry of the flow. For most soils the effect of gravity near the cavity is small enough to obtain satisfactory hydraulic conductivity values. Gravity has no effect on the pressure head distribution directly below the cavity, suggesting that this is a preferred location for tensiometers. The analytical solution obtains the hydraulic conductivity in an exact manner for any position. The radius of the cavity should be kept as small as possible. (Knapp-USGS)
W74-06735

SOLUTION OF EQUATION FOR VERTICAL UNSATURATED FLOW OF SOIL WATER,
California Univ., Santa Barbara.
J. C. Bruch, Jr., and G. Zyvoloski.
Soil Science, Vol 116, No 6, p 417-422, December 1973. 4 fig, 11 ref. OWRR A-039-CAL(6) California Project W-336.

Descriptors: *Unsaturated flow, *Soil water movement, *Infiltration, *Finite element analysis, Equations, Hysteresis, Capillary conductivity, Porous media.
Identifiers: *Galerkin method.

The nonlinear equation describing the unsteady and unsaturated, one-dimensional vertical flow in porous media may be solved by the finite element method employing a Galerkin approach. Finite elements in space and time and linear shape functions were used for two different element configurations, triangles and rectangles. A quadratic form used for the diffusion coefficients and capillary conductivities based on curve-fitting of experimental data of these functions. The results are compared on the basis of element type, as well as to solutions obtained by difference methods and a series solution technique, and are in good agreement. This method is useful in that it is easily programmed, stable, computationally fast, converges rapidly to the solution, and does not require constant parameters over the entire solution domain. (Knapp-USGS)
W74-06736

THE GENUS NEOCHLORIS STARR (CHLOROPHYCEAE, CHLOROCOCCALES),
Slippery Rock State Coll., Pa. Dept. of Biology.
For primary bibliographic entry see Field 5A.
W74-06760

DISTRIBUTION OF MERCURY IN RESIDUAL SOILS,
Colorado School of Mines, Golden. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W74-06797

QUALITY IMPROVEMENT OF FEEDLOT LAGOON WATER BY PERCOLATION THROUGH SOIL UNDER NATIVE PASTURE,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 5D.
W74-06830

MEASUREMENTS OF THE DOWNSLOPE FLOW OF WATER IN A SOIL,
Bristol Univ. (England). Dept. of Geography.
D. R. Weyman.
Journal of Hydrology, Vol 20, No 3, p 267-288, November 1973. 9 fig, 27 ref.

Descriptors: *Soil water movement, *Saturated flow, *Unsaturated flow, *Subsurface runoff, Slopes, Topography, Percolation, Infiltration, Anisotropy, Porosity, Moisture content.

Measurements were made of unsaturated and saturated lateral soil water flow on a convex hillslope with a good soil cover and impermeable bedrock during natural rainstorms. The hydraulics of flow were examined in detail with particular reference to the role of breaks in vertical permeability, the change from saturated to unsaturated flow and the velocity of flow. A zone of soil saturation extends upwards from the slope base. Slope discharge, through the B and B/C horizons, is related to the form of the saturation zone, within which flow is lateral. The time required for vertical percolation and the low hydraulic conductivity of the lower soil horizons result in a hillslope hydrograph which is delayed and attenuated and cannot be regarded as stormflow. During drainage the saturation zone contracts and is replaced by a lateral unsaturated flow system at the profile base which supplies discharge from the B/C horizon without further recharge. In general, either distinct soil horizons or impermeable bedrock are essential for the initiation of lateral flow. Saturated flow is likely to dominate hillslope hydrographs through noncapillary pore spaces but these may be integrated to the point where Darcy's law still holds. Although lateral soil water flow is a widespread phenomenon, it is unlikely to provide storm runoff to the stream unless saturated conditions are generated within the organic horizons or flow within the lower soil horizons is dominated by non-Darcian flow through noncapillary spaces in the soil. (Knapp-USGS)
W74-06886

NITRIC OXIDE SORPTION BY CALCAREOUS SOILS: II. EFFECT OF MOISTURE ON CAPACITY, RATE, AND SORPTION PRODUCTS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 5B.
W74-06894

KINETICS OF THE PHOSPHATE INTERACTION WITH CALCITE,
Utah State Univ., Logan. Dept. of Soil Science and Biometeorology.
For primary bibliographic entry see Field 5B.
W74-06895

AZIDE AND ETHYLENETHIOUREA MOBILITY IN SOILS,
Agricultural Research Service, Beltsville, Md. Agricultural Environmental Quality Inst.
For primary bibliographic entry see Field 5B.
W74-06896

NITROGEN MINERALIZATION-WATER RELATIONS IN SOILS,
Agricultural Research Service, Beltsville, Md. Agricultural Environmental Quality Inst.
For primary bibliographic entry see Field 5B.
W74-06897

MINERAL NITROGEN MOVEMENT INTO SUBSOILS FOLLOWING CONTINUED ANNUAL FERTILIZATION FOR CORN,
Minnesota Univ., St. Paul. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W74-06898

A COMPARISON OF HYDRAULIC CONDUCTIVITIES CALCULATED WITH MORPHOMETRIC AND PHYSICAL METHODS,
Wisconsin Univ., Madison. Dept. of Soil Science.
J. Bouma, and J. L. Denning.
Soil Science Society of America Proceedings, Vol 38, No 1, p 124-127, January-February 1974. 5 fig, 1 tab, 11 ref.

Descriptors: *Hydraulic conductivity, *Adsorption, Soil moisture, Analytical techniques, Laboratory tests, Moisture content, Pores, Porosity, Soil water.
Identifiers: *Moisture retention.

Hydraulic conductivity (K) of coarse porous media with packing pores could be calculated not only by physical methods but also with morphometric techniques if matching factors were used. Morphometric K curves are closest to physical curves derived from moisture adsorption characteristics. The morphometric technique can be applied exclusively to small or fragile homogeneous soil materials that cannot be sampled for moisture retention determinations in the laboratory. The pore interaction model of Marshall overestimated K(sat) when morphometric data were used. Moisture retention curves calculated with morphometric data, agreed well in coarse porous media with physical adsorption curves. (Knapp-USGS)
W74-06899

FIELD MEASUREMENT OF EVAPORATION FROM SOIL SHRINKAGE CRACKS,
Agricultural Research Service, Temple, Tex. Blackland Conservation Research Center.
For primary bibliographic entry see Field 2D.
W74-06900

ESTIMATING SOIL EROSION FROM THE REDISTRIBUTION OF FALLOUT CS-137,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 2J
W74-06901

AN ISOKINETIC SAMPLER FOR WIND EROSIBLE SILT AND CLAY PARTICLE MEASUREMENT,
Illinois Univ., Urbana. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2J.
W74-06902

EFFECT OF VARYING THE ON-OFF TIME OF RAINFALL SIMULATOR NOZZLES ON SURFACE SEALING AND INTAKE RATE,
Agricultural Research Service, Morris, Minn. North Central Soil Conservation Research Center.
For primary bibliographic entry see Field 2J.
W74-06903

BUFFER INTENSITIES AND EQUILIBRIUM PH OF MINERALS AND SOILS: I. THE CONTRIBUTION OF MINERALS AND AQUEOUS CARBONATE TO PH BUFFERING,
Agricultural Univ., Wageningen (Netherlands). Dept. of Soil Science and Geology.
N. Van Breemen, and W. G. Wielemaker.
Soil Science Society of America Proceedings, Vol 38, No 1, p 55-60, January-February 1974. 2 fig, 1 tab, 16 ref.

Descriptors: *Water chemistry, *Hydrogen ion concentration, *Weathering, Mineralogy, Alkalinity, Carbon dioxide, Silicates, Equilibrium, Carbonates, Aqueous solutions, Soil chemistry.
Identifiers: *Buffering(pH).

Thermodynamic equilibrium considerations were used to calculate pH buffer intensities for a number of aqueous systems involving 16 common soil and rock minerals (gibbsite, kaolinite, allophane, hematite, limonitic iron oxide, quartz, amorphous silica, calcite, siderite, hydrated magnetite + amorphous Fe(OH)3, microcline, albite, anorthite, Mg-montmorillonite, two illites, and Mg-chlorite), gaseous CO2 and 26 dissolved species. The calculation of buffer intensities is outlined for simple oxides and carbonates and for silicate minerals during congruent and incongruent dissolution. Silicate minerals, carbonates and gibbsite provide strong buffering upon addition of strong acid under slightly alkaline to slightly acid conditions. Carbon dioxide at constant partial pressure is far more effective than any of the minerals considered in counteracting the effect of an increase in alkalinity. (See also W74-06905) (Knapp-USGS)
W74-06904

BUFFER INTENSITIES AND EQUILIBRIUM PH OF MINERALS AND SOILS: II. THEORETICAL AND ACTUAL PH OF MINERALS AND SOILS,
Agricultural Univ., Wageningen (Netherlands). Dept. of Soil Science and Geology.
N. Van Breemen, and W. G. Wielemaker.
Soil Science Society of America Proceedings, Vol 38, No 1, p 61-66, January-February 1974. 2 fig, 2 tab, 36 ref.

Descriptors: *Water chemistry, *Hydrogen ion concentration, *Weathering, Mineralogy, Alkalinity, Carbon dioxide, Silicates, Equilibrium, Carbonates, Aqueous solutions, Soil chemistry.
Identifiers: *Buffering(pH).

Equilibrium pH values of different clay minerals, oxides and carbonates at pCO2 of 0.01 atm are between 4.5 and 8, in the range typical for most soils. The agreement between the calculated pH and the abrasian pH for most minerals is reasonable. The pH of a number of soils can be explained

by partial equilibrium between the soil solution and kaolinite, allophane, gibbsite, montmorillonite or calcite. For illite the agreement is less satisfactory. The effects of reducing conditions and the possible role of pH buffering by organic matter are discussed briefly. Application of the phase rule indicates that the specific mineral assemblage of acid sulfate soils provides a nearly ideal pH-stat; addition of moderate amounts of sulfuric acid or lime hardly affects the pH. (See also W74-06904) (Knapp-USGS)
W74-06905

EVALUATION OF INFLUENCE OF AVAILABLE SOIL WATER STORAGE CAPACITY ON GROWING SEASON LENGTH AND YIELD OF TROPICAL PASTURES USING SIMPLE WATER BALANCE MODELS,
Commonwealth Scientific and Industrial Research Organization, Townsville (Australia). Div. of Tropical Pastures.
For primary bibliographic entry see Field 3F.
W74-06927

TRANSFORMATION OF IRON IN A WATERLOGGED SOIL AS INFLUENCED BY REDOX POTENTIAL AND PH,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W74-06934

SOLUTE MOVEMENT THROUGH DISTURBED AND UNDISTURBED SOIL CORES,
North Dakota State Univ., Fargo. Dept. of Soils.
For primary bibliographic entry see Field 5B.
W74-06935

THERMODYNAMICS OF ION EXCHANGE,
Technion - Israel Inst. of Tech., Haifa. Dept. of Agricultural Engineering.
I. Ravina, and J. DeBock.
Soil Science Society of America Proceedings, Vol 38, No 1, p 45-49, January-February 1974. 2 tab, 13 ref.

Descriptors: *Ion exchange, *Clays, *Water chemistry, Thermodynamics, Sorption, Cation exchange, Chemical potential, Ionization, Free energy.

A local formulation of nonequilibrium thermodynamics was used to define the electrochemical potentials in the ion-clay-water system, thus enabling development of an improved nonempirical approach to cation-exchange processes. The presence of the electrical field in the system is expressed by a proportional increase of the pressure in the double layer. The effect of the electrical field on the chemical potentials of the exchangeable cations is divided into the common electrostatic term and a term dependent on their polarizabilities. For systems containing a mixture of monovalent ions the electrostatic effect of the electrical field is the same for each of the exchangeable cations. Using values of the polarizabilities and intrinsic volumes of the alkali metal cations, the free energies of exchange with sodium in montmorillonite were calculated. The calculated free energies were in good agreement with experimental values. (Knapp-USGS)
W74-06936

GRAY FOREST SOILS IN THE SPRUCE-FIR FORESTS IN THE SUB-URAL REGION (VYATKA-KAMA PROVINCE), (IN RUSSIAN),
Leningrad State Univ. (USSR).
A. A. Khantulev, A. S. Schastnaya, and I. A. Tereshenkova.
Biol Nauki. Vol 15, No 12, p 125-129, 1972. Illus.
Identifiers: Fir, *Forest soils, Forests, Humus, Metabolites, Minerals, *Soils, Spruce, *USSR(Vyatka-Kama province), Hydrogen ion concentration.

Comparative studies were conducted on soil samples obtained from the USSR interfluvial region of the Vyatka-Cheptsa river in the Vyatka-Kama province, and soil samples from the Kaluga, Belgorod and Ryazan oblasts forest steppes. There were no meaningful differences with respect to humus, Ca, Mg, metabolites or pH between the different samples. This similarity in the nature of the gray forest soils is significant, since different bioclimatic factors were responsible for their formation.--Copyright 1973, Biological Abstracts, Inc.
W74-07004

A MULTICHANNEL SYRINGE PUMP FOR STEADY STATE FLOW IN SOIL COLUMNS,
New Mexico State Univ., University Park. Dept. of Agronomy.
P. J. Wierenga, R. J. Black, and P. Manz.
Soil Sci Soc Am Proc. Vol 37, No 1, p 133-135. 1973. Illus.
Identifiers: Control, Leaching, *Pumps(Syringe), *Soil columns, *Steady-state slow.

A multichannel syringe pump was designed for maintaining a constant rate of outflow over long periods of time. Low flow rates are obtained by using a timer-control which causes the pump to make 1 cycle/set time interval. The pump is not pulse free, but for many studies requiring steady state water movement in soil columns this is not considered too great a disadvantage. Measured over a 10-day period at a rate of outflow of 173 ml/day, the mean day-to-day variation was less than 0.2 ml/day.--Copyright 1973, Biological Abstracts, Inc.
W74-07028

PHYSICAL MICROCLIMATES OF EROSION-CONTROL STRUCTURES IN A SALT DESERT AREA,
Alberta Univ., Edmonton. Dept. of Botany.
R. W. Wein, and N. E. West.
J Appl Ecol. Vol 9, No 3, p 703-719. 1972. Illus.
Identifiers: *Climates, Desert areas, Erosion control, *Evaporation, Salt desert areas, Soil temperature, Temperature, *Utah, Winds.

A study of the physical microclimates of gully plugs and contour furrows was carried out in a salt desert area of southeastern Utah. Net radiation soil surface temperature and soil water evaporation were measured in the environs of these eroison-control structures. Net radiation rates varied with soil color, slopes, and aspects of the gully plugs and contour furrows. Soil-surface temperatures reached values in excess of 60C for level soils and aspects in July. The northern aspects reached 58C at this time. These temperatures are above the recognized upper limit of tolerance for plant tissue. No differences in evaporation occurred among positions or aspects of gully plugs and contour furrows. This indicates that the dry winds of the area have a great influence on soil water evaporation from bare soil.--Copyright 1973, Biological Abstracts, Inc.
W74-07029

SEASONAL AND STRATIGRAPHIC CONTROLS IN COASTAL FLOODPLAIN SOILS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Soils.
P. H. Walker.
Aust J Soil Res. Vol 10, No 2, p 127-142. 1972. Illus.
Identifiers: Aeration, *Australia(Macleay River), Coastal plains, Estuarine environment, *Flood plains, Particle, Salinity, Seasonal, Sediments, *Soils, *Stratigraphic controls, Swampland, Water table.

Soils of the Macleay River, Australia, coastal floodplain are developed in a relatively thin veneer of alluvium which is underlain by extensive estuarine deposits representing the postglacial rise of sea level. Soil particle size, water table, salt, and pH distributions relate to catenary variations from levee to back swamp and acid aeration products derived from the underlying estuarine beds. Groundwater data from 50 swampland locations for the period 1962-1968 showed strong seasonal trends. At 39 sites, water-table level correlated closely and positively ($P < 0.05$) with rainfall summed for the 6 mo. (log R6) prior to the month of sampling. Groundwater salinity at 20 sites correlated negatively ($P < 0.05$) with water-table level. Surface soil salinity up to 7.8% and groundwater pH as low as 2 were recorded during the 7-yr period. Reserves of estuarine sediment occurred in certain swamplands which were capable of further acid production. Programs of swamp drainage need to avoid exposure of these reserves. A system of shallow drains, set no deeper than the upper limit of the estuarine deposits, could be used both to remove excess flood water from back swamps and to remove salts produced by aeration of the estuarine materials.--Copyright 1973, Biological Abstracts, Inc.
W74-07030

ONE-DIMENSIONAL VERTICAL INFILTRATION,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div of Environmental Mechanics.
T. Talsma, and J. Y. Parlange.
Aust J Soil Res. Vol 10, No 2, p 143-150. 1972. Illus.
Identifiers: Equations, *Hydraulic conductivity, *Infiltration(Vertical), *Sorptivity.

Various concise equations were proposed, and used, to describe the dynamics of 1-dimensional, vertical, infiltration into uniform soils. Such equations, even when initial and boundary conditions are satisfied, do not describe infiltration with equal accuracy for all materials, especially when applied over a large time interval. Recently proposed equations appear more reliable and require only 2, easily measurable, soil properties, viz., sorptivity and hydraulic conductivity, for application in most practical situations. Numerical, laboratory, and field data are presented. These adequately support the reliability of the solutions. The applicability of the solutions to field soils with systematically varying conductivity is more restricted than the 2 or 3-dimensional solutions.--Copyright 1973, Biological Abstracts, Inc.
W74-07034

EFFECT OF PLANT GROWTH AND FORM OF NITROGEN FERTILIZER ON DENTRIFICATION FROM FOUR SOUTH AUSTRALIAN SOILS,
Waite Agricultural Research Inst., Glen Osmond (Australia).
R. C. Stefanson.
Aust J Soil Res. Vol 10, No 2, p 183-195. 1972.
Identifiers: *Australia, Biological studies, *Denitrification(Soils), Fertilizers, *Nitrogen fertilizer, *Plant growth, Soils, Wheat.

In measuring losses of volatile N in sealed growth chambers, 4 major wheat-growing soils were used, namely, a mallisol, a red-brown earth, a calcareous sand, and a grey-brown soil of heavy texture. The rate of loss varied 1-15 mg N/(kg soil/wk) when nitrate N was applied to the soil; when ammonium N was used, losses were 1-4 mg N/(kg soil/wk) over a 6-wk period. The major component of these losses was N gas with lesser quantities of N2O. Both gases were produced by biological denitrification of soil nitrate. This was confirmed with an incubation experiment which used a portion of the same samples of soil. When nitrate N was applied to the soil, denitrification was increased by increasing soil water content and plant growth. These effects were greatest in the heavy-textured soils. The application of ammonium N to the red-brown earth, amllisol, and gray-brown soil of heavy texture reduced the losses of soil N as N

gas and N2O. Considerable losses of soil N were recorded for the calcareous sand when ammonium N was applied. Plant growth did not affect the losses of soil N from these soils receiving ammonium N.--Copyright 1973, Biological Abstracts, Inc.
W74-07039

SOIL MOISTURE DISTRIBUTION DURING TWO-DIMENSIONAL ABSORPTION FROM A CYLINDRICAL SOURCE,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmrntal Mechanics.
T. Talsma, J. Y. Parlange, and P. H. Groenevelt.
Aust J Soil Res. Vol 10, No 2, p 209-214. 1972. Illus.
Identifiers: *Absorption, Diffusivity, *Distribution, *Soil moisture, Sand, Porous media.

The moisture content distribution in fine sand, during 2-dimensional, horizontal, absorption from a cylindrical source, was analyzed using a recently developed theory. Well-justified approximations yield the result that, for a particular rigid porous medium, the time course of the moisture profile depends only on 2 functions, each of which depends on the moisture diffusivity function. This permits the reduction to a common basis of experimental results on a single soil, using different source dimensions and sampling at different times. Moisture profiles, obtained experimentally after various absorption times with 2 source radii, were in satisfactory agreement with the theory.--Copyright 1973, Biological Abstracts, Inc.
W74-07042

2H. Lakes

NITROGEN TURNOVER IN IMPOUNDMENTS,
Oklahoma State Univ., Stillwater. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W74-06505

PHYTOPLANKTON POPULATIONS IN RELATION TO DIFFERENT TROPHIC LEVELS AT WINNIPESAUKEE LAKE, NEW HAMPSHIRE, U.S.A.,
New Hampshire Univ., Durham. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W74-06529

THE EFFECTS OF ECOLOGICAL CHANGES ON BUCKEYE LAKE, OHIO, WITH EMPHASIS ON LARGEMOUTH BASS AND AQUATIC VASCULAR PLANTS,
Bureau of Sport Fisheries and Wildlife, Washington, D.C.
For primary bibliographic entry see Field 5C.
W74-06546

ESTABLISHMENT OF MEAN HIGH WATER LINES IN FLORIDA LAKES,
Florida Univ., Gainesville. Water Resources Research Center.
J. H. Davis, Jr.
Available from the National Technical Information Service as PB-231 302, $3.75 in paper copy, $1.45 in microfiche. Publication No. 24, November 1, 1973. 53 p, 11 fig, 3 ref. OWRR A-015-FLA(1). 14-31-0001-3209, 14-31-0001-3509, 14-31-0001-3809.

Descriptors: *Lakes, *High water mark, *Boundaries(Property), Water level fluctuations, *Florida, Aquatic plants, *Dating, *Dendrochronology.

This project was undertaken to provide a method of detecting former highwater levels by using plants presently growing in, and near, Florida lakes. Species, position, growth form, and other characteristics were used to develop viable statistics. The project was not intended for final legal determinations of former mean highwater lines but for the determination, where applicable flora exists, of the physical location of the boundary between riparian land and state-owned lake bottoms to assist in the formulation of a state policy for the establishment of mean high-water monuments in Florida lake basins. Results show this botanical method can be used in some cases with a high degree of reliability to date shoreline water positions back to 1845, when Florida became a state. The inspections of lake shores not only included the vegetation and particular plants, especially large old trees, but also some of the geology, soils, sediments, and the stage records of lake levels. The Cabinet Board of Trustees of the Internal Improvement Trust Fund and the State Bureau of Geology collaborated in this study. (Morgan-Florida)
W74-06610

DENITRIFICATION AS A PATHWAY FOR NITRATE REMOVAL IN AQUATIC SYSTEMS,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W74-06612

DISTRIBUTION AND MIXING OF INFLOW INTO STRATIFIED LAKES: A HYDRAULIC MODEL STUDY, (PHASE I),
Oklahoma State Univ., Stillwater. School of Mechanical and Aerospace Engineering.
P. M. Moretti, and D. K. McLaughlin.
Available from the National Technical Information Service as PB-231 311, $3.75 in paper copy, $1.45 in microfiche. Oklahoma Water Resources Research Institute, Stillwater, Completion Report, (1973). 54 p, 12 fig, 1 tab, 30 ref. OWRR A-044-OKLA(2).

Descriptors: *Dispersion, Lakes, *Mixing, *Stratification, *Hydraulic models, Model studies, *Distribution patterns, Simulation analysis.
Identifiers: OSU stratified lake model, *Vertical distortion.

The similitude problems in modeling flow in stratified lakes was investigated both theoretically and experimentally. Models with transparent sides were built with representative inlets. Using salt solutions of varying density and coloration, the establishment of stratified conditions, the control and modeling of inlet flows, and the use of visualization methods were developed. Special attention was given to the problem of vertical distortion: in the modeling of lakes, it is necessary to use a different depth scale than the horizontal length scale. Too little vertical depth in the model allows boundary layer effects to dominate; too much depth and distortion may invalidate the similitude of the model to the lake. Two models with different amounts of vertical distortion were built and compared. The modeling technique was developed to the point where consistent results are attainable. Quantitative methods using photographic sequences and computer analysis of time lines were used to show the basic flow patterns of inlet flows into stratified lakes, and to show the application and limitations of vertical scale distortion.
W74-06618

UTILIZATION OF ERTS-1 DATA TO MONITOR AND CLASSIFY EUTROPHICATION OF INLAND LAKES,
Bendix Corp., Ann Arbor, Mich.
For primary bibliographic entry see Field 5A.
W74-06698

ERTS-1 OBSERVES ALGAL BLOOM IN LAKE ERIE AND UTAH LAKE,
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 5A.
W74-06699

DETERMINATION OF LAND USE IN MINNESOTA BY AUTOMATIC INTERPRETATION OF ERTS MSS DATA,
Honeywell, Inc., St. Paul, Minn. Systems and Research Center.
For primary bibliographic entry see Field 4A.
W74-06702

STUDIES ON THE PHOTOSYNTHETIC PIGMENTS AND THEIR DECOMPOSITION IN THE SEDIMENT OF LAKE BALATON AND LAKE BELSO,
Magyar Tudomanyos Adademia, Tihany. Biological Research Inst.
For primary bibliographic entry see Field 5C.
W74-06741

HORIZONTAL PHYTOPLANKTON STUDIES IN LAKE BALATON BASED ON SCOOPED SAMPLES AND FILTRATES TAKEN IN 1967,
Magyar Tudomanyos Akademia, Tihany. Biological Research Inst.
For primary bibliographic entry see Field 5C.
W74-06756

ENERGETICS OF DAPHNIA AMBIGUA,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 5C.
W74-06831

THE RUNOFF OF WATER AND NUTRIENTS FROM WATERSHEDS TRIBUTARY TO CAYUGA LAKE, NEW YORK,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 5B.
W74-06848

WATER AND NUTRIENT BUDGETS FOR CAYUGA LAKE, NEW YORK,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 5B.
W74-06849

MATERIALS INPUT OF LAKE CHAMPLAIN: A SYNOPTIC APPRAISAL,
Vermont Univ., Burlington. Dept. of Zoology.
M. Potash, and E. B. Henson.
Water Resources Bulletin, Vol 10, No 2, p 348-359, April 1974. 2 fig, 4 tab, 12 ref.

Descriptors: *Lakes, *Water quality, *Hydrologic budget, *Sedimentation, Dissolved solids, Conductivity, Eutrophication, Water pollution sources, *New York, *Vermont, Lake morphology, Lake morphometry, Path of pollutants.
Identifiers: *Lake Champlain.

In Lake Champlain (New York-Vermont), detailed, regional studies were made, and the results integrated, to yield total lake conditions. Using specific conductance measurements, and values of total dissolved solids calculated from them, an approach was made to assessing the materials budget of the lake. The sampling program involved inventorying all 319 tributaries, determining the watershed area for each, and dividing the Champlain basin into appropriate hydrographic regions. Data were obtained from samples collected from 41 selected streams (representing 97.5% of the annual water input), sampling occurring in all seasons of the year since 1970. Over one million metric tons of total dissolved solids enter Lake Champlain annually, about two-thirds (63%) from the eastern (Vermont) portion and almost one-fourth (22%)

from the western (New York) part of the drainage basin, the remainder (15%) entering from the south end. Of the total quantity added annually, 17.4% is retained in the lake, indicating that a solids buildup is occurring at a significant rate. Specific conductance, and therefore total dissolved solids, may be utilized as a convenient indicator of water quality conditions, and the results should be applied to permit more efficient watershed management. (Knapp-USGS)
W74-06882

WALDEN'S WAY REVEALED,
Geological Survey, Boston, Mass.
E. H. Walker.
Man and Nature, p 11-20, December 1971. 2 fig.

Descriptors: *Surface-groundwater relationships, *Water level fluctuations, *Lakes, *Massachusetts, Water balance, Glacial drift, Hydrogeology.
Identifiers: *Walden Pond(Mass).

The water level of Walden Pond, Massachusetts, rises and falls through seasons and years almost exactly in agreement with changes in local groundwater level. Walden occupies a glacial kettle. There probably are a few feet of sand and silt on the floor of Walden and underneath lies glacial till, and deeper is bedrock. The sand and gravel is highly pervious and yields hundreds of gallons of water per minute to a large number of town and industrial wells. The rise of water level in Walden and in the sand and gravel around it during winter and spring and the decline through summer and autumn is the normal change observed in almost all wells and water table ponds in this part of the country. Replenishment of groundwater occurs mainly in the cold months, when evaporation and plants return very little water to the air, and most of the water from rain and melting snow sinks into the ground. After plants start growing in spring their roots draw so much water from the soil that the soil becomes dry enough to absorb most of the rain that falls in summer. As a result, rain in summer provides scarcely any relenishment to groundwater reservoirs. Meanwhile, the water in the ground leaks away continually. So the water in the ground lowers all through the growing season. Walden Pond has been unusually low during the past several years. A decline that began in 1963 continued until, at the end of 1966, water level was about 6 feet below what is considered normal. The pond has risen gradually since early in 1967 but still is not quite back to its usual level. (Knapp-USGS)
W74-06925

PHYTOPLANKTON SUCCESSIONS AND LAKE DYNAMICS IN LAS VEGAS BAY, LAKE MEAD, NEVADA,
Nevada Univ., Reno.
For primary bibliographic entry see Field 5C.
W74-07001

PRODUCTION AND BIOGENIC ACTIVITY OF DISTILLATES, FILTRATES AND EXTRACTS FROM THE POMORIE AND ATANASOVO LAGOON MUD, (IN BULGARIAN),
S. Apostolov.
Dokl Sel'sko Khoz Akad Im Georgiya Dimitrova. Vol 5, No 1, p 51-56, 1972. Illus.
Identifiers: *Biogenic activity, *Bulgaria, Carotene, Distillates, Extracts, Fats, Filtrates, *Lagoons, Minerals, *Mud, Proteins, Rice, Vitamins, *Productivity, Salts.

The mud collected from the Atanasovo and Pomorie lagoons, Bulgaria, contains crude protein, fats, carotene, vitamins, Na, Mg and Fe salts. The filtrates and distillates stimulate the growth of rice seeds.--Copyright 1973, Biological Abstracts, Inc.
W74-07003

THE LAGUNA DE VEGUETA ON THE MID-PERUVIAN COAST AND ITS FISHES, PARTICULARLY AEQUIDENS RIVULATUS (GUENTHER 1859), (IN GERMAN),
Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn (West Germany).
K. H. Lueling.
Zool Beitr. Vol 19, No 1, p 93-108, 1973. Illus.
Identifiers: *Aequidens-rivulatus, Bryconamericus-peruanus, Coasts, Dorminator-latifrons, *Fishes, Lebiasina-bimaculata, Pimelodella-yuncensis, *Lagoons, *Peru(Laguna de Vegueta).

The Laguna de Vegueta is an elongated tub-shaped lagoon in mid-Peru, north of the community of Hacho on the Pacific Ocean. This lagoon and its fishes were studied in 1970-1971. The biologic and hydrologic relationships governing this location are described. Its climate is moderated by the Humboldt current. Quite near the shores of the lagoon are salt deposits, as a result of which the water is distinctly salty. However, the lagoon is fed by wells supplying pure, crystal-clear earth-filtered fresh water. The fish species represented in the lagoon include Bryconamericus peruanus, Lebiasina bimaculata, Aequidens rivulatus, Pimelodella yuncensis, Dorminator latifrons. A map of northwestern South America shows several locations where Aequidens rivulatus was found.--Copyright 1973, Biological Abstracts, Inc.
W74-07007

SYSTEMS ANALYSIS IN THE MARION LAKE IBP PROJECT,
British Columbia Univ., Vancouver.
For primary bibliographic entry see Field 5C.
W74-07010

BENTHIC ALGAE IN WATER OF THE NEOUVIELLE MASSIF (HAUTES-PYRENEES),
Paul Sabtier Univ., Toulouse (France).
W. K. Besch, D. Backhaus, J. Capblanq, and P. Lavandier.
Ann Limnol. Vol 8, No 2, p 103-118, 1972. Illus. (English summary).
Identifiers: *Algae, Benthos, *Diatoms, Distribution, *France(Neouvielle Massif), Lakes, Pyrenees, Zonation.

Ninety-three diatom species are reported from a spring, a cold stenothermic stream and 2 lakes in the Neouvielle Massif (France). Among the commoner diatoms a zonation was apparent, both along the stream and according to depth in Lake Port-Bielh. The spatial distribution of the commoner species, and the factors may cause it, are discussed.--Copyright 1973, Biological Abstracts, Inc.
W74-07013

ATLANTIC STURGEON (ACIPENSER STURIO) IN WATERS OF GEORGIA, (IN RUSSIAN),
N. Sh. Nunua.
Biol Nauki. Vol 15, No 9, p 27-90, 1973. Illus.
Identifiers: Acipenser-sturio, *Ecology, *Sturgeon(Atlantic), *USSR(Georgia), *Black Sea.

Data are given on the ecology of the Atlantic sturgeon (Acipenser sturio) in the Black Sea and Rioni River in Georgia, USSR. The Atlantic sturgeon has adapted well to habitation in the Black Sea. Artifical reproduction can restore the stock of the sturgeon in the Rioni River and reacclimatize it in the Baltic Sea.--Copyright 1973, Biological Abstracts, Inc.
W74-07016

CORRELATION BETWEEN CO2 AND O2 CONCENTRATIONS IN LAKE ERIE, USA,
State Univ. Coll., Fredonia, N.Y.
For primary bibliographic entry see Field 5C.
W74-07025

SPRING FOOD OF CHAIN PICKEREL (ESOX NIGER) IN MAINE LAKES,
Maine Dept. of Inland Fisheries and Game, Bangor.
K. Warner.
Trans Am Fish Soc. Vol 102, No 1, p 149-151. 1973.
Identifiers: *Chain pickerel, Crayfish, Esox-niger, *Fish foods, Frogs, Insects, Lakes, *Maine, Salamander.

Frequency of occurrence of food items in the stomachs of chain pickerel from 18 Maine lakes in May 1967-1970 show mostly fish species and a few insects, crayfish, frogs, and salamanders.--Copyright 1973, Biological Abstracts, Inc.
W74-07032

EFFECTS OF ALEWIVES (ALOSA PSEUDOHARENGUS) ON THE ZOOPLANKTON OF LAKE WONONSKOPOMUS, CONNECTICUT,
Naval Medical Research Inst., Bethesda, Md.
S. J. Warshaw.
Limnol Oceanogr. Vol 17, No 6, p 816-825. 1972. Illus.
Identifiers: *Alewives, Alosa-pseudoharengus, *Connecticut(Lake Wononskopomus), Daphnia-galeata-mendotae, Lakes, Plankton, *Zooplankton(Limnetic), *Predation.

The effects of predation by alewives (A. pseudoharengus) on the limnetic zooplankton of Lake Wononskopomuc, Connecticut were examined over several years. Shifts in zooplankton composition and size distribution toward small forms were apparent 8 yr after alewife introduction. A partial reversal of these effects, including an increase in the abundance of large species and a size increase in at least one species, Daphnia galeata mendotae, followed an alewife die-off.--Copyright 1973, Biological Abstracts, Inc.
W74-07033

THE EFFECT OF SEASON AND ANIMAL SIZE ON THE CALORIC CONTENT OF DAPHNIA PULICARIA FORBES,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
N. B. Snow.
Limnol Oceanogr. Vol 17, No 6, p 404-413. 1972. Illus.
Identifiers: *Caloric content, *Canada(West Blue Lake-Manitoba), *Daphnia-pulicaria, Energy content, Fat, Growth, Season, Size, Aquatic animals.

The population of D. pulicaria in West Blue Lake, Manitoba (Canada) was sampled monthly for over a year. Very small animals were entirely absent during winter when no reproduction was occurring, while large, red, fat-laden individuals were more numerous than at any other time. In spring, large numbers of small animals appeared and the largest size classes virtually disappeared, to reappear the following winter. The large, fat, winter animals had a very high energy content (approximately 9000 cal/g dry wt.) whereas smaller individuals at the same time had values similar to those later in summer. Caloric content of all sizes decreased as summer progressed (approximately 4900 cal/g dry wt.) and the inequality between different sizes also disappeared. During Nov. the mean caloric content began to rise again and once more large animals had higher values than smaller ones.--Copyright 1973, Biological Abstracts, Inc.
W74-07038

DISTRIBUTION AND CIRCULATION OF ARSENIC THROUGH WATER, ORGANISMS AND SEDIMENTS OF LAKE MICHIGAN,
Michigan Univ., Ann Arbor. School of Natural Resources.
For primary bibliographic entry see Field 5B.
W74-07046

2I. Water In Plants

NATURAL PHYTOCENOSES OF THE RIVER LITTORAL IN THE LOWER REACHES OF THE RIVER HRON,
Komenskeho Universita, Bratislava (Czechoslovakia). Dept. of Geobotany.
L. Somsak.
Acta Fac Rerum Nat Univ. Comenianae Bot. 20. p 1-91. 1972. Illus.
Identifiers: *Czechoslovakia(Hron River), Dicots, Monocots, Rivers, *Phytocenoses, *Littoral(River).

Ecological characteristics and floristic composition of 5 associations identified as littoral associations of the lower reaches of the Hron river in Slovakia(Czechoslovakia) are described. The association Polygono Chenopodietum is characterized by Persicaria lapathi-folia, Chenopodium rubrum, C. glaucum and C. polyspermum. The association Polygono Bidentetum is characterized by Persicaria hydropiper, P. minor, Bidens tripartitus, the association Heleocharis acicularis-Limosella aquatica by R. amphibia and Eleocharis acicularis, the association Rorippo-Agrostietum by Agrostis stolonifera, R. silvestris and Barbaraea vulgaris, the association Rorippo-Phalaridetum arundinaceae by Baldingera arundinaceae, Calamagrostis pseudophragmites, Calystegia sepium, Carex hirta and Equisetum arvense.--Copyright 1973, Biological Abstracts, Inc.
W74-06550

AN ECOLOGICAL STUDY OF VELLOZIA SCHNITZLEINIA, A DROUGHT-ENDURING PLANT OF NORTHERN NIGERIA,
Ife Univ. (Nigeria). Dept. of Biological Sciences.
A. J. Owoseye, and W. W. Sanford.
J Ecol. Vol 60, No 3, p 807-817. 1972. Illus.
Identifiers: Chloroplast, Cultivation, Cyanin, *Drought response(Plants), Ecological studies, *Nigeria, Sucrose, *Vellozia-Schnitzleinia-Var-Occidenta.

Vellozia schnitzleinia var. occidentalis, known to occur only in a restricted area of northern Nigeria, was observed in situ and under cultivation. Its habitat is described. The plant is particularly remarkable for its rapid response to drought, and the ability of its leaves to survive over 5 mo. without water and to 'resurrect' within a few days after the onset of rains. Under cultivation, plants become quiescent whenever water is withheld. Within 24 hr, chloroplasts in the leaf mesophyll begin to fragment and they completely disappear within 3-5 days. At the same time, anthocyanin develops abaxially in the cells adjoining the fibers of the midrib and in the translucent cells surrounding the vascular bundles. Leaves become brown-purple, brittle and adaxially folded. Sucrose content of leaves, on a dry-weight basis, increases above the normal. With watering, chloroplasts begin regenerating within 24 hr, anthocyanins quickly disappear and sucrose content drops, for a time, below normal.--Copyright 1973, Biological Abstracts, Inc.
W74-06768

PREDATION ON THE FRESHWATER BIVALVE UNIO PICTORUM BY THE RAT, RATTUS NORVEGICUS, (IN ITALIAN),
Parma Univ. (Italy). Istituto di Zoologia e Anatomia Comparata.
G. Gandolfi, and V. Parisi.
Ateneo Parmense Acta Nat. Vol 8, No 1, p 5-31, 1972. Illus. (English summary).
Identifiers: Anodonta-cygnaea, Bivalves, Cerastoderma-lamarcki, Planorbarius-corneus, *Italy(River Taro), *Predation, Rattus-norvegicus, Rivers, Unio-pictorum, Viviparus-ater, Viviparus-contectus, *Rodents, *Mollusks(Bivalve).

Cases of predation by R. norvegicus (Berkenhout) on the freshwater mollusk U. pictorum are considered in conjunction with information on predation by the same rodent on bivalve mollusks Anodonta cygnaea and Cerastoderma lamarcki and on the gastropods Viviparus ater, V. contectus and Planorbarius corneus. In the case of U. pictorum 6 stations along a 1500-m stretch of the River Taro (Italy) and 2 stations more than 100 km away were studied. The techniques used to open U. pictorum, deducible from the shell breaks, lead to some ethologic considerations. The differences in habits between colonies of rats in the field and between their methods of breaking bivalve mollusks and those of unexperienced laboratory rats suggest some hypotheses concerning cultural transmission based on observational learning. The incidence of predation on the population of U. pictorum also has a definite ecologic significance in that a large fraction of the secondary production of the river ecosystem is exported by this route, and the rat is the chief biotic factor in U. pictorum population control in the studied areas.--Copyright 1973, Biological Abstracts, Inc.
W74-07008

CHANGES IN RATE AND RHYTHMS OF DEVELOPMENT OF PERENNIAL POLYCARPIC PLANTS AT DIFFERENT ALTITUDES IN HUMID HIGH MOUNTAINS, (IN RUSSIAN),
A. A. Malyshev.
Bot Zh. Vol 57, No 9, p 1069-1081. 1972. English summary.
Identifiers: Altitudes, Anthemis, Bromus, Centaurea, Festuca, Fritillaria, Humid, Mountains, Muscari, Perennials, *Polycarpic plants, Polygonum, Primula, Pulsatilla, Scabiosa, *USSR(Caucasus).

The reorganization of developmental cycles of perennial polycarpic plants (Polygonum, Scabiosa, Aetheopappus (Centaurea), Anthemis, Pulsatilla, Muscari, Fritillaria, Primula, Festuca and Bromus) after transplantation from one altitudial level to the other from northeast Altai and northwest Caucasus (USSR) was studied. Cultural and spontaneous perennial polycarpic plants adapt themselves to the short vegetational period of mountains by means of morphogenetic reorganization of their short developmental cycles. Up to the upper limits of the middle-mountainous zone (i.e., up to the 2000 m height in the Caucasus and up to the 1000 m height in Altai) the number of yearly developmental cycles observed in shoots of one generation in plants is the same as on the plain. In the alpine belt or in the transitional part of subalpine belt (Caucasus-2400-2700 m, Altai-1750) generative development of plants is less intensive. In species studied shoots here form an extra yearly cycle. This morphogenetic delay in ontogenesis facilitates the increase of yearly cycles of generative development of plants. In the year of fruiting the shoots of perennials develop faster in conditions of high mountains than in lower zones, forming seeds earlier. This is explained by the fact that buds are more developed and by development of plants in favorable conditions of longer days and more intensive insolation.--Copyright 1973, Biological Abstracts, Inc.
W74-07014

AN ANNOTATED LIST OF THE SUMMER VERTEBRATE FAUNA OF UPPER LUSK CREEK, POPE COUNTY, ILLINOIS,
Eastern Kentucky Univ., Richmond. Dept. of Biological Sciences.
M. P. Thompson, Jr.
Trans Ky Acad Sci. Vol 33, No 3/4, p 49-56. 1972.
Identifiers: Abundance, Creeks, Distribution, *Fauna(Vertebrates), *Illinois(Lusk Creek), Moxostoma-duquesnei, Rana-sylvatica, Scaphiopus-holbrooki, Summer.

A summer survey of the vertebrates of the Lusk Creek Basin in Southeastern Illinois produced 120 species, including 27 fishes, 13 amphibians, 14 reptiles, 53 birds, and 22 mammals. The spadefoot toad (Scaphiopus holbrooki), wood frog (Rana sylvatica) black redhorst (Moxostoma duquesnei), and other species unreported or uncommon in the locality were collected. A phylogenetic list of forms was compiled with annotations on local distribution, abundance, and habitat preference.--Copyright 1973, Biological Abstracts, Inc.
W74-07036

SOCIAL INTERACTION BETWEEN JUVENILE COHO (ON-CORHYNCHUS KISUTCH) AND FALL CHINOOK SALMON (O. TSHAWYTSCHA) IN SIXES RIVER, OREGON,
Wisconsin Univ., Madison. Lab. of Limnology.
R. A. Stein, P. E. Reimers, and J. D. Hall.
J Fish Res Board Can. Vol 29, No 12, p 1737-1748. 1972. Illus.
Identifiers: *Chinook salmon, *Coho salmon, Fish interaction, Juvenile fish, Oncorhynchus-kisutch, Oncorhynchus-tshawytscha, *Oregon(Sixes River), Rivers, Spawning.

Spawning and emergence of coho and fall chinook salmon overlapped in timing and location in Sixes River, Oregon. In early spring both species were distributed throughout most of the river system. Underwater observations during this period indicated that both species occupied the same habitat. As temperatures increased, coho disappeared from the main river, but continued to occupy cool tributaries. Fall chinook were found primarily in the main river until early summer, when they moved to the estuary. In flowing-water observation troughs coho assumed social dominance and defended space near the source of incoming food. In allopatry in the troughs, both grew at similar rates, but coho maintained lower population densities than did chinook. In sympatry in the troughs or in cool tributary streams, coho grew faster than chinook. Coho had brighter fin and body colors, greater fin development, deeper bodies, and were heavier than fall chinook of the same length. It is suggested that the population of fall chinook salmon in Sixes River might be adversely affected by an increase in numbers of coho. Evidence suggests that ecology of native fishes should be examined closely before widespread manipulation of fish stocks is encouraged.--Copyright 1973, Biological Abstracts, Inc.
W74-07040

OBSERVATIONS ON COMPARATIVE PROPENSITIES FOR CARP FRY DESTRUCTION BY ADULTS AND LAST INSTAR PREIMAGINAL STAGES OF PREDATORY AQUATIC INSECTS,
Taraporewala Marine Biological Research Station, Bombay (India).
G. A. Shirgur, and H. G. Kewalramani.
Proc Indian Acad Sci Sect B. Vol 76, No 3, p 85-89. 1972.
Identifiers: *Aquatic insects, *Carp fry, Catla-Catla, Cirrhina-Mrigala, Coleoptera, *Comparative studies, Cybister, Heteroptera, Labeo-Rohita, Odonata, *Predation.

Studies on comparative propensities for carp fry (Catala catla, Labes rohita, Cirrhina mrigala) destruction by preimaginals and imaginals of both Heteroptera and Coleoptera and Odonata nymphs, were made under laboratory conditions. Coleopterans, especially Cybister larvae, were the most predaceous of all the insects, whereas the Odonata nymphs the least. An interesting feature was observed in case of the preimaginals of Coleoptera and Heteroptera. The preimaginals display more carp fry destructive tendency than their respective adults.--Copyright 1973, Biological Abstracts, Inc.
W74-07044

2J. Erosion and Sedimentation

SOIL AND WATER LOSSES AS AFFECTED BY TILLAGE PRACTICES,
Agricultural Research Service, Brookings, S. Dak. Soil and Water Conservation Research Div.

For primary bibliographic entry see Field 3F.
W74-06595

RECOGNITION OF BEACH AND NEARSHORE DEPOSITIONAL FEATURES OF CHESAPEAKE BAY,
Maryland Geological Survey, Baltimore.
For primary bibliographic entry see Field 2L.
W74-06665

APPLICABILITY OF ERTS-1 IMAGERY TO THE STUDY OF SUSPENDED SEDIMENT AND AQUATIC FRONTS,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 2L.
W74-06666

DISTRIBUTION AND MOVEMENT OF SUSPENDED SEDIMENT IN THE GULF OF MEXICO OFF THE TEXAS COAST,
Geological Survey, Corpus Christi, Tex.
For primary bibliographic entry see Field 2L.
W74-06672

RESERVOIR SEDIMENTATION,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
J. R. McHenry.
Water Resources Bulletin, Vol 10, No 2, p 329-337, April 1974. 1 fig, 2 tab, 18 ref.

Descriptors: *Reservoir silting, *Sedimentation, Erosion, Sediment control, Sediment yield, Desilting, Reservoir design, Reservoir operation, Water management(Applied), Sedimentation rates.
Identifiers: *Reservoir sedimentation.

Reservoirs, as well as lakes and estuaries, are subject to sediment accumulation. The rate at which sedimentation occurs is accelerated or diminished by man's activities. Acceptable rates of sedimentation may be determined on the basis of costs of sediment storage and removal. A review of reservoirs constructed with sediment removal capabilities is given. The rates of reservoir sedimentation in the United States are summarized based on reliable data obtained from all sizes of reservoirs. Problems confronting the engineer concerning reservoir construction and maintenance are discussed on the basis of these data. (Knapp-USGS)
W74-06883

HYDROGEOMORPHOLOGY,
Technische Hochschule, Vienna (Austria). Institut fuer Geophysik.
For primary bibliographic entry see Field 2A.
W74-06891

ESTIMATING SOIL EROSION FROM THE REDISTRIBUTION OF FALLOUT CS-137,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
J. C. Ritchie, J. A. Spraberry, and J. R. McHenry.
Soil Science Society of America Proceedings, Vol 38, No 1, p 137-139, January-February 1974. 2 fig, 3 tab, 18 ref.

Descriptors: *Soil erosion, *Tracers, *Fallout, *Radioisotopes, *Cesium, Erosion, Land use, Path of pollutants, *Mississippi, Watersheds(Basins).

The movement of fallout Cs-137 from soils in three north Mississippi watersheds is logarithmically (r=0.89) related to potential soil loss as calculated by the Universal Soil Loss Equation. Analysis of other published data also showed a significant (r=0.95) logarithmic relation existing between soil loss and Cs-137 loss from soils. It may be possible to calculate soil loss from the movement of fallout Cs-137 in watersheds. Also it may be possible to calculate the movement of surface adsorbed nutrients like Cs-137 in watersheds from soil erosion data. (Knapp-USGS)
W74-06901

AN ISOKINETIC SAMPLER FOR WIND EROSIBLE SILT AND CLAY PARTICLE MEASUREMENT,
Illinois Univ., Urbana. Dept. of Agricultural Engineering.
G. F. Arkin, and E. R. Perrier.
Soil Science Society of America Proceedings, Vol 38, No 1, p 151-152, January-February 1974. 1 fig, 2 tab.

Descriptors: *Sampling, *Soil erosion, *Wind erosion, Equipment, Particle size.
Identifiers: Wind tunnels.

A sampler for soil erosion studies enables rapid measurement of a totally representative profile distribution of soil particles entrained in a turbulent boundary layer within a wind tunnel test section. Differences between mass flux, soil particle concentration, and particle size distribution measured at the sampling point and in the air stream are minimized by isokinetic sampling. (Knapp-USGS)
W74-06902

EFFECT OF VARYING THE ON-OFF TIME OF RAINFALL SIMULATOR NOZZLES ON SURFACE SEALING AND INTAKE RATE,
Agricultural Research Service, Morris, Minn. North Central Soil Conservation Research Center.
L. L. Sloneker, and W. C. Moldenhauer.
Soil Science Society of America Proceedings, Vol 38, No 1, p 157-159, January-February 1974. 1 fig, 2 tab, 8 ref.

Descriptors: *Soil erosion, *Simulated rainfall, Infiltration, Model studies, Runoff, Soil surfaces, Surface sealing.

In many erosion studies, rainfall intensity is controlled by varying the on-off time of sprinklers. After a certain point, the energy to initiate runoff is increased as the nozzle off-time is increased. Water intake rate is increased as application rate is increased even though runoff is taking place. (Knapp-USGS)
W74-06903

KARST HYDROLOGY--A REVIEW,
Geological Survey, Raleigh, N.C.
For primary bibliographic entry see Field 2F.
W74-06907

STRUCTURE OF THE VELOCITY PROFILE OF A SUSPENSION-BEARING FLOW,
For primary bibliographic entry see Field 8B.
W74-06912

DEGREE OF LOCAL SATURATION OF A FLOW BY SUSPENDED MATTER AND ITS RELATION TO THE VOLUME CONCENTRATION,
For primary bibliographic entry see Field 8B.
W74-06913

THE INFLUENCE OF CLAY FRACTION ON THE BASIC PARAMETERS OF THE HYDROTRANSPORT OF FINE FREE-FLOWING MATERIALS,
For primary bibliographic entry see Field 8B.
W74-06914

DISTRIBUTION OF AVERAGE LONGITUDINAL VELOCITIES IN FLOWS WITH COARSE-GRAINED MATERIALS,
For primary bibliographic entry see Field 8B.
W74-06915

ENERGY LOSSES IN A TWO-PHASE FLOW CONTAINING COARSE-GRAIN MATERIAL,
For primary bibliographic entry see Field 8B.
W74-06916

SOME COMMENTS ON SEAGRASSES AND SEDIMENTARY PROCESSES,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
J. R. Schubel.
Special Report 33 (Reference 73-12), November 1973. 32 p, 8 fig, 26 ref.

Descriptors: *Sedimentation, *Vegetation effects, *Bottom sediments, *Grasses, Beaches, Surf, Erosion, Turbidity.
Identifiers: *Seagrasses.

Seagrasses alter the prevailing sedimentation processes in a variety of ways; their net effects are generally to increase the sedimentation rate, to preferentially concentrate the finer particle sizes, and to stabilize the underlying sedimentary deposits. These effects are produced by several processes: (1) by the direct and indirect extraction and entrapment of fine waterborne particles by the grass blades, (2) by the formation and retention of particles produced locally within the grass beds, (3) by the binding and stabilization of the sedimentary substrate by the grass rhizome and root systems, and (4) by the alteration of the chemical environment both of the overlying water and of the underlying sediments. (Knapp-USGS)
W74-06922

THE CBI POGO STICK CORER,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 7B.
W74-06923

HYDROLOGY AND WATER RESOURCES OF THE HOOSIC RIVER BASIN, MASSACHUSETTS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-06958

WATER RESOURCES OF NORTHWESTERN MISSOURI,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-06961

2K. Chemical Processes

PHOSPHORIMETRIC DETERMINATION OF TRACES OF BORON,
Geneva Univ. (Switzerland). Dept. of Inorganic and Analytical Chemistry.
For primary bibliographic entry see Field 5A.
W74-06755

A UNIVERSAL ION-SELECTIVE ELECTRODE BASED ON GRAPHITE PASTE,
Connecticut Univ., Storrs. Dept. of Chemistry.
J. P. Sapio, J. F. Colaruotolo, and J. M. Bobbitt.
Analytica Chimica Acta, Vol 67, No 1, p 240-242, November 1973. 2 fig, 7 ref.

Descriptors: *Water analysis, *Nitrates, *Chlorides, *Calcium, *Design criteria, Aqueous solutions, Materials, *Electrodes.
Identifiers: *Ion-selective electrodes, Chemical interference, Detection limits, Universal electrodes.

A design is proposed for a universal ion-selective electrode which includes many of the advantages of the selectrode, but of a much simpler construction. The electrode consists of a graphite paste prepared from a liquid ion exchanger containing

the ion of interest and commercial graphite powder. Chloride, nitrate, and calcium ion-selective pastes were prepared for use in electrodes to be tested. The chloride and nitrate electrodes gave linear plots of E versus-log a over the activity range of 0.003-0.85 M with a slope of 54 mV/decade activity change. No interference occurred with the chloride electrode when 0.001 M Br, I, NO3, and ClO4 were present. The nitrate electrode was unaffected by 0.00001 M Cl, Br, I, and ClO4. The calcium electrode plot was linear over the activity range of 0.001-0.1 M with a slope of 30 mV/decade. At an activity level of 0.001 M Ca, 0.0001 M Mg and Ba and 0.01 M Na caused no interference. (Little-Battelle)
W74-06758

SELECTRODE - THE UNIVERSAL ION-SELECTIVE ELECTRODE. PART VI. THE CALCIUM (II) SELECTRODE EMPLOYING A NEW ION EXCHANGER IN A NONPOROUS MEMBRANE AND A SOLID-STATE REFERENCE SYSTEM,
Technical Univ. of Denmark, Lyngby. Kemisk Laboratorium A.
For primary bibliographic entry see Field 5A.
W74-06764

SELECTRODE - THE UNIVERSAL ION-SELECTIVE ELECTRODE. PART VII. A VALINOMYCIN-BASED POTASSIUM ELECTRODE WITH NONPOROUS POLYMER MEMBRANE AND SOLID-STATE INNER REFERENCE SYSTEM,
Lund Univ., (Sweden).
For primary bibliographic entry see Field 5A.
W74-06765

NEW METHODS OF NITRITE AND NITRATE ANALYSIS FOR NATURAL WATERS,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5A.
W74-06836

ON THE REACTION BETWEEN IODIDE AND MERCURY(II),
Cairo Univ., Giza (Egypt). Faculty of Science.
For primary bibliographic entry see Field 5A.
W74-06870

ELECTRON-DONOR-ACCEPTOR COMPLEXING REAGENTS IN THE ANALYSIS OF PESTICIDES. VI. INFLUENCE OF STRUCTURE IN DETECTION AND IDENTIFICATION,
Dalhousie Univ., Halifax (Nova Scotia). Trace Analysis Research Centre.
For primary bibliographic entry see Field 5A.
W74-06871

CANCELLATION OF SPECTROPHOTOMETER SYSTEM CHARACTERISTICS USING AN ANALOG COMPUTER,
Department of Agriculture, Ottawa (Ontario). Engineering Research Service.
E. J. Brach, M. Montour, and G. St. Amour.
Laboratory Practice, Vol 22, No 10, p 631-632, October 1973. 6 fig, 2 ref.

Descriptors: *Spectrophotometery, *Analog computers, Potentiometers, Instrumentation, Electronic equipment.
Identifiers: Transmittance, Spectral response, Cancellation, Monochromators.

A method to cancel the effect of spectral and environmental characteristics of the components of a spectrophotometer on spectral response curves of the absorption characteristics of materials is discussed. The method uses analog computer techniques. The spectral range covered is from 450 to 1050 nm. The position of the wavelength drive is interfaced to the analog computer by a potentiometric voltage divider, acting as a linear wavelength to analog voltage converter. (Mortland-Battelle)
W74-06874

NITRIC OXIDE SORPTION BY CALCAREOUS SOILS: II. EFFECT OF MOISTURE ON CAPACITY, RATE, AND SORPTION PRODUCTS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 5B.
W74-06894

KINETICS OF THE PHOSPHATE INTERACTION WITH CALCITE,
Utah State Univ., Logan. Dept. of Soil Science and Biometeorology.
For primary bibliographic entry see Field 5B.
W74-06895

NITROGEN MINERALIZATION-WATER RELATIONS IN SOILS,
Agricultural Research Service, Beltsville, Md. Agricultural Environmental Quality Inst.
For primary bibliographic entry see Field 5B.
W74-06897

BUFFER INTENSITIES AND EQUILIBRIUM PH OF MINERALS AND SOILS: 1. THE CONTRIBUTION OF MINERALS AND AQUEOUS CARBONATE TO PH BUFFERING,
Agricultural Univ., Wageningen (Netherlands). Dept. of Soil Science and Geology.
For primary bibliographic entry see Field 2G.
W74-06904

BUFFER INTENSITIES AND EQUILIBRIUM PH OF MINERALS AND SOILS: II. THEORETICAL AND ACTUAL PH OF MINERALS AND SOILS,
Agricultural Univ., Wageningen (Netherlands). Dept. of Soil Science and Geology.
For primary bibliographic entry see Field 2G.
W74-06905

ELECTRO-OSMOTIC EFFECTS IN A BENTONITE-WATER SYSTEM,
Harcourt Butler Technological Inst., Kanpur (India). Dept. of Chemistry.
R. C. Srivastava, and P. K. Avasthi.
Journal of Hydrology, Vol 20, No 1, p 37-47, September 1973. 5 fig, 3 tab, 10 ref.

Descriptors: *Electro-osmosis, *Bentonite, *Electrochemistry, *Hydraulic conductivity, Darcys law, Clays, Equations, Membrane processes, Water chemistry, Clay minerals.

Measurements of the electro-osmotic velocity, streaming potential and hydraulic conductivity for a bentonite-water system are presented. The flow of electricity in the presence of both hydraulic pressure and electrical potential difference is given by the usual linear phenomenological equation, but the flow of water in the presence of both pressure and electrical potential gradients is given by a nonlinear exponential relationship. The relationship between water flux and pressure gradient in absence of electrical potential gradient is adequately represented by Swartzendruber's equation. Unless the applied potential difference exceeds a certain threshold value, the flow of water due to electro-osmosis does not take place. The plot of electro-osmotic velocity against applied potential difference, though linear, does not pass through the origin. The counter effect of streaming potential cannot account for the non-Darcian behavior. (Knapp-USGS)
W74-06910

CHEMICAL PROFILE OF THE ROSS ICE SHELF AT LITTLE AMERICA V, ANTARCTICA,
Cold Regions Research and Engineering Lab. Hanover, N.H.
For primary bibliographic entry see Field 2C.
W74-06921

TRANSFORMATION OF IRON IN A WATER LOGGED SOIL AS INFLUENCED BY REDOX POTENTIAL AND PH,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W74-06934

THERMODYNAMICS OF ION EXCHANGE,
Technion - Israel Inst. of Tech., Haifa. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W74-06936

QUALITY OF GROUND WATER IN THE LOWER COLORADO RIVER REGION ARIZONA, NEVADA, NEW MEXICO, AND UTAH,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 7C.
W74-06960

STREAM TEMPERATURES IN WASHINGTON STATE,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-06962

2L. Estuaries

SOURCES OF OXYGEN IN ESTUARIES,
For primary bibliographic entry see Field 5C.
W74-06539

UTILIZATION OF OXYGEN IN ESTUARIES,
Water Pollution Research Lab., Stevenag (England).
For primary bibliographic entry see Field 5C.
W74-06540

OXYGEN IN ESTUARIES: REQUIREMENT FOR FISHERIES,
Water Pollution Research Lab., Stevenag (England).
For primary bibliographic entry see Field 5C.
W74-06542

A PHYSICAL MODEL FOR PREDICTION AND CONTROL OF SALTWATER INTRUSION IN THE FLORIDAN AQUIFER,
Florida Univ., Gainesville. Dept. of Civil and Coastal Engineering.
For primary bibliographic entry see Field 2F.
W74-06609

SEASONAL CHANGES OF LITTORAL TRANSPORT AND BEACH WIDTH AND RESULTING EFFECT ON PROTECTIVE STRUCTURES,
Maryland Geological Survey, Baltimore.
T. H. Slaughter.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1259-1267, 1973. 17 fig, ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Beach erosion, *Sedimentation

Littoral drift, *Maryland, *Chesapeake Bay, Surveys, Mapping, Data collections, Aerial photography, Terrain analysis, Sedimentary structures, Sand bars, Sand waves.
Identifiers: *ERTS.

The shorelines of Maryland's portion of the Chesapeake Bay exhibit seasonal changes in direction of littoral transport and resulting beach width. Observation and study of this process at selected locations emphasizes the necessity of study for a complete year's seasonal cycle before stating erosion rates of an area to be protected by structures and the cyclical presence or absence of beaches. Seasonal beach conditions at four sites and resulting physical changes to protective structures were analyzed using ERTS-1 multispectral photography. (See also W74-06619) (Knapp-USGS)
W74-06664

RECOGNITION OF BEACH AND NEARSHORE DEPOSITIONAL FEATURES OF CHESAPEAKE BAY,
Maryland Geological Survey, Baltimore.
R. T. Kerhin.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1269-1274, 1973. 5 fig, 4 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Beach erosion, *Sedimentation, Littoral drift, *Maryland, *Chesapeake Bay, Surveys, Mapping, Data collections, Aerial photography, Terrain analysis, Sedimentary structures, Sand bars, Sand waves.
Identifiers: *ERTS.

Beach and nearshore depositional features are being mapped by ERTS to analyze littoral drift and sedimentation patterns in areas of little or no data. Evaluation of beach and nearshore features aids in the selection of small boat harbors, shoreline protective structures, and general coastal zone development. Through ERTS-1 aircraft support imagery, cuspate forelands, welded beach ridges, and recurved spits are mapped. The nearshore depositional features exhibit a bar and trough topography with three distinct types of sedimentary structures: longshore, transverse, and reticulated bars. Synoptic coverage of beach and nearshore depositional features by ERTS-1 data help in determining the general sedimentation patterns, growth of the beach features, and stability of the bar and trough topography. (See also W74-06619) (Knapp-USGS)
W74-06665

APPLICABILITY OF ERTS-1 IMAGERY TO THE STUDY OF SUSPENDED SEDIMENT AND AQUATIC FRONTS,
Delaware Univ., Newark. Coll. of Marine Studies.
V. Klemas, R. Srna, W. Treasure, and M. Otley.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1275-1290, 1973. 18 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Turbidity, *Wetlands, Sea water, Coasts, Suspended load, Sediment transport, Littoral drift, Currents(Water), Saline water intrusion, Estuaries, Saline water-freshwater interfaces, Dye releases, Tracers, Data collections.
Identifiers: *ERTS, *Interfaces(Aquatic), *Delaware Bay.

Imagery from three successful ERTS-1 passes over the Delaware Bay and Atlantic Coastal Region was evaluated to determine visibility of aquatic features. Data gathered from ground truth teams before and during the overflights, in conjunction with aerial photographs taken at various altitudes, were used to interpret the imagery. Visual inspection, density slicing, and multispectral analysis of the imagery revealed strong suspended sediment patterns and several distinct types of aquatic interfaces or frontal systems. ERTS-1 Multispectral scanner band 5 (0.6-0.7 microns) gave the sharpest definition of interfaces between waters of differing turbidity. Band 4 (0.5-0.6 microns), due to its deeper water penetration, was more sensitive to patterns having lower turbidity, yet was veiled by a uniform blanket of atmospheric scattering making identification of sediment patterns more difficult. Band 6 (0.7-0.8 microns) and band 7 (0.8-1.1 microns) clearly delineated the shoreline and discriminated water from land in the marshes. (See also W74-06619) (Knapp-USGS)
W74-06666

CORRELATION OF ERTS MULTISPECTRAL IMAGERY WITH SUSPENDED MATTER AND CHLOROPHYLL IN LOWER CHESAPEAKE BAY,
National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center.
D. E. Bowker, P. Fleischer, T. A. Gosink, W. J. Hanna, and J. Ludwick.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1291-1297, 1973. 5 fig, 4 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Suspended load, *Algae, *Chesapeake Bay, Turbidity, Data collections, Water quality, Estuaries, *Chlorophyll, Sedimentary structures, Tides, Currents(Water), Sand waves, Monitoring, *Virginia.
Identifiers: *ERTS, James River(Va).

The feasibility of using ERTS multispectral satellite imagery to monitor the characteristics of estuarine waters is being investigated. Greatest detail in suspended matter is revealed by MSS band 5. Near-surface suspended sediment load and chlorophyll can be observed in bands 6 and 7. Images received partially define extent and location of high suspended sediment concentrations. Turbid water of the James River enters Chesapeake Bay as a plume that can be traced along the southern shore and extends seaward of Cape Henry. An area of highly variable turbidity exists in the lower bay between Hampton and Cape Charles, and may be related to strong tidal currents and large-scale bedforms found here. Net quantity of suspended matter in the lower bay has been decreasing since the inception of the study, and represents the diminution of turbid flood waters carried into the bay in late September, 1972. The results so far point to the utility of MSS imagery in monitoring estuarine water character for the assessment of siltation, productivity, and water types. (See also W74-06619) (Knapp-USGS)
W74-06667

PLUME DEVELOPMENT IN LONG ISLAND SOUND OBSERVED BY REMOTE SENSING (ERTS-1),
Geological Survey, Hartford, Conn.
F. H. Ruggles, Jr.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1299-1303, 1973. 2 fig, 1 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Turbidity, Mixing, Saline water-freshwater interfaces, Data processing, Data collections, Water circulation, *Connecticut, *Sediment transport.
Identifiers: *ERTS, *Long Island Sound.

As the Connecticut River flows into Long Island sound, large plumes are developed during the mixing of ocean and estuarine waters. Plumes were delineated for July 28, October 8, October 27, and December 2, 1972, by analyzing ERTS-1 imagery with the SRI Electronic Satellite Image Analysis Console (ESIAC). Insertion of MSS band 5 into the ESIAC produced the best result in this analysis. The four plumes that have been delineated provide the first input to a time-lapse analysis of circulation patterns at the eastern end of Long Island Sound. (See also W74-06619) (Knapp-USGS)
W74-06668

NEW INSIGHTS INTO THE INFLUENCE OF ICE ON THE COASTAL MARINE ENVIRONMENT OF THE BEAUFORT SEA, ALASKA,
Geological Survey, Menlo Park, Calif. Office of Marine Geology and Hydrology.
For primary bibliographic entry see Field 2C.
W74-06669

ERTS-1 OBSERVATIONS OF SEA SURFACE CIRCULATION AND SEDIMENT TRANSPORT, COOK INLET, ALASKA,
Alaska Univ., College. Inst. of Marine Science.
F. F. Wright, G. D. Sharma, and D. C. Burbank.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentation, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1315-1322, 1973. 3 fig, 4 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Estuaries, *Alaska, Water circulation, Path of pollutants, *Sediment transport, Mixing, Data collections, Glacial drift, Tides, Sedimentation, Erosion, Currents(Water).
Identifiers: *ERTS, *Cook Inlet(Alas).

Cook Inlet is a large tide-dominated estuary in southern Alaska. Highly turbid streams enter the upper inlet, providing an excellent tracer for circulation in the lower inlet. ERTS MSS 4 and 5 images can be used in this area to plot sediment and pollutant trajectories, areas of probable commercial fish concentration, and the circulation regime. (See also W74-06619) (Knapp-USGS)
W74-06670

SEDIMENT DISTRIBUTION AND COASTAL PROCESSES IN COOK INLET, ALASKA,
Cold Regions Research and Engineering Lab., Hanover, N.H.
D. M. Anderson, L. W. Gatto, H. L. McKim, and A. Petrone.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1323-1339, 1973. 7 fig, 13 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Estuaries, *Alaska, Water circulation, Path of pollutants, *Sediment transport, Mixing, Data collections, Glacial drift, Tides, Sedimentation, Erosion, Currents(Water).
Identifiers: *ERTS, *Cook Inlet(Alas).

Regional hydrologic and oceanographic relationships in Cook Inlet, Alaska, were recognized from sequential ERTS-1 MSS imagery. Coastline configuration is well defined on bands 6 and 7. Current patterns are visible in the inlet because of differential concentrations of suspended sediment. These patterns are most evident on bands 4 and 5. The circulation patterns are controlled primarily by the interaction between the semidiurnal tides and the counterclockwise Alaska current. Tongues of clear oceanic water enter the inlet through Kennedy Channel along the east shoreline in the vicini-

ty of Cape Elizabeth. A counterclockwise circulation pattern around Kalgin Island results from the interplay of the northerly moving water along the east shore and the southerly moving water along the west side of the inlet. Freshwater plumes heavily laden with sediment are visible at the mouths of all major rivers. Relect plumes from as many as three tidal stages have been recognized. Tidal flats and a number of unmapped cultural features appear prominently in bands 5 and 6. (See also W74-06619) (Knapp-USGS)
W74-06671

DISTRIBUTION AND MOVEMENT OF SUSPENDED SEDIMENT IN THE GULF OF MEXICO OFF THE TEXAS COAST,
Geological Survey, Corpus Christi, Tex.
R. E. Hunter.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1341-1348, 1973. 4 fig, 4 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Turbidity, *Gulf of Mexico, Sediment transport, Suspended load, Provenance, Ocean circulation, Ocean currents, Littoral drift, Data collections, *Texas.
Identifiers: *ERTS.

ERTS-1 imagery is very useful in studies of the distribution of suspended sediment in the Gulf of Mexico off the Texas coast. By using suspended-matter concentrations as tags on water masses, much information on water movement can be obtained. Superimposed on the general offshore decrease in turbidity are more complex concentrations of turbid water which may be classified as plumes or bands. A plume is attached to its source river or inlet during its growth, but at the end of an ebb tidal cycle, the plume from a tidal inlet becomes detached and drifts passively. Most bands are aligned either parallel or obliquely to shore. The bands may originate in several ways: by drift along streamlines from localized sources, such as river mouths, where suspended sediment is being continuously supplied; by the deformation of ebbtide plumes after they have been detached from their source at a tidal inlet; or by the concentration of suspended sediment in the convergence or divergence zones between water masses, especially in the convergence or divergence zones associated with helical circulation cells. (See also W74-06619) (Knapp-USGS)
W74-06672

OCEANOGRAPHIC MAPPING OF STRUCTURE AND DYNAMICS OF THE NORTHERN GULF OF CALIFORNIA BY THE USE OF SPECTRAL MODELING AND ERTS-1,
Arizona Univ., Tucson.
L. K. Leply, G. Calderon, and J. R. Hendrickson.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1349-1356, 1973. 3 fig, 1 tab, 5 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Oceanography, *Ocean currents, Mapping, Surveys, Currents(Water), Data collections.
Identifiers: *ERTS, *Gulf of California.

Distribution and flow of water masses at four depth intervals were determined by analyzing ERTS imagery through the use of optical models of classes of vertical oceanographic profiles. Data used for these models were obtained from shipboard measurements (including surface spectral radiance) and optical and more conventional oceanographic depth profiles. The spectral models obtained were applied to radiance-contoured ERTS imagery in bands 4, 5, 6, and 7. Features mapped by direct photointerpretation of ERTS imagery include submerged shoals, current streamlines, and location of possible upwellings, downwellings and submarine springs. (See also W74-06619) (Knapp-USGS)
W74-06673

REMOTE SENSING OF OCEAN CURRENTS USING ERTS IMAGERY,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
G. A. Maul.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1365-1375, 1973. 4 fig, 10 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Oceanography, *Ocean currents, *Gulf of Mexico, Currents(Water), Ocean circulation, Plankton, Waves(Water), Algae, Turbidity, Data collections, Pollutant identification.
Identifiers: *ERTS.

Major ocean currents such as the Loop Current in the eastern Gulf of Mexico have surface manifestations which can be detected by remote sensing. Surface chlorophyll-a concentrations, which contribute to the shift in color from blue to green in the open sea, have high spatial variability; significantly lower concentrations were observed in the current. The cyclonic edge of the current is an accumulation zone which causes a peak in chlorophyll concentration. The dynamics also cause surface concentrations of algae, which have a high reflectance in the near infrared. Combining these observations gives rise to an edge effect which can show up as a bright lineation on multispectral imagery. Frequently the sea-state in the current is higher than in surrounding water due to differential shear. When high seas introduce bubbles, white caps, and foam, the reflectance is dominated by scattering rather than absorption. This has been detected in ERTS imagery and used for current location. (See also W74-06619) (Knapp-USGS)
W74-06675

APPLICATION OF ERTS-1 IMAGERY TO THE HARVEST MODEL OF THE U.S. MENHADEN FISHERY,
Earth Satellite Corp., Washington, D.C.
P. M. Maughan, A. D. Marmelstein, and O. R. Temple.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1405-1411, 1973. 3 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Fisheries, *Gulf of Mexico, Turbidity, Plankton, Shoals, Data collections.
Identifiers: *ERTS, *Menhaden.

ERTS-1 imagery was evaluated for providing information for the harvest model of the menhaden industry. The unexpected complexity of the physical environment in Mississippi Sound precluded simplistic analysis of fish-environment relationships. Preliminary indications are that an association does exist between fish availability and differences in water transparency (turbidity) within the Sound. A clearer relationship is developing between major turbid features imaged by ERTS-1 and location of successful fishing attempts. Overlays of catch location on ERTS-1 images show an association of school position with interfaces between imaged turbid features. (See also W74-06619) (Knapp-USGS)
W74-06678

COASTAL AND SUBMARINE FEATURES ON MSS IMAGERY OF SOUTHEASTERN MASSACHUSETTS: COMPARISON WITH CONVENTIONAL MAPS,
Geological Survey, Reston, Va. EROS Program Office.
R. S. Williams, Jr.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1413-1422, 1973. 5 fig, 1 tab, 6 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Mapping, *Coasts, *Geomorphology, Topographic mapping, Geologic mapping, Data collections, Data processing, Beaches, Erosion, Sedimentation, *Massachusetts.
Identifiers: *ERTS.

Three ERTS-1, MSS images of southeastern Massachusetts, including Cape Cod Bay, Cape Cod, and Nantucket Sound, show a variety of dynamic geologic and hydrologic phenomena. Coastal features imaged include the coastline at different times in the tidal cycle, harbors, lakes and ponds, marshes (wetlands), and beach and dune areas; submarine features include tidal flats, shoals, natural channels, and bars. Comparisons with conventional maps at 1:1,000,000 and 1:250,000,000 scales show many inaccuracies between the ERTS imagery and the maps. The discrepancies are caused by cartographic generalization from larger scale maps and, in some instances, actual changes in landforms. The marine geological information shown on the ERTS imagery is not shown on the 1:1,000,000- or 1:250,000,000-scale maps, nor is other mappable environmental information. The ERTS-1 imagery provides coastal and submarine information superior to conventional maps at 1:250,000 or smaller scales. The ERTS-1 imagery can be used to increase the accuracy of maps, portray additional environmental information, and provide the capability for frequent updating of maps. (See also W74-06619) (Knapp-USGS)
W74-06679

WATER DEPTH ESTIMATION WITH ERTS-1 IMAGERY,
International Imaging Systems, Mountain View, Calif.
D. S. Ross.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1423-1432, 1973. 5 fig, 5 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Oceanography, *Bathymetry, *Depth, Data collections, Mapping, Surveys, Sounding, Topography.
Identifiers: *ERTS.

Contrast-enhanced 9.5 inch ERTS-1 images were produced for an investigation on ocean water color. Such images lend themselves to water depth estimation by photographic and electronic density contouring. MSS-4 and -5 images of the Great Bahama Bank were density sliced by both methods. Correlation was found between the MSS-4 image and a hydrographic chart at 1:467,000 scale in a number of areas corresponding to water depth of less than 2 meters, 5 to 10 meters, and 10 to about 20 meters. The MSS-5 image was restricted to depths of about 2 meters. Where reflective bottom and clear water are found, ERTS-1 MSS-4 images can be used with density contouring by electronic or photographic methods for estimating depths to 5 meters within about one meter. (See also W74-06619) (Knapp-USGS)

W74-06680

DIGITAL DATA PROCESSING OF ERTS-1 IMAGERY OF DELAWARE BAY,
Bendix Aerospace Systems Div., Ann Arbor, Mich.
A. C. Conrod.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1641-1647, 1973. 3 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, *Estuaries, Data collections, Digital computers.
Identifiers: *ERTS, *Delaware Bay.

An Earth Resources Data Center is capable of automatically producing classification imagery and thematic maps from ERTS computer compatible tapes. ERTS coverage of Delaware Bay was processed to produce classification imagery of water masses in the bay, and a map of all land-water boundaries along the shoreline including wetlands and inland lakes. The results of processing may be obtained by personnel who are data users, and not data processing specialists. Any ERTS investigator can achieve precise and quantifiable results directly from taped data. (See also W74-06619) (Knapp-USGS)
W74-06703

UNSUPERVISED CLASSIFICATION AND AREAL MEASUREMENT OF LAND AND WATER COASTAL FEATURES ON THE TEXAS COAST,
Lockheed Electronics Co., Inc., Houston, Tex. Aerospace Systems Div.
L. M. Flores, C. A. Reeves, S. B. Hixon, and J. F. Paris.
In: Symposium on Significant Results Obtained from the Earth Resources TechnologySatellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1675-1681, 1973. 4 fig, 1 tab, 7 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, Coasts, Wetlands, Beaches, Forests, *Land use, Data collections, *Texas, Gulf of Mexico.
Identifiers: *ERTS.

ERTS-1 multispectral scanner (MSS) digital data were used to delineate coastal land, vegetative, and water features in two portions of the Texas Coastal Zone. Data were analyzed through the use of two clustering algorithms. Many classes were identified as pure features such as water masses, salt marsh, beaches, pine, hardwoods, and exposed soil or construction materials. Most classes were identified to be mixtures of the pure class types. Using an objective technique for measuring the percentage of wetland along salt marsh boundaries, an analysis was made of the accuracy of areal measurement of salt marshes. Accuracies ranged from 89% to 99%. NASA aircraft photography was used as the basis for determining the true areal size of salt marshes in the study sites. (See also W74-06619) (Knapp-USGS)
W74-06706

USE OF ERTS-1 PICTURES IN COASTAL OCEANOGRAPHY IN BRITISH COLUMBIA,
Department of the Environment, Victoria (British Columbia). Marine Sciences Branch (Pacific Region).
J. F. R. Gower.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1683-1684, 1973.

Descriptors: *Remote sensing, Satellites(Artificial), *Oceanography, Water circulation, *Canada, Data collections, Coasts, Data processing, Path of pollutants, Ocean currents, Turbidity, *Pollutant identification.
Identifiers: *ERTS, *British Columbia.

The ERTS-1 color composite picture of the Vancouver-Victoria region illustrates the value of ERTS data for coastal oceanography. The water of the Fraser River plume which is clearly visible in the center of the scene has been of interest to oceanographers on the west coast of Canada for a long time as an easily visible tracer of surface water circulation in the Strait of Georgia. The ERTS satellite gives the first complete view of the plume area. Electronic enhancement of the images shows that the satellite's narrow angle coverage allows very weak surface turbidity features to be made visible to give information on surface currents over a wide area. (See also W74-06619) (Knapp-USGS)
W74-06707

APPLICATION OF ERTS-1 IMAGERY IN COASTAL STUDIES,
Army Engineer Div. South Pacific, San Francisco, Calif. Coastal Engineering Branch.
O. T. Magoon, D. W. Berg, and R. J. Hallermeier.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1697-1698, 1973.

Descriptors: *Remote sensing, Satellites(Artificial), *Oceanography, Navigation, Sediment transport, Path of pollutants, Coasts, Littoral drift, Sea ice, Ocean currents, Data collections, Data processing, *Pollutant identification, *Turbidity.
Identifiers: *ERTS.

Study of the ERTS image of each spectral band separately, in combination with other bands, and in conjunction with other available data permits extraction of data useful in coastal engineering planning and coastal processes studies. An MSS 5 image of August 16, 1972, clearly defines the configuration of Indian River Inlet, Delaware. The offset between the barrier islands north and south of the inlet gives an indication of predominant south-to-north longshore littoral transport at the inlet. In general, sediment plumes emanating from an inlet may be discernible in MSS 4 or MSS 5 and may give some indication of longshore transport direction at the time of the image. Nearshore flow patterns may be traced using the recorded suspended sediment patterns in ERTS imagery. An ERTS image of Lituya Bay, Alaska, obtained on September 18, 1972, shows a well-defined plume of turbid water associated with the Alsek River. Water flow to the northwest may be inferred from this plume's shape. ERTS imagery of the Laptev Sea coastline on the northern shore of Siberia on September 16, 1972, shows important fluid mixing phenomena. A mosaic of MSS 4 images displays a convoluted interface between waters of markedly different turbidities. A mosaic of MSS 4 images of the mouth of the Colorado River (September 30, 1972) slightly overlaps a mosaic of MSS 4 images of a region slightly further south in the Gulf of California (September 29, 1972). The structure of the complex suspended sediment pattern in the overlap area is quite different on the two days. (See also W74-06619) (Knapp-USGS)
W74-06709

DETECTION OF TURBIDITY DYNAMICS IN TAMPA BAY, FLORIDA USING MULTISPECTRAL IMAGERY FROM ERTS-1,
Geological Survey, Tampa, Fla.
A. E. Coker, A. Higer, and C. R. Goodwin.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1715-1726, 1973. 5 fig.

Descriptors: *Remote sensing, *Data collections, Satellites(Artificial), *Turbidity, Dredging, Harbors, Bays, *Florida, Simulation analysis, Mathematical models, Data processing, Water circulation, Path of pollutants, *Pollutant identification.
Identifiers: *ERTS, *Tampa Bay(Fla).

In order to determine the effects of deepening of Tampa Bay on circulation, water quality, and biota during and after the construction, a digital simulation model of the bay was developed, and data were collected by ERTS and conventional methods. Return-Beam Vidicon (RBV) multispectral data were collected while a shell dredging barge was operating in the bay, and used for turbidity recognition and unique spectral signatures representative of type and amount of material in suspension. The processed data integrated with other modeled parameters provide an overview of the dynamics of turbid material during dredging periods. A three-dimensional concept of the dynamics of the plume was achieved by superimposing the parts of the plume recognized at each RBV band. This provides a background for automatic computer processing of ERTS data and three-dimensional modeling of turbidity plumes. (See also W74-06619) (Knapp-USGS)
W74-06711

NUMERICAL MODEL OF ST. LAWRENCE RIVER ESTUARY,
Institute of Coastal Oceanography and Tides, Birkenhead (England).
D. Prandle, and N. L. Crookshank.
Journal of the Hydraulics Division, American Society of Civil Engineers Vol 100, No HY4, Paper 10472, p 517-529, April 1974. 10 fig, 4 ref, append.

Descriptors: *Estuaries, *St. Lawrence River, *Numerical analysis, *Tides, Bores, *Mathematical models, Rivers, Stratified flow, Saline water intrusion, Water circulation, Coriolis force.

A numerical scheme of tidal propagation involves an explicit fine-difference solution to the shallow-water wave equations. This model was combined with one-dimensional models of the higher reaches of the St. Lawrence and Saguenay Rivers. The resulting model represents a complete simulation of the estuary to the limits of the tidal influence. Computed values of the depth-averaged velocities showed good agreement with field recordings of surface velocities in the upstream section of the lower estuary. However results in the downstream section indicated the magnitude of the computed velocities to be lower than the recorded surface velocities. This inconsistency is related to the degree of the vertical density stratification in the estuary. The influence of the Coriolis force on the flow in the lower estuary was also studied; it has a significant effect at long time-scales. (Knapp-USGS)
W74-06738

THE PRESENT AND FUTURE STATUS OF EASTERN NORTH CAROLINA WETLANDS,
North Carolina Univ., Chapel Hill. Dept. of Geography.
A. J. Hawley.
Available from the National Technical Information Service as PB-231 486, $5.00 in paper copy, $1.45 in microfiche. North Carolina Water Resources Research Institute, Raleigh, UNC-WRRI Report No. 87, January 1974. 169 p. OWRR A-053-NC(1).

Descriptors: *Wetlands, *Coastal marshes, Freshwater marshes, Land tenure, Management, *North Carolina, Coastal plains, *Estuarine environment, *Regulation, Water quality control, Preservation, Drainage, Dredging, Forestry, Fisheries, Wildlife, Recreation.
Identifiers: *Wetlands protection.

Alteration and destruction of North Carolina wetlands are proceeding rapidly. Moreover, State dredge and fill regulations apply only to coastal wetlands and state-owned lakes, whereas estimates indicate that these areas account for less than six percent of all wetlands in eastern North Carolina. Despite its losses North Carolina ranks first among all states on the eastern seaboard in the extent of important estuarine area remaining. The State also leads in the acreage of estuarine habitat preserved or proposed for preservation. North Carolina has 5,885,000 acres of wetlands with 95 percent located in the coastal plain counties. In the late 1950's private individuals, companies and corporations owned all wetland acreages in 27 of these 41 coastal plain counties. Highly conservative estimates indicated that over 72 percent of the coastal marshlands were privately owned whereas 56 percent of inland wetlands were in private ownership. Under the assumption that some wetland areas are worth preserving, this study identifies and maps wetland areas considered important by some 200 knowledgeable field interviewees from four subject-oriented perspectives: (1) forestry, (2) fisheries, (3) wildlife, and (4) recreation. The report concludes with recommendations for a State program for wetland protection. (McJunkin-North Carolina)
W74-06850

THE PROBLEM OF DIRECT GROUNDWATER DISCHARGE TO THE SEAS,
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 2F.
W74-06881

WANDO RIVER ENVIRONMENTAL QUALITY STUDIES, AN INTERIM REPORT.
South Carolina Water Resources Commission, Columbia.
For primary bibliographic entry see Field 5B.
W74-06919

DISTRIBUTION OF METALS IN BALTIMORE HARBOR SEDIMENTS,
Environmental Protection Agency, Annapolis, Md. Annapolis Field Office.
For primary bibliographic entry see Field 5B.
W74-06924

EIGHT YEARS OF OBSERVATIONS ON THE WATER LEVEL AT QUEBEC AND GRONDINES 1962-1969: PART I--ANALYSIS OF THE TIDAL SIGNAL,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
For primary bibliographic entry see Field 2E.
W74-06926

COASTAL WETLANDS IN NEW ENGLAND,
For primary bibliographic entry see Field 5G.
W74-06967

RATIFICATION OF PROPOSED CONVENTION ON THE PREVENTION OF MARINE POLLUTION BY DUMPING OF WASTES AND OTHER MATTER (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Department of State, Washington, D.C.
For primary bibliographic entry see Field 6E.
W74-06994

COOPERATIVE GULF OF MEXICO ESTUARINE INVENTORY AND STUDY, FLORIDA: PHASE I AREA DESCRIPTION,
National Marine Fisheries Service, St. Petersburg Beach, Fla. Gulf Coast Fisheries Center.
J. K. McNulty, W. H. Lindall, Jr., and J. E. Sykes.
Available from the National Technical Information Service as COM-73-50277, $1.45 microfiche. November 1972. 137 p, 86 tab, 60 map, 3 chart, 1 illus, 1 bibl.

Descriptors: *Florida, *Coasts, *Estuaries, *Tidal marshes, *Gulf of Mexico, Mangrove swamps, Fisheries, Shellfish, Pollution, Public health, Water temperature, Salinity, Streamflow, Artificial substrates, Commercial fishing.

Newly-developed tables and maps depict the dimensions, submerged vegetation, tidal marshes, mangrove swamps, commercial oyster beds, leased oyster-rearing areas, sources of pollution, drained tidal marshes, and filled areas of Florida's west coast estuaries. Published and unpublished information on temperature, salinity, geology, artificial fishing reefs, stream discharge, human population, commercial fishing, and economic development is presented in new form. Human population in coastal counties increased from 614,616 persons. in 1930 to 3,320,226 persons in 1970. This increase resulted in adverse effects from pollution to 43% of estuarine areas, in the filling of 23,521 acres mainly for residential and industrial development, and in the draining of 26,676 acres of tidal marshes for mosquito control. The increasing population correlates directly with the number of sources of pollution, filled area, and the area closed to shellfishing by public health authorities. Thus, failure to control the adverse effects of population growth will clearly result in continued rapid degradation of estuarine habitat on Florida's west coast. (Conko-Florida)
W74-06995

DISTRIBUTION AND SEASONAL VARIATIONS OF THE PLANKTON IN 'RIVIERE DE MORLAIX,' (IN FRENCH),
For primary bibliographic entry see Field 5C.
W74-07012

SEASONAL AND STRATIGRAPHIC CONTROLS IN COASTAL FLOODPLAIN SOILS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Soils.
For primary bibliographic entry see Field 2G.
W74-07030

FLORIDA MANGROVES AS SHORELINE STABILIZERS,
Florida Dept. of Natural Resources, St. Petersburg. Marine Research Lab.
For primary bibliographic entry see Field 4A.
W74-07047

ECOLOGICAL ASPECTS ALONG THE SHORES OF THE BURABALANGA TIDAL ESTUARY BALASORE DISTRICT, ORISSA STATE,
Botanical Survey of India, Calcutta.
T. A. Rao, and A. K. Mukherjee.
Proc Indian Acad Sci Sect B. Vol 76, No 5, p 201-206. 1972.
Identifiers: Ecological studies, *Estuaries, *India(Burabalanga), Precipitation, Soils, *Tidal estuary.

A few terrestrial strips of the Burabalanga (India) tidal estuary were studied both for their taxa and soil. There is a distinct change in the vegetational patterning and species composition from the stabilized estuarine shore towards the upland relief. With increasing distance from the estuarine shore line, the cover percentage decreased. Similarly, the edaphic parameters show significant differences and show correlation both negative and positive in response to tidal rhythms within a broad topo-sequence. It is concluded that the cause for the sequential changes of taxa and soil correspond roughly to tidal floodings on the intertidal areas and the combined action of precipitation (climate) and local topography on the supratidal area.--Copyright 1973, Biological Abstracts, Inc
W74-07049

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3B. Water Yield Improvement

SPRINKLER PRECIPITATION GAGE ERRORS,
Agricultural Research Service, Kimberly, Idaho. Snake River Conservation Research Center.
For primary bibliographic entry see Field 3F.
W74-06593

CHANGES IN WATER YIELD OF SMALL WATERSHEDS BY AGRICULTURAL PRACTICES,
Agricultural Research Service, Riesel, Tex.
For primary bibliographic entry see Field 2E.
W74-06597

UNIVERSITY OF CHICAGO CONTRIBUTION TO PROJECT METROMEX-I.
Chicago Univ., Ill. Dept. of the Geophysical Sciences.
For primary bibliographic entry see Field 2B.
W74-06937

3C. Use Of Water Of Impaired Quality

EFFECTS OF SEWAGE DISPOSAL AND RECLAMATION ON GROUND WATER QUALITY,
California State Dept. of Public Health, Sacramento. Environmental Sanitation Div.
For primary bibliographic entry see Field 5D.
W74-06948

AGRICULTURAL WASTES AND GROUND WATER QUALITY,
California Univ., Davis.
For primary bibliographic entry see Field 5B.
W74-06951

3D. Conservation In Domestic and Municipal Use

EVAPORATION SUPPRESSION, A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C.
Available from the National Technical Information Service as PB-231 200; $9.75 in paper copy, $1.45 in microfiche. Water Resources Scientific Information Center Report WRSIC 73-216, December 1973, 478 p.

Descriptors: *Evaporation control, *Bibliographies, *Evapotranspiration, Irrigation, *Monomolecular films, Arid lands, Water conservation, *Reservoir evaporation, Water yield improvement, Soil moisture, *Transpiration control.

This report, containing 320 abstracts, is another in a series of planned bibliographies in water resources to be produced from the information base comprising SELECTED WATER RESOURCES ABSTRACTS (SWRA). At the

time of search for this bibliography, the data base had 64,268 abstracts covering SWRA through November 1, 1973 (Volume 6, Number 21). Author and subject indexes are included.
W74-06501

3E. Conservation In Industry

COLOR REMOVAL FROM KRAFT MILL EFFLUENTS BY ULTRAFILTRATION,
Champion International Corp., Hamilton, Ohio.
For primary bibliographic entry see Field 5D.
W74-06521

CHLORINE PRODUCTION DROPS AS DEMAND LAGS.
For primary bibliographic entry see Field 5B.
W74-06766

AREA FINANCING OF WATER RESOURCE DEVELOPMENT IN WEST MINNESOTA,
Minnesota Univ., St. Paul. Dept. of Agricultural and Applied Economics.
For primary bibliographic entry see Field 6B.
W74-06846

U.S. DEEPWATER PORT STUDY, VOL. 2. COMMODITY STUDIES AND PROJECTIONS,
Nathan (Robert R.) Associates, Inc., Washington, D.C.
For primary bibliographic entry see Field 6D.
W74-06863

U.S. DEEPWATER PORT STUDY, VOL 3. PHYSICAL COAST AND PORT CHARACTERISTICS, AND SELECTED DEEPWATER PORT ALTERNATIVES,
Nathan (Robert R.) Associates, Inc., Washington, D.C.
For primary bibliographic entry see Field 6D.
W74-06864

EXPLORING ENERGY CHOICES.
Energy Policy Project, Washington, D.C.
For primary bibliographic entry see Field 6D.
W74-06879

3F. Conservation In Agriculture

BAKING QUALITY OF SPRING WHEAT AS AFFECTED BY RAIN DURING DRYING AFTER REAPING (IN POLISH),
Wyzsza Szkola Rolnicza, Wroclaw (Poland). Instytut Hodowli Roslin i Nasiennictwo.
M. Zamorska.
Hodowla Rosl Aklim Nasienn. Vol 16, No 2, p 107-122. 1972. Illus. (English summary).
Identifiers: Drying, Rain, Reaping, *Wheat(Spring), *Poland, *Grain harvesting.

Seven spring wheat varieties were studied over 5 yr. Grain harvested during a rainless spell did not differ significantly from that harvested after with regard to 1000 seed weight, protein content and water-absorbing capacity of flour. Bread and dough characteristics depended to a certain degree on date of harvest, which was related to rainfall. Bread made of grain slightly affected by rain had a greater volume compared to that made of grain harvested during a rainless spell. Bread volume was smaller when grain was subjected to rain for a longer time. Identical or greater dough elasticity and slight softening of dough were characteristic of grain slightly affected by rain compared to that harvested during a rainless spell.--Copyright 1973, Biological Abstracts, Inc.
W74-06548

WHEAT AND GRAIN SORGHUM IRRIGATION IN A WIDE BED-FURROW SYSTEM,
Agricultural Research Service, Bushland, Tex.
R. R. Allen, and J. T. Musick.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 1, p 61-63, January-February, 1972. 4 fig, 1 tab, 7 ref.

Descriptors: *Irrigation practices, *Furrow irrigation *Irrigation design, Irrigation efficiency, Irrigation, Infiltration rates, *Wheat, *Grain sorghum, Agricultural engineering, *Texas.
Identifiers: Row crops, Wide-bed furrows, Southern High Plains.

A wide bed-furrow system was tested for irrigation of winter wheat and grain sorghum on a slowly permeable clay loam in the Southern High Plains. The system consisted of 60-inch spaced furrows separating relatively broad flat beds about 40 inches wide. Wheel traffic zones were maintained along the center of the beds separate from water furrows. The wide bed-furrow system was compared with conventional 40-inch bed-furrows where wheel traffic occurs in irrigation furrows. Beds and furrows were maintained in place during a second crop by no-till seeding grain sorghum after wheat and using chemical weed control. The wide bed-furrow system was successfully managed for production of both winter wheat and grain sorghum. Yields from 60-inch bed-furrows were similar to those from the 40-inch spacing. Water intake during irrigation of wide bed-furrows on the 1,000-foot length of run was similar to 40-inch conventional bed-furrows during a winter irrigation of wheat but averaged 23 percent less during three spring irrigations, and 19 percent less during two seasonal irrigations of grain sorghum. (Skogerboe-Colorado State)
W74-06580

MATHEMATICAL MODEL OF WATER ADVANCE IN BORDER IRRIGATION,
Washington State Univ., Pullman. Dept. of Agricultural Engineering.
D. L. Bassett.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 5, p 992-995, September-October, 1972. 3 fig, 12 ref.

Descriptors: *Model studies, *Surface irrigation, *Border irrigation, Irrigation practices, *Mathematical models, Computer models, Infiltration rates, Agricultural engineering, *Unsteady flow.
Identifiers: Water advance.

A mathematical model is presented which describes the advance of water over a dry porous bed as in border irrigation. The model uses the complete equations of continuity and motion for unsteady spatially varied flow. These are solved by the method of characteristics, with an external shape function and volume balance technique for advancing the tip. Computed solutions are compared with laboratory and field tests. Results suggest the model will predict flow with accuracy acceptable for most field use and comparable to that with which input data are described. (Skogerboe-Colorado State)
W74-06582

HYDRAULICS OF A CENTER PIVOT SYSTEM,
South Dakota State Univ., Brookings. Dept. of Agricultural Engineering.
S. T. Chu, and D. L. Moe.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 5, p 894-896, September-October, 1972. 3 fig, 1 tab, 4 ref.

Descriptors: *Fluid mechanics, *Pipe flow, *Head loss, Irrigation practices, Sprinkler irrigation, Hydraulics, Closed conduits, Pressure conduits, Water distribution(Applied), Application methods.
Identifiers: *Center pivot system.

The analytical solutions for the total pressure head loss and the distribution of pressure head loss along the mainline of a center pivot system are presented. It is shown that the theoretical results are good approximations of practical field situations. (Skogerboe-Colorado State)
W74-06583

DESIGN CRITERIA FOR IRRIGATION SYSTEMS WITH COMPLEX PIPE LOOPS,
Nebraska Univ., Lincoln. Coll. of Engineering and Architecture.
D. M. Edwards, and B. Spencer.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 1, p 76-78, January-February, 1972. 3 fig, 1 tab, 7 ref.

Descriptors: *Irrigation engineering, *Irrigation design, *Sprinkler irrigation, *Pipe flow, Pipelines, Hydraulics, Fluid mechanics, Irrigation systems, Irrigation practices, *Design criteria.
Identifiers: *Loop networks.

A design procedure is presented for the analysis of irrigation systems utilizing loop networks. The design of these systems is readily adapted to the digital computer. With the advent of solid set sprinkler, subsurface, and trickle irrigation systems the simple system layout may no longer be an adequate design. In these cases loop networks will lower fixed and operation irrigation costs while developing better water distribution by maintaining more uniform pressures throughout the system. This design procedure has been used successfully in actual field installations. It should be emphasized that although the procedure produces very reliable results, the results of the entire analysis are only as good as the initial selection of inputs and outputs and human judgments. (Skogerboe-Colorado State)
W74-06585

DEVELOPMENT OF ASPHALT MOISTURE BARRIER EQUIPMENT,
International Harvester Co., Hinsdale, Ill.
R. C. Fischer.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 4, p 630-631, July-August, 1972. 2 fig, 6 ref.

Descriptors: *Soil moisture, *Asphalt, *Linings, Soil asphalt, Moisture availability, Deep percolation, Groundwater movement, Root zone.
Identifiers: *Moisture barriers.

Prototype equipment for installation of asphalt water barrier under sandy farmland has attained rates of 1 1/4 acres per hour. Installation requires a tractor of 200 horsepower and 1000 gallons of asphalt per acre. Predictions show that some vegetable crops will return the installation price of $250 per acre within three years. Some corn areas have taken five years. Asphalt barrier will conserve water and plant nutrients from leaching and reduce stream pollution. Asphalt barrier may become a significant factor in increasing the world food supply. (Skogerboe-Colorado State)
W74-06586

EVALUATION OF A FURROW MODIFYING DEVICE,
Agricultural Research Service, Auburn, Ala.
W. R. Gill.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 3, p 401-403, May-June, 1972. 5 fig, 3 tab, 2 ref.

Descriptors: *Soil treatment, *Cultivation, *Soil management, Soil physics, Soil texture, Soil properties, Evaluation, *Furrow irrigation.
Identifiers: *Plowing.

A study of the modification of a furrow slice indicates that a two-phase isolation and shearing of the soil slice may reduce the draft of a plow in cer-

tain soil conditions. The observed effect may be achieved by a reduction of compaction hardening or a partial loosening of the slice. While the undercutting and plowing of the slice may be done in separate operations it would appear that they can be simultaneously undertaken in a single operation if suitable space is provided between the tools. The forces on a plow may be beneficially altered by varying the parameters of an integrally mounted undercutting device. The use of a cutter reduces large lateral forces on plows. (Skogerboe-Colorado State)
W74-06588

DEEP PLOWING - AN ENGINEERING APPRAISAL,
Agricultural Research Service, Beltsville, Md.
P. E. James, and D. E. Wilkins.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 3, p 420-422, May-June, 1972. 5 fig, 4 tab, 4 ref.

Descriptors: *Cultivation, *Soil management, *Deep tillage, Farm management, Root zone, Soil treatment, Radioactivity, *Cost-benefit analysis.
Identifiers: *Deep plowing.

Tests to determine the benefits and costs of deep plowing were conducted under six different sets of conditions. Questions to be answered were: limitations of deep plowing, power requirements, plow modifications needed, and soil burial pattern. Results ranged from almost no benefit to nearly double yields. Answers to the questions are as varied as the field conditions. The need for deep plowing should be evaluated at each location. It is not a solution to all problems. (Skogerboe-Colorado State)
W74-06590

A SIMULATED ENVIRONMENTAL MODEL OF TEMPERATURE, EVAPORATION, RAINFALL, AND SOIL MOISTURE,
Agricultural Research Service, State College, Miss.
J. W. Jones, R. F. Colwick, and E. D. Threadgill.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 5, p 366-372, March-April, 1972. 8 fig, 2 tab, 24 ref.

Descriptors: *Environment, *Computer models, *Plant growth, Plant-Soil-Water relationships, Model studies, *Soil moisture, Climatic data, Precipitation(Atmospheric), Environmental effects, *Simulation analysis, *Crop production, Temperature, Soil moisture.

An environment model was developed for crop production or other biological systems to provide inputs of daily rainfall, temperature, evaporation, and soil moisture variations with depth. The weather model was run on the computer and 10 years of simulated data were shown to compare very closely with observed data for State College. The soil moisture model produced results that fell within 10 percent of the observed data for at least 43 days. The models can be used to provide basic environmental variables for use in crop production simulations for studying complete systems at various locations. The methods of simulation developed show promise for studying and projecting environmental factors. (Skogerboe-Colorado State)
W74-06591

HYDRODYNAMICS OF BORDER IRRIGATION ADVANCE,
Nebraska Univ., Mitchell. Scotts Bluff Experiment Station.
D. C. Kincaid, D. F. Heermann, and E. G. Kruse.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 4, p 674-680, July-August, 1972. 14 fig, 1 tab, 10 ref.

Descriptors: *Irrigation practices, *Irrigation design, *Border irrigation, *Infiltration rates, Irrigation systems, Computer models, Application methods, Crop production, Agricultural engineering, *Mathematical models, Flow, Mannings equation.

A mathematical model simulating border irrigation was developed by numerically solving the hydrodynamic equations of overland flow. A power law infiltration function is used and the resistance is calculated by Manning's equation. The advance rate is controlled by the overall volume balance of the system. The moving boundary is the locus of points at some arbitrary depth. Comparisons of the model with experimental advance data, surface hydrographs and surface storage volume curves show that the model simulates border flow reasonably well with a resistance function of the form of Manning's equation. The model will describe advance for any specified inflow conditions whenever the slope, infiltration and resistance properties of the border are known. (Skogerboe-Colorado State)
W74-06592

SPRINKLER PRECIPITATION GAGE ERRORS,
Agricultural Research Service, Kimberly, Idaho. Snake River Conservation Research Center.
R. A. Kohl.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 2, p 264-265, 271, March-April, 1972. 2 fig, 1 tab, 7 ref.

Descriptors: *Irrigation practices, *Sprinkler irrigation, *Precipitation gages, Uniformity coefficient, *Evaporation control, Evaporation.

Different types of precipitation gages have been tried with sprinkler irrigation. The main problem encountered has been that of evaporation losses from the container. Covering the water with oil had little effect since much of the evaporation took place from droplets clinging to the walls above the oil. A 250 milliliter separatory funnel filled with oil was tested and found to be quite successful. As the water enters, the oil is displaced into another container. The problem of splash losses still exists with this method. (Skogerboe-Colorado State)
W74-06593

SOIL AND WATER LOSSES AS AFFECTED BY TILLAGE PRACTICES,
Agricultural Research Service, Brookings, S. Dak. Soil and Water Conservation Research Div.
C. A. Onstad.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 2, p 287-289, March-April, 1972. 1 fig, 6 tab, 8 ref.

Descriptors: *Soil conservation, *Water conservation, *Erosion control, Soil erosion, Agricultural runoff, *Cultivation, Mulching, Sediment control.

Four corn tillage treatments were compared with respect to their effect on soil and water losses in a 6-year study. The treatments tested were: conventional tillage, mulch tillage, till-planted up and down slope, and till-planted on the contour. Higher runoff on the conventionally tilled plots and lower runoff on the contoured till-plant treatment were significant at the 1-percent level. Runoff differences were not significant for the mulch-tilled and the till-planted up and down slope. The differences in soil loss were also significant in the same manner as runoff. These measurements were made on slope lengths of 72.6 ft. Longer slopes would have more soil loss per unit area. Extrapolated to a 300-foot slope length, the soil loss from the conventional treatment would have exceeded 5 tons per acre even though growing season rainfall was only 80 percent of normal. (Skogerboe-Colorado State)
W74-06595

PERFORMANCE OF A TILE DRAINAGE SYSTEM: AN EVALUATION OF A TILE DESIGN AND MANAGEMENT,
Agricultural Research Service, Urbana Ill
E. R. Perrier, A. J. MacKenzie, L. B. Grass, and H. H. Shull.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 3, p 440-444, May-June, 1972. 6 fig, 6 tab, 15 ref.

Descriptors: *Drainage, *Drainage effects, *Drainage practices, Drainage systems, Subsurface drainage, Tiles, Drainage area, Drainage engineering, Irrigation practices, Evaluation, Design.

Comparisons were made of the steady and unsteady-state drainage relations measured in the field to determine the performance and required management of an existing drainage system. The data were obtained from an 80 acre cotton field in California's Imperial Valley. The soil is a Holtville silty clay loam highly stratified, typical of the area. Various drainage design equations were compared to the measured data. Use of the tile lines for irrigation was also investigated. Results indicate that all of the equations only approximate the actual operation of the system. The use of the tile lines for irrigation showed promise. (Skogerboe-Colorado State)
W74-06596

DEEP PLOWING AND CHEMICAL AMENDMENT EFFECT ON A SODIC CLAYPAN SOIL,
Agricultural Research Service, Mandan, N. Dak.
F. M. Sandoval, J. J. Bond, and G. A. Reichman.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 4, p 681-684, 687, July-August, 1972. 4 fig, 5 tab, 13 ref.

Descriptors: *Soil management, *Deep tillage, *Soil amendments, Crop production, Cultivation, Soil properties, Soil chemistry, Soil profiles, Fallowing, Soils.
Identifiers: Deep plowing.

Deep plowing and chemical amendments improved a Solonetzic soil, increased barely yields, and substantially increased wheat yields under the dryland conditions of western North Dakota. The Rhoades silty clay loam, which had a shallow dense sodic claypan, was plowed to 6, 12, and 24-inch depths with and without soil amendments. Split plots were alternately fallowed and cropped for 5 years. Barley was grown 4 years and wheat on the 5th year. Crop yield increases attributed to deep plowing appeared to be associated with greater soil water availability for crop use and for soil leaching. Soil improvement was evidenced by the reduction of bulk densities and lessened saline sodic soil conditions. Hardness of the soil crust was reduced by deep plowing, and amendments further increased soil friability. The 5th year after deep tillage and amendment treatments, spring wheat yields were 1,170, 1,570, and 1,885 pounds per acre for the 6, 12, and 24-inch plowing depths respectively. (Skogerboe-Colorado State)
W74-06598

A COMPUTERIZED SOLUTION FOR BENCH LEVELING DESIGN,
Archer Daniels Midland Co., Lincoln, Neb.
For primary bibliographic entry see Field 4A.
W74-06600

PASTURE IRRIGATION WITH A CENTER PIVOT SPRINKLER SYSTEM,
Nebraska Univ., North Platte. Dept. of Agricultural Engineering.
B. R. Somerhalder, and D. C. Clanton.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 5, p 902-904, 908, September-October, 1972. 1 fig, 6 tab.

Descriptors: *Irrigation practices, *Sprinkler irrigation, *Pasture management, Carrying capac

ty, Forages, Pasture, Crop production, *Nebraska.
Identifiers: *Center-pivot sprinklers, Beef production.

Irrigated cool season pasture under a 52-acre center-pivot sprinkler system was grazed with beef cattle for two years at the University of Nebraska, North Platte Station. Three classes of animals -- cows and calves, yearlings, and weaned calves -- were grazed at different times during each year. Average investment and operating costs for two years of forage production was $126.04 per acre; average beef gain was 748 lb. per acre. This resulted in a feed cost of 16.8 cents per pound of gain. (Skogerboe-Colorado State)
W74-06601

ECOLOGICAL AND PHYSIOLOGICAL IMPLICATIONS OF GREENBELT IRRIGATION,
California Univ., Riverside. Dept. of Plant Sciences.
For primary bibliographic entry see Field 5D.
W74-06608

APPLICATIONS OF REMOTE SENSING (ERTS) TO RESOURCE MANAGEMENT AND DEVELOPMENT IN SAHELIEN AFRICA (REPUBLIC OF MALI),
American Univ., Washington, D.C. Dept. of Biology.
For primary bibliographic entry see Field 4A.
W74-06686

GAMMA RADIATION MEASUREMENTS OF BULK DENSITY CHANGES IN A SOIL PEDON FOLLOWING IRRIGATION,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 2G.
W74-06715

BIBLIOGRAPHY OF WATER MANAGEMENT.
Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering.
Dept. of Agricultural and Irrigation Engineering, Utah State Univ., UMC 41, Logan, Utah 84322, Price: $6.00. Utah State University Report 211 (d)-5, January 1974, 352 p. Compiled by: D. Polchow, M. J. Lindberg, and L.C. Gabrish.

Descriptors: *Bibliographies, *Management, *Farm management, Planting management, Land management, *Irrigation, *Agriculture, Soil management, *Water management(Applied), Administration, Water policy, *Foreign projects, Foreign research.

This bibliography is the compilation of all of the relevant book titles dealing with on-farm water located at Utah State University. To date, 9,132 titles are housed in component parts of the Merrill Library which are pertinent to on-farm water. This figure includes: 5,964 books catalogued by dewey decimal call number; 1,593 books housed in the archives and special collections section of the library; 1,593 government documents; 432 vertical file materials; 301 non-book microfilm, microfiche and motion pictures; and 88 maps. Holdings in other centers of information on campus have also been included in the bibliography. There are 1,634 titles in the Utah Water Research Laboratory, 450 titles in the Agricultural and Irrigation Engineering Department, and 193 titles on business law in the College of Business.
W74-06854

EVALUATION OF INFLUENCE OF AVAILABLE SOIL WATER STORAGE CAPACITY ON GROWING SEASON LENGTH AND YIELD OF TROPICAL PASTURES USING SIMPLE WATER BALANCE MODELS,
Commonwealth Scientific and Industrial Research Organization, Townsville (Australia). Div. of Tropical Pastures.
R. L. McCown.
Agric Meteorol. Vol 11, No 1, p 53-63, 1973. Illus.
Identifiers: Dry matter production, *Pastures(Tropical), Season, *Soil water, *Stylosanthes-Humilis, Water storage, Yield, *Water balance models, Simulation analysis.

The results of a comparative study of the soil water balance, plant water relations and dry matter production of pastures (Townsville stylo (Stylosanthes humilis L.)) on 3 soils with available water storage capacities of 75, 150 and 180 mm are reported. Differences among sites in growing season length varied 0-27% in the 4 yr of study. To enable sampling of a much larger number of years, the methods of systems analysis and simulation are used. The experimental data are used to test or to formulate simple models which are in turn used to simulate the growing season length and dry matter production in 60 yr for which rainfall records are available. The results of the simulation study portray the extreme variation in production among years in a seasonally dry tropical climate. While the advantage conferred by a soil storing 180 mm available water as opposed to 75 mm would be expected to be nil in 8 yr, the average increase in pasture yield expected in 70% of years would be 34%.--Copyright 1973, Biological Abstracts, Inc.
W74-06927

WHATEVER HAPPENED TO TVA,
For primary bibliographic entry see Field 6E.
W74-06968

LEGAL AND ADMINISTRATIVE ASPECTS OF AN AQUACULTURE POLICY FOR HAWAII, AN ASSESSMENT,
Hawaii State Dept. of Planning and Economic Development, Honolulu.
For primary bibliographic entry see Field 6E.
W74-06992

USE OF WASTE HEAT FOR SOIL WARMING IN NORTH CAROLINA,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering; and North Carolina State Univ., Raleigh. Dept. of Horticultural Science.
For primary bibliographic entry see Field 5D.
W74-07000

PRODUCTION AND BIOGENIC ACTIVITY OF DISTILLATES, FILTRATES AND EXTRACTS FROM THE POMORIE AND ATANASOVO LAGOON MUD, (IN BULGARIAN),
For primary bibliographic entry see Field 2H.
W74-07003

COMPETITIVE SAPROPHYTIC COLONIZATION BY FUSARIUM OXYSPORUM F. SP. VASINFECTUM,
Libya Univ., Tripoli.
M. S. El-Abyad, and Y. E. Saleh.
Trans Br Mycol Soc. Vol 60, No 2, p 187-195, 1973.
Identifiers: Cotton roots, Fusarium-oxysporum-F-Sp-vasinfectum, *Saprophytic colonization, Soils, *Fungus, Hydrogen ion concentration, *Soil moisture.

Saprophytic colonization by F. oxysporum Schl. f. sp. vasinfectum (Atk.) Snyder et Hansen was investigated under several environmental conditions. At low moisture levels (20 and 40% moisture-holding capacity), the fungus invaded and persisted in sterile soil if inoculated before its competitors. At 100% M.H.C. (moisture-holding capacity) the fungus failed to invade the soil, possibly because of antagonism by bacteria. On dead cotton roots the fungus behaved as a vigorous saprophyte at 10-30 C and at pH range 4.7-8.8. Saprophytic colonization of the roots by Fusarium in competition with some common fungi was tested at standard inoculum potentials. The fungus was highly invasive when inoculated simultaneously with or before its competitors but saprophytic colonization was reduced when some competitors were inoculated 2 days ahead.--Copyright 1973, Biological Abstracts, Inc.
W74-07011

NITROGEN-FIXING ACTIVITY IN UPLAND AND FLOODED RICE FIELDS,
For primary bibliographic entry see Field 5B.
W74-07024

ESTIMATES OF PRAIRIE PROVINCIAL WHEAT YIELDS BASED ON PRECIPITATION AND POTENTIAL EVAPOTRANSPIRATION,
Department of Agriculture, Ottawa (Ontario). Plant Research Inst.
G. D. V. Williams.
Can J Plant Sci. Vol 53, No 1, p 17-30. 1973. Illus.
Identifiers: *Canada, Equations, *Evapotranspiration, Prairie, *Precipitation(Atmospheric), Regression analysis, Transpiration, Variability, Weather, *Wheat yields.

Weather-based estimates of Alberta, Saskatchewan and Manitobe (Canada) wheat yields were made for the years 1952-67 by weighting estimates for 42 prairie crop districts according to the number of hectares of wheat per district. The crop-district estimates were computed from May-July monthly precipitation and estimated potential evapotranspiration (PE) data, and the preseason conserved precipitation, using regression equations derived separately for different parts of the prairies. In Saskatchewan, where semiarid climates predominate, variability of wheat yields is high and much of it can be attributed to weather variability. In the most humid province, Manitoba, the yield variation is smallest, and less of this variation can be explained using the weather data. Lack of uniformity in climate, soils, and the sizes of crop districts contributed to several analysis problems, one of which was a bias in the results, particularly in Alberta. Equations based on precipitation and PE were superior to those based on precipitation alone. The estimation procedures can be useful in connection with the transporting and marketing of grain, and in planning future land use.--Copyright 1973, Biological Abstracts, Inc.
W74-07027

CONTROL OF MOSQUITOES BREEDING IN RICE-FIELDS,
Microbiological Research Establishment, Salisbury (England).
For primary bibliographic entry see Field 5G.
W74-07041

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

PROCESSING, CHEMICAL COMPOSITION AND NUTRITIVE VALUE OF AQUATIC WEEDS,
Florida Univ., Gainesville. Water Resources Research Center.
L. O. Bagnall, R. L. Shirley, and J. F. Hentges.

Availability from NTIS as PB-231 207; $3.75 in paper copy, $1.45 in microfiche. Publication No 25, November 16, 1973. 55 p, 29 fig, 12 tab, 30 ref. OWRR A-017-FLA(2). 14-31-0001-3809.

Descriptors: Drying, Chemical analysis, *Nutrients, Digestion, *Aquatic weeds, *Water hyacinth, *Rooted aquatic plants, Animal physiology, Toxins, Feeds, *Forages, Chemical properties, Florida.

As an alternative to chemical control, water hyacinth (Eichhornia crassipes) and hydrilla (Hydrilla verticillata) can be converted to agriculturally useful products. Whole or chopped plants can be readily composted to create an organic material for potting plants. The 90 to 95% moisture content plants can be pressed to remove 75% of the water with a modest energy input. The pressed plants can be ensiled with suitable additives or dried to make animal feed. Projected best processing costs are $2.50 per ton of hyacinth silage, $11.21 per ton of dried hyacinth and $8.40 per ton of dried hydrilla. Protein contents range from 12 to 18% and ash-free crude fiber contents range from 25 to 35%, which are in the range usually found in land forages. Ash concentrations of 10 to 30% were found, which are much higher than those found in land forages. Nitrates, oxalates and cyanide found in the aquatic plants were in ranges considered to be safe in usual land forages. Calcium to phosphorous ratios were at the high end of the satisfactory range and beyond. Dried pelleted water hyacinth has a replacement value equivalent to cotton seed hulls and sugar cane bagasse. Animal acceptability of properly made hyacinth silage was very good. Animal utilization of protein was poor and that of other nutrients was fair for both dried and ensiled water hyacinth. (Morgan-Florida)
W74-06502

APPLICATION OF DDDP IN WATER RESOURCES PLANNING,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W74-06503

MATHEMATICAL MODEL OF WATER ADVANCE IN BORDER IRRIGATION,
Washington State Univ., Pullman. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W74-06582

HYDRAULIC ROUGHNESS OF CORRUGATED PLASTIC TUBING,
Guelph Univ. (Ontario). School of Engineering.
For primary bibliographic entry see Field 8B.
W74-06589

EFFECT OF ROUGHNESS ELEMENTS ON HYDRAULIC RESISTANCE FOR OVERLAND FLOW,
Soil Testing Services, Inc., Northbrook, Ill.
For primary bibliographic entry see Field 8B.
W74-06594

A COMPUTERIZED SOLUTION FOR BENCH LEVELING DESIGN,
Archer Daniels Midland Co., Lincoln, Neb.
E. F. Smith, and D. M. Edwards.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 4, p 667-669, July-August, 1972. 3 fig, 8 ref.

Descriptors: *Computer programs, *Land forming, Land development, Irrigation practices, Agricultural engineering, Land use.
Identifiers: *Land grading.

The analysis presented can be used on all digital computers. Solutions to the program for reshaping the surface of the land resulted in a large savings in cost and time as compared to the trial-and-error procedure without the computer. It also made available the possibility of analyzing the same data with various sets of input restrictions. However, certain limitations are imposed when using this program: (1) Only rectangular areas are adaptable to this program. (2) The entire final surface of the bench is graded to a uniform plane. (3) The digital computer divorces all factors of human judgment from the solution. Human judgment is the key to successful design when applied before data reach the computer. (Skogerboe-Colorado State)
W74-06600

PASTURE IRRIGATION WITH A CENTER-PIVOT SPRINKLER SYSTEM,
Nebraska Univ., North Platte. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W74-06601

COMPARISON OF STRENGTH TEST METHODS FOR CORRUGATED PLASTIC DRAINAGE TUBING,
Ohio State Univ., Columbus. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 8A.
W74-06602

SYMPOSIUM ON SIGNIFICANT RESULTS OBTAINED FROM THE EARTH RESOURCES TECHNOLOGY SATELLITE-1, VOLUME I: TECHNICAL PRESENTATIONS, SECTION B.
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 7C.
W74-06619

CHANGE IN LAND USE IN THE PHOENIX (1:250,000) QUADRANGLE, ARIZONA BETWEEN 1970 AND 1972: SUCCESSFUL USE OF A PROPOSED LAND USE CLASSIFICATION SYSTEM,
Geological Survey, Washington, D.C. Geographic Applications Program.
J. L. Place.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 899-906, 1973. 4 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Mapping, *Land use, *Arizona, Urbanization, Grazing, Farms, Planning, Data collections, Data processing, Land classifcation.
Identifiers: *Phoenix(Ariz), *ERTS.

Changes in land use in the Phoenix (1:250,000 scale) Quadrangle in Arizona were mapped using only the images from ERTS-1 to verify the utility of a land use classification system proposed for use with ERTS images. The period of change investigated was from November 1970 to late summary or early fall, 1972. Seasonal changes also were studied using successive ERTS images. Types of changes detected are cropland or rangeland developed for new residential areas; rangeland converted to new cropland; and possibly new ares of industrial or commercial development. The ERTS images focus attention on those areas of greatest change requiring more intensive study. (See also W74-06619) (Knapp-USGS)
W74-06622

LAND USE INVESTIGATIONS IN THE CENTRAL VALLEY AND CENTRAL COASTAL TEST SITES, CALIFORNIA,
California Univ., Santa Barbara. Geography Remote Sensing Unit.
J. E. Estes.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1 Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 907-914, 1973. 1 fig, 1 tab.

Descriptors: *Remote sensing, Satellites(Artificial), *Mapping, *Surveys, *Land use, Farms, Grazing, Planning, Urbanization, *California, Data collections, Data processing.
Identifiers: *ERTS.

ERTS-1 data can be a valuable source for environmental resource information needs. The resolution of ERTS-1 data places constraints upon the detail to which specific environmental phenomena can be investigated. Furthermore, resolution limitations create certain problems for investigation of environments in which a diversity of phenomena are localized in small areal units. These limitations, however, are mitigated to a large degree through the synoptic perspective afforded by ERTS-1. The advantage of this synoptic view is that large-scale environmental resource information can be obtained within a standardized format for a single date and monitored with comparative ease to reflect changing resource conditions. In the Central Valley and Central Coastal test sites California, urban areas can be differentiated best on MSS bands 4 and 5; transportation linkages are most readily defined from MSS band 7; agricultural field boundaries are adequately identifiable on MSS bands 4-7, and most clearly defined on band 7; and cultivated land can be mapped accurately from MSS band 5. (See also W74-06619) (Knapp-USGS)
W74-06623

LAND USE IN NORTHERN COACHELLA VALLEY,
California Univ., Riverside. Dept. of Geography.
J. B. Bale, and L. W. Bowden.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1 Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admi Rept NASA SP-327, p 915-922, 1973. 3 fig, 5 ref.

Descriptors: *Remote sensing, Satellites(Artificial), Mapping, *Surveys, *Land use, Farms, Grazing, Planning, Urbanization, *California, Data collections, Data processing.
Identifiers: *ERTS, *Coachella Valley(Calif).

ERTS-1 imagery has great utility for monitoring land use change and as a data source for regional planning. In California, open space desert resources are under severe pressure to serve as a source of recreation for the heavily populated southern coastal plain. The northern half of the Coachella Valley has historically served as a focal point for weekend recreational activity and second homes. Since demand in this area has remained high, land use change from rural to urban residential has been occurring continuously since 1968. This area of rapid change is an ideal site to illustrate the utility of satellite imagery as a data source for planning information. (See also W74-06619) (Knapp-USGS)
W74-06624

LAND USE CLASSIFICATION AND CHANGE ANALYSIS USING ERTS-1 IMAGERY CARETS,
Geological Survey, Washington, D.C. Geographic Applications Program.
R. H. Alexander.
In: Symposium on Significant Result Obtained from the Earth Resources Technology Satellite Vol 1--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 923-930, 1973. 7 fig, 1 tab.

Descriptors: *Remote sensing, Satellites(Artificial), *Mapping, *Land use, Urbanization, Farms, Forests, Streams, Lakes, Beaches, *Virginia, Data collections, Data processing, Land classification.
Identifiers: *ERTS, *Norfolk(Va).

ERTS imagery in the Central Atlantic Regional Ecological Test Site area was examined to determine what categories of land use could be detected, and to what extent land use change could be identified and mapped. Land use detail exceeds the expectations of the Interagency Steering Committee and the USGS proposed standardized classification. Significant land use changes totaling 39.2 sq km in the Norfolk-Portsmouth SMSA were identified and mapped using a combination of procedures employing ERTS and high-altitude aircraft data. (See also W74-06619) (Knapp-USGS)
W74-06625

ERTS REGIONAL-SCALE OVERVIEW LINKING LAND USE AND ENVIRONMENTAL PROCESSES IN CARETS,
Geological Survey, Washington, D.C. Geographic Applications Program.
R. H. Alexander.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 931-937, 1973. 3 fig, 1 tab.

Descriptors: *Remote sensing, Satellites(Artificial), *Mapping, *Land use, Urbanization, Farms, Forests, Streams, Lakes, Beaches, *Virginia, Data collections, Data processing.
Identifiers: *ERTS.

A mosaic of ERTS images of the Central Atlantic Regional Ecological Test Site was used to partition the region into zones on the basis of similarity of tones and textures visible at a regional-scale overview. The resulting patterns were compared with existing small-scale maps of the region representing relief, land surface forms, geology, soils, vegetation, forest types, and land use. The ERTS-derived zones most closely resemble the patterns on the small-scale land use map, suggesting that land use is an indicator or resultant surface expression of several interacting environmental processes. These results lend support to a model of interdisciplinary regional analysis in which data on land use and land use change become the basic data entry into a regional information system to serve regional planners and land managers. (See also W74-06619) (Knapp-USGS)
W74-06626

EVALUATION OF LAND USE MAPPING FROM ERTS IN THE SHORE ZONE OF CARETS,
Viginia Univ., Charlottesville. Dept. of Environmental Sciences.
R. Dolan, and L. Vincent.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 939-948, 1973. 3 fig, 1 tab.

Descriptors: *Remote sensing, Satellites(Artificial), *Mapping, *Land use, Urbanization, Farms, Forests, Streams, Lakes, Beaches, *Virginia, Data collections, Data processing.
Identifiers: *ERTS.

ERTS imagery of the Atlantic shoreline zone of the Central Atlantic Regional Ecological Test Site was evaluated for classifying land use and land cover, employing the USGS Geographic Application Programs's land use classification system. ERTS data can provide a basis for land cover and land use mapping within the shoreline zone. Because of the dynamic nature of this environment, two additional terms are considered: vulnerability to storms and progressive erosion, and sensitivity to man's activities. (See also W74-06619) (Knapp-USGS)
W74-06627

GEOGRAPHIC APPLICATIONS OF ERTS-1 DATA TO LANDSCAPE CHANGE,
Tennessee Univ., Knoxville. Dept. of Geography.
J. B. Rehder.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 955-963, 1973. 8 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Mapping, *Urbanization, *Strip mines, Land use, Surveys, Data collections, Data processing, *Tennessee.
Identifiers: *ERTS.

Analysis of landscape change requires large are coverage on a periodic basis in order to analyze aggregate changes over an extended period of time. The ERTS program can provide this capability. Three avenues of experimentation and analysis are being used in the investigation: (1) a multiscale sampling procedure utilizing aircraft imagery for ground truth and control, (2) a densitometric and computer analytical experiment for the analysis of gray tone signatures, comparisons, and ultimately for landscape change detection and monitoring, and (3) an ERTS image enhancement procedure for the detection and analysis of photomorphic regions. The data are being analyzed on the East Tennessee Test Site, a 20,000-square-mile region with landscape change elements such as forest alterations, strip mines, highway construction, urban-suburban growth, and cyclic seasonal changes in agriculture. The Knoxville Test Site, an 11-x 21-mile area which encompasses the city of Knoxville, is being investigated for landscape change associated with urban growth. A second smaller test site on the Cumberland plateau is being monitored for forest alterations and landform disturbances associated with surface strip mining for coal. (See also W74-06619) (Knapp-USGS)
W74-06628

IDENTIFICATION OF SOIL ASSOCIATIONS IN WESTERN SOUTH DAKOTA ON ERTS-1 IMAGERY,
South Dakota State Univ., Brookings. Dept. of Plant Science; and South Dakota State Univ., Brookings. Remote Sensing Inst.
For primary bibliographic entry see Field 2G.
W74-06629

LAND USE OF NORTHERN MEGALOPOLIS,
Dartmouth Coll., Hanover, N. H.
R. B. Simpson, and D. T. Lindgren.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrolton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 973-980, 1973. 4 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Land use, *Mapping, Surveys, Data collections, Data processing, Urbanization, Farms, Forests, Rural areas, New England, *Cities, Connecticut, Massachusetts, Rhode Island.
Identifiers: *ERTS.

ERTS data were used to map and digitize the land use of northern Megalopolis (Massachusetts, Connecticut, and Rhode Island) and to evaluate ERTS as a planning tool for megalopolitan areas. The southern New England region provides a good test of ERTS's capabilities because of its complex landscape. Not only are there great differences in the degree of urban development, but in relief and vegetative cover as well. Land use classification was applied with relatively good accuracy. Several categories, particularly the nonbuiltup ones, were identified with great accuracy, while the buildup categories have several areas of difficulty. (See also W74-06619) (Knapp-USGS)
W74-06630

REMOTE SENSING APPLIED TO LAND-USE STUDIES IN WYOMING,
Wyoming Univ., Laramie. Dept. of Geology.
R. M. Breckenridge, R. W. Marrs, and D. J. Murphy.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 981-989, 1973. 3 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Land use, *Wyoming, Strip mines, Urbanization, Farms, Grasslands, Reservoirs, Lakes, Geologic mapping, Data collections, Data processing, Terrain analysis, *Mapping.
Identifiers: *ERTS.

Preliminary evaluations of ERTS-1 show that physiographic and land-use inventory maps can be compiled by using a combination of visual and automated interpretation techniques. Test studies in the Powder River basin of Wyoming show that ERTS image interpretations can provide much physiographic and land-use information needed for management of fuel resources. Water impoundments as small as one acre were detected, and water bodies larger than five acres could be mapped and their acreage estimated. Flood plains, irrigated lands, and some individual crops were identified and mapped. Coniferous and deciduous trees were mapped separately. Gross soil distinctions were made and were found to be closely related to the bedrock geology. Several broad unstable areas were identified. These were related to specific geologic and slope conditions and generally extended through large regions. Some new oil fields and all large open-cut coal mines were mapped. The most difficult task accomplished was that of mapping urban areas. Most Wyoming towns are surrounded by agricultural land, natural flood plains, and rangeland. Areas of new development can usually be defined. Snow cover provides a considerable degree of enhancement of the urban areas by increasing the constrast between the populated areas and the surrounding country. (See also W74-06619) (Knapp-USGS)
W74-06631

ERTS-1 APPLICATIONS TO MINNESOTA LAND USE MAPPING,
Minnesota Univ., Minneapolis. Dept. of Geography.
D. Brown, J. Gamble, S. Prestin, D. Trippler, and M. Meyer.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 991-997, 1973. 8 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Land use, *Minnesota, Urbanization, Farms, Mining, Forests, Wetlands, Data collections, Data processing, *Mapping.
Identifiers: *ERTS.

Land use class definitions that can be operationally employed with ERTS-1 imagery are being developed for Minnesota. Investigations of urban, extractive, forest, and wetlands areas indicate that it is feasible to subdivide each of these classes into several subclasses with the use of ERTS-1 images from one or more time periods. (See also W74-06619) (Knapp-USGS)

W74-06632

A MULTIDISCIPLINARY SURVEY FOR THE MANAGEMENT OF ALASKAN RESOURCES UTILIZING ERTS IMAGERY,
Alaska Univ., College.
J. M. Miller, and A. E. Belon.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 999-1005, 1973. 5 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Alaska, *Mapping, *Land management, Land use, Forests, Transportation, Mining, Surveys, Data collections, Fisheries, Ecology, Tundra.
Identifiers: *ERTS.

ERTS-1 data were applied to a coordinated multidisciplinary survey of Alaska to provide updated resource inventory data to land use planning groups and government agencies concerned with resource management. Of particular emphasis in this survey are vegetative, hydrological, and geological analyses of the proposed trans-Alaska transportation corridor, and lands to be selected by the State of Alaska, the native corporations, and the Department of Interior. ERTS data are satisfying these objectives on a regional scale. (See also W74-06619) (Knapp-USGS)
W74-06633

THE USE OF ERTS-1 DATA FOR THE INVENTORY OF CRITICAL LAND RESOURCES FOR REGIONAL LAND USE PLANNING,
Wisconsin Univ., Madison.
J. L. Clapp, R. W. Kiefer, M. M. McCarthy, and B. J. Niemann, Jr.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1007-1014, 1973. 6 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Mapping, *Wetlands, *Wisconsin, Surveys, *Land use, Planning, Data collections, Data processsing, Regional analysis.
Identifiers: *ERTS.

In eastern Wisconsin, computer-generated spatial and statistical comparisons of critical land resource data derived from conventional sources, RB-57 photographs, and ERTS images suggest that land resource data can be mapped from ERTS images on a statewide basis. ERTS-interpreted information of wetland resources was more descriptive and accurate than the current statewide information sources. For the detection of the wetland resources as overall patterns, the ERTS images appear comparable to RB-57 photographs as a data source. (See also W74-06619) (Knapp-USGS)
W74-06634

INVESTIGATIONS OF AN URBAN AREA AND ITS LOCALE USING ERTS-1 DATA SUPPORTED BY U-PHOTOGRAPHY,
Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.
H. A. Weeden, F. Y. Borden, D. N. Applegate, and N. Bolling.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellites-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1015-1022, 1973. 4 fig, 1 tab, 2 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Urbanization, Aerial photography, Mapping, Surveys, Data collections, Data processing, Photogrammetry, Farms, Forests, *Pennsylvania, *Cities.
Identifiers: *ERTS.

An urban area in central Pennsylvania and the surrounding locality were investigated by photointerpretation of ERTS-1 imagery and by computer processing of MSS tapes. The photointerpretation and processing were then coordinated. The results of the cooperative effort of photointerpreters and computer processing analysts were much improved over independent efforts. Single frames of U-2 photography could be projected onto printer output maps with little recognizable distortion in areas 10 to 25 cm square. In this way targets could be identified for use as training areas for computer-processed signature identification. In addition, at any stage of category mapping, the level of success in correct classification could be assessed by this method. (See also W74-06619) (Knapp-USGS)
W74-06635

FIRST LOOK ANALYSES OF FIVE CYCLES OF ERTS-1 IMAGERY OVER COUNTY OF LOS ANGELES: ASSESSMENT OF DATA UTILITY FOR URBAN DEVELOPMENT AND REGIONAL PLANNING,
General Electric Co., Philadelphia, Pa. Missile and Space Div.
S. Raje, R. Economy, and J. McKnight.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1023-1030, 1973. 5 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Cities, *Land use, *Urban mapping, *California, Planning, Data collections, Data processing, Urbanization, Surveys, Regional analysis.
Identifiers: *ERTS, *Los Angeles.

Significant results were obtained from the analyses of ERTS-1 imagery from five cycles over Los Angeles by photointerpretation and by an interactive hybrid multispectral information extraction system. Photointerpretation of ERTS images produced over 25 overlays at 1:1,000,000 scale depicting regional relations and urban structure in terms of several hundred linear and areal features. A possible new fault lineament has been discovered on the northern slope of the Santa Monica mountains. An ERTS scene analyzed to provide object class patterns was directly overlaid on a current Los Angeles County land use pattern map prepared at 1:24,000 scale. The geometric and thematic content is sufficient for routine use at the 1:24,000 standard operating scale for county and regional planning. (See also W74-06619) (Knapp-USGS)
W74-06636

PREPARATION OF URBAN LAND USE INVENTORIES BY MACHINE-PROCESSING OF ERTS MSS DATA,
Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
W. Todd, P. Mausel, and K. Wenner.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1031-1039, 1973. 3 fig, 1 tab.

Descriptors: *Remote sensing, Satellites(Artificial), *Urban mapping, *Land use, *Cities, Data collections, Data processing, Suburban areas, Roads, Forests, Surveys, Mapping.
Identifiers: *ERTS, Milwaukee, Chicago, Indianapolis.

Spectral classes of urban phenomena identified from Earth Resources Technology Satellite (ERTS) multispectral scanner data in Milwaukee included suburban, inner city, industry, grass (open area), road, wooded suburb, water, cloud and shadow. The Milwaukee spectral class statistics were used to classify the Chicago area within the same ERTS frame, and similar results were achieved. In another ERTS frame Marion County (Indianapolis) data were classified into similar classes. The Marion County ERTS study was supported by a land use classification of an area near downtown Indianapolis that utilized 12 band MSS data collected by aircraft from 3,000 feet. The results of the ERTS analyses suggest that satellite data will be useful tool for the urban planner for monitoring urban land use. (See also W74-06619) (Knapp-USGS)
W74-06637

A COMPARISON OF LAND-USE DETERMINATIONS USING DATA FROM ERTS-1 AND HIGH ALTITUDE AIRCRAFT,
National Aeronautics and Space Administration, Houston, Tex. Lyndon B. Johnson Space Center.
M. A. Lundelius, C. M. Chesnutwood, J. G. Garcia, and R. B. Erb.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1041-1046, 1973. 3 fig, 1 append.

Descriptors: *Remote sensing, Satellites(Artificial), *Urban mapping, *Land use, *Cities, Data collections, Data processing, Suburban areas, Roads, Forests, Surveys, Mapping, *Texas.
Identifiers: *ERTS, *Houston(Tex).

ERTS-1 MSS imagery was used in a study area in the Houston Area Test Site to classify land use. The two types of imagery used included: (1) black and white transparencies of each band enlarged to a scale of approximately 1:250,000 and (2) color transparencies composited from the computer compatible tapes using the film recorder on a multispectral data analysis station. Urban data from the same scene were also analyzed using a computer-aided (clustering) technique. The resulting clusters, representing areas of similar content were compared with land use patterns in Houston. A technique was developed to correlate the spectral clusters to specific urban features on aircraft imagery by the location of specific, high contrast objects in particular resolution elements. The surface feature composition within each picture element could then be determined from the aircraft imagery. It was concluded that ERTS-1 data could be used to develop Level I and many Level II land use categories for regional inventories and perhaps to some degree on a local level. (See also W74-06619) (Knapp-USGS)
W74-06638

DIGITAL LAND USE MAPPING IN OAKLAND COUNTY, MICHIGAN,
Environmental Research Inst. of Michigan, Ann Arbor.
I. J. Sattinger, and R. D. Dillman.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1047-1054, 1973. 4 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Land use, *Urban mapping, *Michigan, Recreation, Data collections, Data processing, Rural areas, Wetlands, Streams, Vegetation.
Identifiers: *Detroit, *ERTS.

ERTS-1 data for a portion of Oakland County, Michigan, was computer processed to produce a map of water, urban areas, wooded areas, and other vegetation. Comparison with RB-57 photography of the area shows a good correspondence of the two sources of data. Preliminary evaluation indicates that this type of four-category map derived from ERTS data will be useful for conceptual studies of large geographic areas in recreational planning. (See also W74-06619) (Knapp-USGS)
W74-06639

MAPPING OF AGRICULTURAL LAND USE FROM ERTS-1 DIGITAL DATA,
Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.
A. D. Wilson, G. A. May, and G. W. Peterson.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1055-1058, 1973. 2 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Land use, *Farms, Pennsylvania, Mapping, Surveys, Cities, Urbanization, Forests, Data collections, Data processing.
Identifiers: *ERTS.

A selected area in Lancaster and Lebanon Counties, two of the major agricultural counties in Pennsylvania, was studied using ERTS data. This area was delineated on positive transparencies on MSS data collected on October 11, 1972. Channel seven was used to delineate general land forms, drainage patterns, water and urban areas. Channel five was used to delineate highway networks. These identifiable features were useful aids for locating areas on the computer output. The use of ERTS digital data for the automatic mapping of land use appears very feasible. Forest land, cultivated land and water were classified within a 5,000-acre area. Computer-generated maps were used to delineate broad land use categories, such as forest land, agricultural land, urban areas and water. These digital maps have a scale of approximately 1:24,000, allowing direct comparison with U.S.G.S. 7.5 minute quadrangle sheets. Aircraft data were used as a form of ground truth useful for the delineation of land use patterns. (See also W74-06619) (Knapp-USGS)
W74-06640

THE USE OF THE TEMPORAL DIMENSION IN CLASSIFYING AND MAPPING ERTS-1 MSS DATA,
Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.
F. Y. Borden, and D. N. Applegate.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1059-1066, 1973. 2 fig, 1 tab, 1 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Land use, Cities, Urbanization, Transportation, Streams, Vegetation, Data collections, Data processing, *Pennsylvania, Land classification.
Identifiers: *ERTS.

ERTS-1 MSS data from two scenes of the same central Pennsylvania area were brought into registration by translation and then merged. The two scenes were viewed on different dates but from adjacent ground tracks. Targets selected to be mapped included river water, railroad yards, creeks, urban areas, industrial areas, and vegetation. Equivalent training areas were chosen from each of the original scenes and from the merged data. Classification maps were produced for each, and a comparison was made. Scene brightness was found to have the most important effect on classification differences. (See also W74-06619) (Knapp-USGS)
W74-06641

IDENTIFICATION AND MAPPING OF COAL REFUSE BANKS AND OTHER TARGETS IN THE ANTHRACITE REGION,
Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.
F. Y. Borden, D. N. Thompson, and H. M. Lachowski.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1067-1074, 1973. 2 fig, 1 tab, 2 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Coal mines, *Mine wastes, *Pennsylvania, Mapping, Surveys, Strip mines, Planning, Data collections, Data processing, Pollutant identification.
Identifiers: *ERTS.

ERTS-1 MSS data covering parts of Pennsylvania's southern and eastern middle anthracite coal fields were studied to determine how well accumulations of coal refuse could be identified and mapped by computer analysis and processing. Spectral signatures of coal refuse targets were similar to water but had higher reflectances in all channels. Although no underflight photography was at hand to judge mapping success, correlation was made with 1:24,000 scale U.S. Geological Survey maps dated 1974 and 1948. Coal refuse targets correlated well with existing maps. (See also W74-06619) (Knapp-USGS)
W74-06642

AUTOMATIC INTERPRETATION OF ERTS DATA FOR FOREST MANAGEMENT,
Honeywell, Inc., St. Paul, Minn. Systems and Research Center.
L. Kirvida, and G. R. Johnson.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1075-1082, 1973. 6 fig, 1 tab.

Descriptors: *Remote sensing, Satellites(Artificial), *Surveys, Forests, *Mapping, Forestry, *Forest management, Data collections, *Data processing, Automation.
Identifiers: *ERTS.

Automatic stratification of forested land from ERTS-A data provides a valuable tool for resource management. The results are useful for wood product yield estimates, recreation and wild life management, forest inventory and forest condition monitoring. Automatic procedures based on both multispectral and spatial features are evaluated. With five classes, training and testing on the same samples, classification accuracy of 74% was achieved using the MSS multispectral features. When adding texture computed from 8 x 8 arrays, classification accuracy of 99% was obtained. (See also W74-06619) (Knapp-USGS)
W74-06643

LAND RESOURCES SURVEY FOR THE STATE OF MICHIGAN,
Environmental Research Inst. of Michigan, Ann Arbor.
B. Sellman.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1083-1090, 1973. 4 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Mapping, *Land resources, *Michigan, *Land use, Surveys, Data collections, Data processing, Forests, Wetlands, Farms, Cities, Urbanization.
Identifiers: *ERTS.

ERTS-1 satellite imagery was evaluated as an information source for a statewide inventory of Michigan's land resources. The study uses photointerpretation of MSS photography and computed processed results. The first task completed was a 1:500,000-scale land use map of the state in four classes: urban, forest, water, and agriculture and other. This map was constructed from existing information sources including federal, state and county maps, and aerial photography. An ERTS color IR photomosaic for the entire state will also be constructed at a scale of 1:250,000. (See also W74-06619) (Knapp-USGS)
W74-06644

TERRAIN CLASSIFICATION MAPS OF YELLOWSTONE NATIONAL PARK,
Environmental Research Inst. of Michigan, Ann Arbor.
F. J. Thomson, and N. E. G. Roller.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1091-1095, 1973. 2 fig, 1 tab.

Descriptors: *Remote sensing, Satellites(Artificial), *Terrain analysis, *Mapping, *National parks, Surveys, Topography, Forests, Grasslands, Vegetation, Data collections, *Land classification.
Identifiers: *ERTS, *Yellowstone National Park.

Preliminary terrain classification maps of Yellowstone National Park were prepared by applying multispectral pattern recognition techniques to ERTS-MSS digital data. The five categories recognized were exposed rock and soil, water, coniferous forest, grass-sage vegetation, and lowland grassy vegetation. (See also W74-06619) (Knapp-USGS)
W74-06645

TERRAIN TYPE RECOGNITION USING ERTS-1 MSS IMAGES,
Itek Corp., Lexington, Mass. Optical Systems Div.
For primary bibliographic entry see Field 7C.
W74-06661

NATURAL RESOURCE INVENTORY AND MONITORING IN OREGON WITH ERTS IMAGERY,
Oregon State Univ., Corvallis.
G. H. Simonson, D. P. Paine, C. E. Poulton, R. D. Lawrence, and J. H. Herzog.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1451-1458, 1973. 6 fig, append.

Descriptors: *Remote sensing, Satellites(Artificial), *Natural resources, *Oregon, *Surveys, Data collections, Data processing, Land use, Forests, Grazing, Vegetation, Forestry, Clear-cutting, Monitoring, Farms, Irrigation.
Identifiers: *ERTS, Cook County(Oregon).

Multidiscipline team interpretation of ERTS and flight imagery provides resource and land use information needed for land use planning in Oregon. A coordinated inventory of geology, soil-land-

scapes, forest and range vegetation, and land use for Crook County illustrates the value of this approach for broad area and state planning. Other applications include mapping fault zones, inventory of forest clearcut areas, location of forest insect damage, and monitoring irrigation development. Computer classification is being developed for use in conjunction with visual interpretation. (See also W74-06619) (Knapp-USGS)
W74-06683

RESOURCE MANAGEMENT IMPLICATIONS OF ERTS-1 DATA TO OHIO,
Ohio Dept. of Economic and Community Development, Columbus.
D. C. Sweet, T. L. Wells, and G. E. Wukelic.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1459-1466, 1973. 5 fig, 1 tab.

Descriptors: *Remote sensing, Satellites(Artificial), *Land use, *Surveys, *Ohio, Strip mines, Air pollution, Monitoring, Data collections, Management, Planning.
Identifiers: *ERTS, *Resource management.

Experimental analysis of ERTS-1 imagery demonstrates that remote sensing from space is a means of delineating and inventorying Ohio's strip-mined areas, detecting powerplant smoke plumes, and providing the data necessary for periodically compiling land use maps for the entire state. The nature and extent of these problems throughout Ohio are summarized. How ERTS data can contribute to their solution and the long-term significance of these initial findings to overall resource management interests in Ohio are discussed. (See also W74-06619) (Knapp-USGS)
W74-06684

ASSESSMENT OF SOUTHERN CALIFORNIA ENVIRONMENT FROM ERTS-1,
California Univ., Riverside. Dept. of Geography.
L. W. Bowden, and J. H. Viellenave.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1467-1474, 1973. 3 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Environment, *California, Data collections, Monitoring, Surveys, Natural resources, Recreation, Vegetation, Urbanization, Land use.
Identifiers: *ERTS.

ERTS-1 imagery is a useful source of data for evaluation of earth resources in Southern California. Applications of ERTS data include detection and identification of macroscale tectonic and vegetational patterns, as well as detailed analysis of urban and agricultural processes. The sequential nature of ERTS-1 imagery allows monitoring significant changes in the environment. Some preliminary work has begun, directed toward assessing the impacts of expanding recreation, agriculture, and urbanization on the fragile desert environment. (See also W74-06619) (Knapp-USGS)
W74-06685

APPLICATIONS OF REMOTE SENSING (ERTS) TO RESOURCE MANAGEMENT AND DEVELOPMENT IN SAHELIEN AFRICA (REPUBLIC OF MALI),
American Univ., Washington, D.C. Dept. of Biology.
N. H. MacLeod.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1475-1481, 1973. 3 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Land use, *Geologic mapping, Grazing, Farms, Floods, Deserts, Data collections, Dunes, *Arid lands.
Identifiers: *ERTS, *Mali(Sahara region).

The primary resource management problem in Sub-Saharan Africa (the Sahel) is increasing aridity. ERTS observations were made of sand streams, dune orientations, moisture and vegetation changes and other factors. A second major interest is grazing of cattle, sheep, and goats, which is associated with major movements of people and animals twice yearly to obtain forage. The changes in available forage are being observed. The location of the cultivators is also being mapped from ERTS imagery. Hydrological analysis is being carried on in the Niger and Bani River watersheds. The size, timing, and areal extent of the annual flood is of particular interest. So far, good imagery of the maximum flood stage has been obtained and assessed. Geologic information on fault zones, sand dune formations, scarps, tectonic basins and focal points of faulting are all visible. (See also W74-06619) (Knapp-USGS)
W74-06686

FIRST ERTS-1 RESULTS IN SOUTHEASTERN FRANCE: GEOLOGY, SEDIMENTOLOGY, POLLUTION AT SEA,
Institut Francais du Petrole, des Carburants et Lubrifiants, Rueil-Malmaison (France).
A. Fontanel, J. Guillemot, and M. Guy.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1483-1491, 1973. 4 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Geological mapping, Paleohydrology, Sedimentation, Water pollution, Surveys, Mapping, Data collections, Deltas, Structural geology, *Pollutant identification.
Identifiers: *ERTS, *Alps, *France(Rhone Delta).

ERTS photos of Western Alps are very useful for tectonic interpretation because large features are clearly visible on these photographs even though they are often hidden by small complicated structures if studied on large-scale documents. The variations of the shorelines in the Rhone Delta for a period covering the last 8,000 years could be seen. Some instances of industries discharging pollutant products at sea were detected, as well as very large anomalies of unknown origin. Coherent optical processing brings out tectonic features in the Alps. (See also W74-06619) (Knapp-USGS)
W74-06687

ERTS-1 APPLIED FOR STRUCTURAL AND MORPHOLOGICAL INVESTIGATIONS CASE STUDIES: (1) LOS ANGELES, CALIFORNIA AND (2) COASTAL PLAIN, NEW JERSEY,
William Paterson Coll. of New Jersey, Wayne. Dept. of Geography.
For primary bibliographic entry see Field 7C.
W74-06690

A PRELIMINARY EVALUATION OF ERTS-1 IMAGES ON THE VOLCANIC AREAS OF SOUTHERN ITALY (NASA CONTRACT FO-013),
Consiglio Nazionale delle Ricerche, Milan (Italy). Laboratorio per la Geofisica della Litosfera.
For primary bibliographic entry see Field 7C.
W74-06691

THERMAL SURVEILLANCE OF CASCADE RANGE VOLCANOES USING ERTS-1 MULTISPECTRAL SCANNER, AIRCRAFT IMAGING SYSTEMS, AND GROUND-BASED DATA COMMUNICATION PLATFORMS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C
W74-06692

INITIAL EVALUATION OF THE GEOLOGIC APPLICATIONS OF ERTS-1 IMAGERY FOR NEW MEXICO,
New Mexico Bureau of Mines and Mineral Resources, Socorro.
Linden K. Vonder, and F. E. Kottlowski
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1561-1566, 1973. 1 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Geologic mapping, *New Mexico, Data collections, Surveys, Mapping, Structural geology, Vegetation, Geomorphology.
Identifiers: *ERTS, Pecos River Valley(N Mex).

Images recorded during the first two months of the ERTS-1 mission in New Mexico are of poor quality, owing largely to high ground reflectance. Later images are of better quality, and MSS bands 5 and 7 have proven to be particularly useful. Features noted include major structural forms, vegetation patterns, drainage patterns, and outcrops of geologic formations. The Border Hills Structural Zone and the Y-O Structural Zone are prominently reflected in coverage of the Pecos Valley. A study of available maps and remote sensing materials covering the Deming-Columbus area indicated that the limit of detection and the resolution of MSS products are not as good as those of aerial photographs, geologic maps, and manned-satellite photographs. The limit of detection of high-contrast features on MSS prints is approximately 1,000 feet or 300 meters for linear features and about 18 acres for roughly circular areas. (See also W74-06619)(Knapp-USGS)
W74-06693

MAPPING OF SPOIL BANKS USING ERTS-PICTURES,
Ohio Univ., Athens. Dept. of Geology.
For primary bibliographic entry see Field 5A.
W74-06695

USE OF ERTS-1 DATA FOR REGIONAL PLANNING IN THE METROPOLITAN WASHINGTON COUNCIL OF GOVERNMENTS--A SHORT BRIEF,
Metropolitan Washington Council of Governments, D.C. Remote Sensing Project.
H. J. Mallon.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1613-1624, 1973. 6 fig, 4 ref

Descriptors: *Remote sensing, Satellites(Artificial), *City planning, *Urbanization, Cities, *District of Columbia, *Land use, Surveys, Mapping, Data collections, Regional analysis.
Identifiers: *ERTS.

Land use and land use activity changes represent basic data requirements in regional planning studies. ERTS remote sensing imagery can provide necessary data. One study using large-scale aircraft imagery developed a high degree of analytical detail and functional identification. ERTS and small-scale aircraft imagery developed data identifying in more general detail major activity changes within the metropolitan region. (See also W74-06619) (Knapp-USGS)

W74-06700

LAND USE MAPPING AND CHANGE DETECTION USING ERTS IMAGERY IN MONTGOMERY COUNTY, ALABAMA,
Alabama Univ., University. Dept. of Civil and Mineral Engineering.
R. P. Wilms.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1625-1633, 1973. 3 fig, 2 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Land use, *Urbanization, *Alabama, City planning, Surveys, Mapping, Data collections, Farms, Forests, Suburban areas.
Identifiers: *ERTS, *Montgomery County(Ala).

The feasibility of using remotely sensed data from ERTS-1 for mapping land use and detecting land use change in Montgomery County, Alabama, was investigated. Land use information was gathered from 1964 air photo mosaics and from 1972 ERTS data. The 1964 data provided the basis for comparison with ERTS-1 imagery. From this comparison, urban sprawl was quite evident for the city of Montgomery. A significant trend from forestland to agricultural was also discovered. The development of main traffic arteries between 1964 and 1972 was a vital factor in the development of some of the urban centers. Remotely sensed data from ERTS is useful for inventorying land use and detecting land use change. (See also W74-06619) (Knapp-USGS)
W74-06701

DETERMINATION OF LAND USE IN MINNESOTA BY AUTOMATIC INTERPRETATION OF ERTS MSS DATA,
Honeywell, Inc., St. Paul, Minn. Systems and Research Center.
R. E. Zirkle, and D. R. Pile.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1635-1639, 1973. 1 tab.

Descriptors: *Remote sensing, Satellites(Artificial), *Land use, *Lakes, *Minnesota, Surveys, Data processing, Data collections, Mapping.
Identifiers: *ERTS.

The feasibility of identifying land use in Minnesota by automatic interpretation of ERTS-MSS data was tested. Ultimate objectives include establishment of land use delineation and quantification by computer processing with a minimum of human operator interaction. A lake count in Ramsey County was compared to the ERTS-derived count and a concurrent aerial photo planimetry count. The results were usually within 10% on individual water bodies. (See also W74-06619) (Knapp-USGS)
W74-06702

PRECISION ANNOTATION OF PREDETERMINED PRIMARY SAMPLING UNITS ON ERTS-1 MSS IMAGES,
Earth Satellite Corp., Berkeley, Calif.
J. W. van Roessel, and P. G. Langley.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1661-1673, 1973. 2 fig, 1 tab, 2 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, *Mapping, Forests, Forestry, Boundaries(Property), Management, Surveys, Data collections, Terrain analysis, *Forest management.
Identifiers: *ERTS.

Resectioning programs were developed for projecting the boundary corners of sample units, management units, and counties into ERTS-1 and other MSS images. The technique used includes corrections for earth curvature, terrain elevation, and MSS distortions. The minimum standard error obtained was about 0.15 mm or 150 meters on the ground. This technique makes it possible to include land ownership as an integral part of forest resource sampling plans using ERTS imagery. (See also W74-06619) (Knapp-USGS)
W74-06705

UNSUPERVISED CLASSIFICATION AND AREAL MEASUREMENT OF LAND AND WATER COASTAL FEATURES ON THE TEXAS COAST,
Lockheed Electronics Co., Inc., Houston, Tex. Aerospace Systems Div.
For primary bibliographic entry see Field 2L.
W74-06706

APPLICATION OF ERTS-1 IMAGERY IN THE FIELDS OF GEOLOGY, AGRICULTURE, FORESTRY, AND HYDROLOGY TO SELECTED TEST SITES IN IRAN,
Imperial Government of Iran, Tehran. Plan Organization.
K. Ebtehadj.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1699-1714, 1973. 6 plate, 3 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Surveys, *Mapping, Geologic mapping, Forests, Farms, Lakes, Data collections, Data processing.
Identifiers: *ERTS, *Iran.

In a preliminary study of the ERTS-1 imagery coverage of Iran, all of the images were carefully examined, and a photomosaic covering approximately 95% of the country was prepared. A number of images of selected areas were studied in detail. A number of large-scale faults were identified which do not figure on geological maps. A preliminary study was carried out on the recent sediments, their possible sources, and origin. A limited number of geological work maps were prepared. In the fields of agriculture and forestry, studies based on color composite prints of certain areas were undertaken to identify arable areas. Investigations in the field of water resources resulted in the discovery of a number of small lakes and streams. Furthermore, fluctuations of the water level in some lakes were observed. (See also W74-06619) (Knapp-USGS)
W74-06710

ADVANCED SCANNERS AND IMAGING SYSTEMS FOR EARTH OBSERVATIONS.
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 7B.
W74-06712

BASIC RESEARCH IN THE AQUATIC ENVIRONMENT: EFFECTS OF EUTROPHICATION ON PHYTOPLANKTON POPULATIONS AND SELECTED SPECIES OF AQUATIC VASCULAR PLANTS,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 5C.

W74-06835

INTERGOVERNMENTAL RELATIONS AS SEEN BY FLORIDA STATE LEGISLATORS: LAND USE AND WATER RESOURCE PROBLEMS,
Florida Atlantic Univ., Boca Raton.
For primary bibliographic entry see Field 6B.
W74-06845

THE PRESENT AND FUTURE STATUS OF EASTERN NORTH CAROLINA WETLANDS,
North Carolina Univ., Chapel Hill. Dept. of Geography.
For primary bibliographic entry see Field 2L.
W74-06850

STORMWATER RUNOFF QUALITY FOR URBAN AND SEMI-URBAN/RURAL WATERSHEDS,
Purdue Univ., Lafayette, Ind. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5B.
W74-06851

TECHNIQUES FOR IDENTIFYING AND EVALUATING MARKET AND NONMARKET BENEFITS AND COSTS OF WATER RESOURCE SYSTEMS.
Texas Water Development Board, Austin. Systems Engineering Div.
For primary bibliographic entry see Field 6B.
W74-06852

DETERMINATION OF THE CONFIDENCE INTERVALS OF THE PEARSON III LAW USING ORDER STATISTICS (DETERMINATION DES INTERVALLES DE CONFIANCE DE LA LOI PEARSON III PAR LES STATISTIQUES D'ORDRE),
National Inst. of Scientific Research, Quebec.
For primary bibliographic entry see Field 2E.
W74-06906

ON FLOOD PROBABILITIES OF EAST ALPINE RIVERS,
Zentralanstalt fuer Meteorologie und Geodynamik, Vienna (Austria).
For primary bibliographic entry see Field 2E.
W74-06909

OHIO RIVER BASIN COMMISSION ANNUAL REPORT, FISCAL YEAR ENDING JUNE 30, 1972.
Ohio River Basin Commission, Cincinnati.
For primary bibliographic entry see Field 6E.
W74-06918

HYDROLOGY AND WATER RESOURCES OF THE HOOSIC RIVER BASIN, MASSACHUSETTS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-06958

WATER RESOURCES OF NORTHWESTERN MISSOURI,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-06961

CHOCTAWHATCHEE RIVER AND HOLMES CREEK, FLORIDA, PERMIT APPLICATION BY FLORIDA GAME AND FRESH WATER FISH COMMISSION (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Mobile, Ala.

Available from the National Technical Information Service as EIS-FL-73-0455-F, $5.00 in paper copy, $1.45 in microfiche. June 16, 1972. 56 p, 1 map.

Descriptors: *Florida, *Navigable rivers, *Aquatic habitats, *Environmental effects, Channel improvement, Beds, Water sports, Turbidity, Biota, Ecology.
Identifiers: Navigation obstructions, *Environmental Impact Statement, *Holmes Creek(Fla), *Choctawhatchee River(Fla).

This environmental impact statement involves the application for a permit to remove from the Choctawhatchee River and Holmes Creek snags and stumps that are navigational hazards to small boats. The project would take place on the Choctawhatchee River from the Alabama-Florida State line to the mouth and on Holmes Creek from Vernon to its confluence with the Choctawhatchee. Environmental impacts include increase in opportunity for safe usage of the resource for boating, fishing, and general recreation. Adverse environmental effects include reduction of aquatic habitat, temporary increase in turbidity, and insignificant effect upon biota. (Sears-Florida)
W74-06985

WOODCOCK CREEK LAKE, FRENCH CREEK BASIN, PENNSYLVANIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Pittsburgh, Pa.
For primary bibliographic entry see Field 8A.
W74-06986

PATTERSON WATERSHED PROJECT, STANISLAUS COUNTY, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Berkeley, Calif.
Available from the National Technical Information Service as EIS-CA-73-0465-F. $4.25 microfiche $1.45. January 1973. 38 p, 2 map, 1 tab, 3 append.

Descriptors: *Drainage, *Environmental effects, Watersheds, Saline soils, Salts, Waste flows, Crops, *California, Wildlife, Fish.
Identifiers: *Environmental Impact Statements, *Patterson watershed project(Calif), Stanislaus County(Calif).

The watershed protection and agricultural drainage project located in Stanislaus County, California will lower the high water table on 4,190 acres; improve the physical condition of the soil; remove excess soluble salts from the soil; eliminate health hazards due to wet basements and poor septic tank operation; contribute additional dissolved salts to the San Joaquin River and existing drainage ditches; eliminate mosquito-breeding areas; increase crop yields; and create temporary disturbances during construction. The project should not have a significant effect on fish. No project impact on wildlife is anticipated. Small environmental values will be temporarily disturbed while the project is being installed. Some adverse environmental effects include temporary removal of a small land area from production and a possible small increase in waste flows from local food processing plants. (Daniels-Florida)
W74-06987

HURRICANE CREEK WATERSHED PROJECT, HUMPHREYS AND DICKSON COUNTIES, TENNESSEE (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 4D.
W74-06988

LOWER KLAMATH RIVER FLOOD CONTROL PROJECT, DEL NORTE COUNTY, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATMENT).
Army Engineer District, San Francisco, Calif.
Available from the National Technical Information Service as EIS-CH-73-0494-F. PC $4.50 microfiche $1.45. July 1972. 42 p, 5 plate.

Descriptors: *California, *Flood protection, *Levees, Landfills, Bank protection, Flood plain zoning, Aquatic habitats, Federal budget.
Identifiers: *Environmental Impact Statements, Del Norte County(Calif), *Klamath River(Calif).

This project was authorized under the Flood Control Acts of 1966 and 1970 for the purpose of providing for the flood protection work necessary to preserve the towns and river banks for commercial and recreational opportunities. Flood control for the Lower Klamath River is a three part project which includes filling a depressed area behind a highway, a levee system surrounding a town, and bank protection on the north bank along a two mile reach beginning near the mouth of the river. The flood plain is managed by the county. Environmental impacts include loss of riparian habitat in levee sites and bank protection areas, and preservation of important recreational area through flood plain zoning. Adverse environmental effects include some loss of native vegetation in borrow area and levee sites, temporary loss of riparian habitat in bank protection areas, and temporary turbidity during construction. (Sears-Florida)
W74-06989

NUTWOOD WATERSHED, ILLINOIS (FINAL ENVIRONMENTAL STATEMENT).
Soil Conservation Service, Washington, D. C.
Available from the National Technical Information Service as EIS-IL-73-0606-F. PC $5.00 microfiche $1.45. March 1973. 52 p, 4 append.

Descriptors: *Illinois, *Watersheds(Basins), *Watershed management, *Land management, Floodwater, Water level, Flood control, Hydrologic aspects, Erosion, Sediment, Drainage, Fishery, Aquatic habitat, Environmental effects, Turbidity.
Identifiers: *Environmental Impact Statements, Jerseyville(Ill), *Nutwood watershed(Ill).

This watershed project is to be carried out in Jersey and Greene Counties, Illinois by three sponsoring local organizations with federal assistance. The project will include land treatment measures supplemented by three floodwater retarding structures, two water level control structures, and one pumping station. Project purposes include improvement of hydrologic conditions, reduction of erosion, sediment, and floodwater damage and improvement of agricultural drainage. The land treatment program will reduce annual upland erosion, promote more efficient land use, and reduce water runoff. Combined land treatment and structural measures will reduce sediment and floodwater damages. Bottomland will benefit from flood control, improved drainage, and more intensive land use. A lake fishery and aquatic habitat will replace pasture land, and woodland and pasture will be periodically inundated by flood detention pools. Construction of the dams and spillways will temporarily disturb or destroy some vegetative cover. (Sears-Florida)
W74-06990

PROPOSAL FOR OKLAWAHA RIVER, OCALA NATIONAL FOREST, FLORIDA, (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Forest Service (USDA), Washington, D.C.
Avail from Nat Tech Info Serv, U.S. Dept of Commerce, Springfield, Va as EIS-FL-73-0075-F-2. PC $23.00, microfiche $1.45. Vol 2, Appendices 15-44, January 1973. 419 p, 29 append, 6 map, 20 chart, 91 tab.

Descriptors: *Florida, *Environmental effects, *Reservoirs, *Legislation, *Canals, Biology, Navigation, Locks, Saline water intrusion, Canal seepage, Backwater, Water utilization, Surface water, Habitats, Soil-water-plant relationship, Aquatic environment
Identifiers: *Environmental Impact Statements, Marion County(Fla), *Oklawaha River(Fla)

This volume contains thirty appendices regarding various studies, reports and projects within the Oklawaha River Proposal. Included are the following: report of fisheries study team, Lake Oklawaha; aquatic vegetation in Lake Oklawaha, recreation use, Rodman Dam; Oklawaha survey; soil properties affected by flooding in Oklawaha River; reproduction survey in Oklawaha River; reports of various organizations on the Cross-Florida Barge Canal; various studies and reports involving aquatic vegetation; and dissolved oxygen levels in Lake Oklawaha. (Conko-Florida)
W74-06993

FLORIDA MANGROVES AS SHORELINE STABILIZERS,
Florida Dept. of Natural Resources, St. Petersburg. Marine Research Lab.
T. Savage.
Fla Dep Nat Resour Mar Res Lab Prof Pap Ser. 19 p 1-46. 1972. Illus.
Identifiers: Avicennia-Germinans, *Florida, *Mangroves(Red and Black), Protection, Rhizophora-Mangle, *Shoreline stabilizers(Plants).

A preliminary assessment of the use of native mangroves for shoreline stabilization and protection is reported. Field and laboratory tests were preformed to select the species and plant procedure best suited for this purpose. Based upon its broad latitudinal range, tolerance of adverse soil conditions, extensive early root system, and ease of transplanting, Avicennia germinans, the black mangrove, holds greatest promise for use in a state-wide program. Furthermore, it is at least as important as Rhizophora mangle, the red mangrove, in natural shoreline protection.--Copyright 1973, Biological Abstracts, Inc.
W74-07047

4B. Groundwater Management

NETWORK ANALYSIS OF CONJUNCTIVELY OPERATED GROUND WATER-SURFACE WATER SYSTEMS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
A. S. Hamdan, and D. D. Meredith.
Available from the National Technical Information Service as PB-231 204; $7.00 in paper copy, $1.45 in microfiche. Illinois Water Resources Center, Urbana, Research Report No 76, January 1974. 75 p, 7 fig, 24 tab, 33 ref, append. OWRR A-059-ILL(2). 14-31-0001-3813.

Descriptors: *Optimum development plans, *Alternative water use, Surface-groundwater relationships, *Conjunctive use, Reservoir operation, *Water supply, Optimization, Operations research, *Illinois, Model studies, Networks, Flow, *Algorithms, Investment, Water policy, Constraints.
Identifiers: *Network flow analysis, Kaskaskia River basin(Ill).

The concept of network models is introduced and a general network model for a multiple purpose, multiple unit water resource system is developed. The 'out-of-kilter' algorithm is then presented as a solution technique for network flow problems. A model for preliminary screening of alternatives for water supply from conjunctive use of ground water and surface water in the Kaskaskia River Basin in Illinois is presented and analyzed. The results from the analysis demonstrate how the network procedures can be used to determine optimum investment plans, to test policy constraints, and to develop policies for future development and future constraints.

W74-06504

CAPILLARY PROPERTIES OF SOILS - INFLUENCE UPON SPECIFIC YIELD,
Agricultural Research Service, Fort Collins, Colo.
For primary bibliographic entry see Field 2F.
W74-06584

APPLICATION OF MONTE CARLO METHOD TO SOIL WATER MOVEMENT,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W74-06599

A PHYSICAL MODEL FOR PREDICTION AND CONTROL OF SALTWATER INTRUSION IN THE FLORIDAN AQUIFER,
Florida Univ., Gainesville. Dept. of Civil and Coastal Engineering.
For primary bibliographic entry see Field 2F.
W74-06609

HYDROLOGIC DATA FROM THE PICEANCE BASIN, COLORADO.
Geological Survey, Denver, Colo.
Colorado Dept of Natural Resources, Denver, Colorado Water Resources Basic-Data Release No 31, J. F. Ficke, J. B. Weeks and F. A. Welder, Compilers, 1974. 246 p, 80 fig, 91 tab.

Descriptors: *Hydrologic data, *Colorado, *Water wells, *Groundwater basins, *Oil shales, Water levels, Water yield, Drillers logs, Water quality.
Identifiers: *Piceance basin(Colo).

Water data collected in and compiled for the Piceance basin, Colorado, are presented. Included are groundwater and surface-water data collected by the Geological Survey and private companies. Groundwater data were collected from 52 wells in the Piceance basin. Of the 52 wells, 25 wells have transmissivity data, 16 wells have discharge data, 39 wells have temperature data, 8 wells have vertical flow data, 37 wells have specific conductance data, 17 wells have common ion data, and 18 wells have trace element data. A potentiometric map of the report area is given. The map is based on the altitude of water levels in 51 observation wells which penetrate the Green River Formation. The water-level measurements were made during the summer of 1972. (Knapp-USGS)
W74-06714

GROUND-WATER RECHARGE STRIP BASIN-EXPERIMENTS,
California State Univ., Fullerton. Dept. of Civil Engineering.
R. R. Brock, and A. C. Amar.
Journal of the Hydraulics Division, American Society of Civil Engineers Vol 100, No HY4, Paper 10503, p 569-592, April 1974. 12 fig, 2 tab, 15 ref, append.

Descriptors: *Artificial recharge, *Groundwater recharge, *Hydraulic models, *Dupuit-Forchheimer theory, Porous media, Groundwater movement, Unsteady flow.

The problem of recharging a strip basin to a horizontal water table overlying an impervious base was formulated using the saturated flow equations. From this formulation the number of dimensionless variables that determine a dimensionless water table rise were identified using the exact or potential theory and an approximate (Dupuit-Forchheimer) theory. Experiments were performed in a 5-m long sand model. As a dimensionless recharge rate was increased, an expected systematic deviation from the theory is presumably a result of the invalidity of the assumption of the theory for deep flows. Experimental results are presented in the form of dimensionless graphs. (Knapp-USGS)

W74-06740

GEOLOGIC AND HYDROLOGIC BACKGROUND FOR SELECTING SITE OF PILOT-PLANT REPOSITORY FOR RADIOACTIVE WASTE,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5B.
W74-06820

241-T-106 TANK LEAK INVESTIGATION.
Atlantic Richfield Hanford Co., Richland, Wash.
For primary bibliographic entry see Field 5B.
W74-06861

GROUND-WATER HYDROLOGY OF NORTHERN NAPA VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2F.
W74-06880

EFFECTS OF GROUND-WATER DEVELOPMENT ON THE PROPOSED PALMETTO BEND DAM AND RESERVOIR IN SOUTHEAST TEXAS,
Geological Survey, Austin, Tex.
E. T. Baker, Jr., and C. R. Follett.
Water-Resources Investigations 18-73, June 1973. 70 p, 20 fig, 6 tab, 14 ref.

Descriptors: *Baseline studies, *Groundwater resources, *Pre-impoundment, *Reservoirs, *Texas, Data collections, Hydrogeology, Hydrologic data, Aquifer characteristics, Water wells, Pumping, Water yield, Water level fluctuations, Land subsidence, Water table, Forecasting, Evaluation, Faults(Geologic), Damsites, Surface-groundwater relationships.
Identifiers: *Palmetto Bend Dam(Tex).

Palmetto Bend Dam and Reservoir, a water-supply project to be constructed in two stages, will impound the waters of the Navidad and Lavaca Rivers in Jackson County, Texas. This investigation was made in 1970-1972 to determine the effects of large-scale groundwater withdrawals on the proposed dam and reservoir. Groundwater continues to discharge into the Navidad and Lavaca Rivers by seepage outflow even though large amounts of groundwater are pumped for irrigation. Although a reduction in streamflow probably has occurred, a complete loss of the low flow of the streams by infiltration to a lowered water table seems remote. The large groundwater withdrawals will continue to cause land-surface subsidence, which will range from 0.012 foot to more than 0.026 foot per year. A minimum of about 0.013 to n studying seawater and those based on studying the sea bottom. The seawater methods incorporate investigations of the electric conductivity, the distribution of temperature, the anomalies of salt composition of seawater and groundwater discharge studies with tracers. The sea-bottom methods include locating groundwater discharge from data on physical or chemical anomalies in bottom sediments (geothermal and geochemical techniques) and investigating structural features of the sea bottom (geophysical method, geomorphological method and observations by divers and submersibles). Experience in studying submarine springs and groundwater discharge to the Baltic and Caspian Seas is discussed. (Knapp-USGS)
W74-06920

SOME COMMENTS ON SEAGRASSES AND SEDIMENTARY PROCESSES,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 2J.
W74-06922

GROUND WATER POLLUTION FROM SUBSURFACE EXCAVATIONS: PART II--POLLUTION FROM WELLS.
For primary bibliographic entry see Field 5B.
W74-06933

PROCEDINGS NINTH BIENNIAL CONFERENCE ON GROUND WATER.
For primary bibliographic entry see Field 5B.
W74-06942

CONJUNCTIVE OPERATION OF SOUTHERN CALIFORNIA GROUND WATER BASINS WITH THE STATE WATER PROJECT,
Southern California Metropolitan Water District, Los Angeles.
V. Gleason, and D. Georgeson.
In: Proceedings of 9th Biennial Conference on Ground Water, Sept 13-14, 1973, Francisco Torres Conference Center, Goleta, Calif: California University Water Resources Center Report No 26, p 5-37, December 1973.

Descriptors: *Conjunctive use, *California, *Inter-basin transfers, Water resources development, Water management(Applied).
Identifiers: California Water Plan.

Conjunctive operation of Southern California groundwater basins with the State Water Project offers important benefits to Southern California specifically and to the State generally. Those include significant reduction of future State Water Project costs, improvement of the quality of Southern California's water supplies, more efficient use of electric power resources, and more effective use of groundwater basins. Under the storage-in-advance approach the project would use its available delivery capacity to transport surplus Sacramento Valley water to Southern California during wet years and store that water in vacant space within Southern California's groundwater basins for subsequent use during drought years. Under the replacement approach, the project would borrow water that is now in Southern California's groundwater basins when a drought curtails project imports to Southern California. The State or its water service contractors would guarantee the replacement of the borrowed water under terms that would assure full protection for the groundwater basins and their local users. (See also W74-06942) (Knapp-USGS)
W74-06943

GEOTHERMAL DEVELOPMENT AND SOUTHWEST STORAGE BASINS,
Bureau of Reclamation, Boulder City, Nev. Region 3.
R. T. Littleton.
In: Proceedings of 9th Biennial Conference on Ground Water, Sept 13-14, 1973, Francisco Torres Conference Center, Goleta, Calif: California University Water Resources Center Report No 26, p 46-48, December 1973,

Descriptors: *Geothermal studies, *Groundwater basins, *Southwest U.S., California, Water resources development.
Identifiers: *Geothermal energy.

Information about the amount of water stored in debris-filled basins in a large part of the Southwest is reviewed. The total figure is 1.7 billion acre-feet of recoverable storage under present economics and water quality standards. The energy contained in the heated water in some of these basins may be used to desalt the mineralized water and to generate power. (See also W74-06942) (Knapp-USGS)
W74-06945

PROTECTING GROUND WATER QUALITY--SOME PROBLEMS AND SOLUTIONS,
Luhdorff (E.E.) Co., Woodland, Calif.
For primary bibliographic entry see Field 5B.

W74-06946

GROUND WATER QUALITY DATA FOR PLANNING, MONITORING AND SURVEILLANCE,
California State Dept. of Water Resources, Sacramento. Div. of Resources Development.
For primary bibliographic entry see Field 5A.
W74-06947

ENVIRONMENTAL QUALITY: AS AN OBJECTIVE OF GROUND WATER MANAGEMENT,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 5B.
W74-06956

AVAILABILITY OF GROUND WATER IN THE GRANTS PASS AREA, JOSEPHINE COUNTY, OREGON,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 7C.
W74-06959

4C. Effects On Water Of Man'S Non-Water Activities

UNRECORDED POLLUTION AND DYNAMICS OF BIOCHEMICAL OXYGEN DEMAND,
Rutgers - The State Univ., New Brunswick, N.J.
For primary bibliographic entry see Field 5B.
W74-06613

MULTIDISCIPLINARY APPLICATION OF ERTS-1 DATA TO NORTH CAROLINA NATURAL RESOURCE MANAGEMENT,
North Carolina State Univ., Raleigh.
C. W. Welby, J. O. Lammi, and R. J. Carson.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1443-1450, 1973. 3 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Data collections, *Management, *Natural resources, Forestry, Urbanization, Sedimentation, *Clear-cutting, Turbidity, *North Carolina.
Identifiers: *ERTS, Natural resource management.

Two examples of the use of ERTS-1 data are monitoring of man's activities affecting the forest resource and pinpointing sources of sediment load in streams and rivers. In North Carolina most forest harvesting is done by the clear-cutting method. Imagery enlarged to a scale of approximately 1:300,000 provides a spectacular display of bare lands and affords a method for rapidly taking inventory of the total clear-cut acreage. Images of two rivers and chains of reservoirs along them provide an opportunity to evaluate ERTS-1 imagery as a tool to monitor sediment sources as well as loads of sediment. Critical areas requiring priority natural resource management action can be identified, and the updating of information about a region is valuable in effective planning and management of the natural resources. (See also W74-06619) (Knapp-USGS)
W74-06682

SENSITIVITY OF SURFACE RUNOFF TO VARIATIONS OF WATERSHED PARAMETERS IN SMALL URBAN AREAS-A KINEMATIC MODEL,
Howard Univ., Washington, D.C. Dept. of Civil Engineering.
C. L. Yen, and S. N. Sakhleh.
Available from the National Technical Information Service as PB-231 484 $4.00 in paper copy, $1.45 in microfiche. Completion Report, C.E. Report 74-02, January 1974, 77 p, 12 fig, 22 ref OWRR C-3261(3735)(1) 14-31-0001-3735.

Descriptors: *Urban runoff, *Roughness(Hydraulic), *Mathematical models, *Overland flow, Precipitation excess, *Infiltration rates, *Flood peak, *Slopes, Cities, Urbanization, Computer programs, Watersheds(Basins)
Identifiers: *Rainfall duration, Kinematic models

The continuing growth of urban areas that replace farm lands and forests with paved areas and structures inevitably brings about changes in watershed physical parameters such as surface slope, roughness and infiltration rates. The effects of these changes, which result in increased volume and peak rate of runoff that often cause tremendous damage to life and properties, needs to be better understood. The present study proposed a mathematical model, based on kinematic wave theory, to evaluate the effects of urbanization on peak flows for small areas. This model takes into account the spatial variations of slope, roughness, slope-length, rain-excess intensity and duration. Computer programs for watershed profiles having two and three sections with different parameters were written for computing peak overland flow under various conditions. The effects of varying infiltration rate, slope, roughness, slope-length and rainfall durations have been investigated using the model proposed. Results are: (i) high infiltration (pervious) portion located at the lower end of watershed profile reduces peak flow more effectively than at the upper end, (ii) increasing roughness-slope parameter beyond certain value will bring about little additional reduction in peak flow, and (iii) for a given rainfall duration, an optimum slope-length for managing peak flow can be found. These results need to be verified by laboratory or field observations.
W74-06853

EXPLORING ENERGY CHOICES.
Energy Policy Project, Washington, D.C.
For primary bibliographic entry see Field 6D.
W74-06879

UNIVERSITY OF CHICAGO CONTRIBUTION TO PROJECT METROMEX-I.
Chicago Univ., Ill. Dept. of the Geophysical Sciences.
For primary bibliographic entry see Field 2B.
W74-06937

RIVER V. RICHMOND METROPOLITAN AUTHORITY.
For primary bibliographic entry see Field 6E.
W74-06984

4D. Watershed Protection

RESERVOIR SEDIMENTATION,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 2J.
W74-06883

AN EXPANDING ROLE FOR SUBARCTIC WATERSHED RESEARCH,
Cold Regions Research and Engineering Lab., Fairbanks, Alaska.
C. W. Slaughter, and A. E. Helmers.
Water Resources Bulletin, Vol 10, No 2, p 256-264, April 1974. 3 fig, 21 ref.

Descriptors: *Water resources, *Research and development, *Environment, *Arctic, Water balance, Hydrologic budget, Soils, Cold regions, Ecology, Climatology, Permafrost, Hydrology, Hydrogeology, Water yield, Data collections, Forestry, Land management.

Natural resources research should in many cases be broadened in scope and oriented toward more general environmental problems. Locales with a history of watershed research are suited for development of comprehensive, environmental research programs. In the North American Subarctic there is almost no history of watershed studies. Basic data on hydrometeorologic parameters such as precipitation amounts and areal and seasonal distribution of runoff are scarce; the data framework within which environmental understanding can be structured is exceedingly sketchy. Opportunity exists in the discontinuous-permafrost settings of central Alaska to begin rectifying this situation. A basic program of multiagency, multidiscipline research and data acquisition for the most significant hydrologic subregions is being research and data acquisition for the most significant hydrologic subregions is being developed, based around several existing environmental research areas, chiefly the Bonanaza Creek Experimental Forest, the Caribou-Poker Creeks Research Watershed, the Wickersham Dome Fire Study Area, and a series of outlying sites. (Knapp-USGS)
W74-06884

CONSERVATIONISTS GO TO COURT--PART 1,
R. D. Butcher.
American Forests, Vol 77, p 32-35, 55, June 1971. 2 photo.

Descriptors: *Federal Government, *Rivers and Harbors Acts, *Aesthetics, *Judicial decisions, Social aspects, Wildlife conservation, Cases, Public rights, Permits, Regulation, Wetlands, Political aspects, Governments, Dredging, Landfills.
Identifiers: *Administrative regulations, *Environmental impact statement, *National Environmental Policy Act, *Standing(Legal), Public trust doctrine, Sierra Club.

The judicial system is finally helping to resolve a wide range of natural resource conservation controversies. The subjects of litigation are almost limitless, with the common denominator being the public's right to a quality environment. Ways are being found to knock down the old barriers to bringing such suits, such as the problem of standing to sue. In Scenic Hudson Preservation Conference v. Federal Power Commission, it was held that those who by their activities and conduct exhibited special interest in esthetic, conservational, and recreational aspects of power development were aggrieved parties. Standing has been found under the public trust doctrine in Gould v. Greylock Reservation Commission. In Sierra Club v. Hickel standing was denied on the grounds that no local conservation group was joined. However the Sierra Club is made up of local chapters and this case is being appealed. Many lawsuits concern the dredging and filling of tidal wetlands under the authority of the U.S. Army Corps of Engineers pursuant to the Rivers and Harbors Act of 1899. It has been held that permits may be withheld on environmental grounds in compliance with the National Environmental Policy Act. (Sperling-Florida)
W74-06971

PATTERSON WATERSHED PROJECT, STANISLAUS COUNTY, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Berkeley, Calif.
For primary bibliographic entry see Field 4A.
W74-06987

HURRICANE CREEK WATERSHED PROJECT, HUMPHREYS AND DICKSON COUNTIES, TENNESSEE (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.

Avail from Nat Tech Info Serv, as EIS-TW-73-1466-F. PC $4.75 microfiche $1.45. August, 1973. 49 p, 1 map.

Descriptors: *Watershed management, *Erosion control, *Watershed Protection and Flood Prevention Act, *Soil management, Flood control, Flood protection, Floodwater, *Tennessee, Adoption of practices, Water supply, Water resources development, River basin development, Agricultural watersheds, Structures.
Identifiers: *Environmental Impact Statements, Humphreys and Dickson Counties(Tenn), *Hurricane Creek Watershed(Tenn).

The project's purposes are watershed protection and prevention of floods and municipal water shortage. The project includes conservation land treatment measures to be supplemented by seven floodwater retarding structures and one multiple-purpose structure. The project will be funded by federal assistance under the authority of the Watershed Protection and Flood Prevention Act and will be implemented by the sponsoring local organizations. The proposed conservation land treatment measures should reduce erosion and sediment production by 29%. The structural measures should reduce floodwater crop and pasture damage on 4,820 acres of flood plain by 78%, sediment and flood plain scour damage by the same percentage and damages to roads and bridges by 93%. There should also be a reduction in in conveniences such as closed roads. About 755 acres of vegetation cover will be affected, including 163 acres of upland wildlife habitat that will be lost, and another 700 acres will be subject to certain land use changes. Alternatives considered included conservation land treatment alone, the purchasing of flood plain land for public use, combinations of 19 potential floodwater retarding structure sites with and without channel work, seeking alternate water sources, and maintaining the status quo. (Sutton-Florida)
W74-06988

NUTWOOD WATERSHED, ILLINOIS (FINAL ENVIRONMENTAL STATEMENT).
Soil Conservation Service, Washington, D. C.
For primary bibliographic entry see Field 4A.
W74-06990

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

FRESHWATER BIOLOGY AND POLLUTION ECOLOGY: TRAINING MANUAL.
Environmental Protection Agency, Cincinnati, Ohio. Office of Water Program Operations.
Available from the National Technical Information Service as PB-224 201, $10.00 in paper copy, $1.45 in microfiche. Report No EPA-430/1-73-006, April 1973. 550 p, 220 fig, 37 tab, 754 ref.

Descriptors: *Training, *Aquatic environment, *Aquatic life, *Water pollution control, *Ecology, Waste water treatment, Systematics, Water quality, Education, Water pollution effects, Bioassay, Limiting factors, Analytical techniques, Aquatic animals, Aquatic plants, Legal aspects, Biodegradation, Indicators, Self-purification, Water temperature, Oil pollution.

This manual is designed as an introduction to aquatic biology for sanitary engineers, scientists, and others who are involved in freshwater pollution studies, surveillance, and control, and will have its greatest value as an adjunct to classroom presentations. Successful development and maintenance of an aquatic population or community depend upon a harmonious ecological balance between environmental conditions and tolerance of the organisms to variations in one or more of these conditions. The principle of limiting factors is one of the major aspects of the environmental control of aquatic organisms. Nomenclature is discussed in detail and aquatic plants and animals classified. The significance of fungi in the biodegradation of organic matter and bacteriological indicators of water pollution are described. The effects of organic pollution such as sewage or other readily oxidizable organic wastes are presented. This manual is primarily concerned with sublethal or chronic levels of pollutants. Recommendations are made for the protection of aquatic life resources and include courtroom procedure and case preparation. Effects of pollution on aquatic life include toxic and organic wastes which may be reinforced or neutralized by a complex of industrial wastes. (Jones-Wisconsin)
W74-06558

GEOGRAPHIC APPLICATIONS OF ERTS-1 DATA TO LANDSCAPE CHANGE,
Tennessee Univ., Knoxville. Dept. of Geography.
For primary bibliographic entry see Field 4A.
W74-06628

IDENTIFICATION AND MAPPING OF COAL REFUSE BANKS AND OTHER TARGETS IN THE ANTHRACITE REGION,
Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.
For primary bibliographic entry see Field 4A.
W74-06642

DETERMINATION OF AEROSOL CONTENT IN THE ATMOSPHERE,
Science Applications, Inc., La Jolla, Calif.
For primary bibliographic entry see Field 7C.
W74-06647

CORRELATION OF ERTS MULTISPECTRAL IMAGERY WITH SUSPENDED MATTER AND CHLOROPHYLL IN LOWER CHESAPEAKE BAY,
National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center.
For primary bibliographic entry see Field 2L.
W74-06667

ERTS-1 OBSERVATIONS OF SEA SURFACE CIRCULATION AND SEDIMENT TRANSPORT, COOK INLET, ALASKA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 2L.
W74-06670

SEDIMENT DISTRIBUTION AND COASTAL PROCESSES IN COOK INLET, ALASKA,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2L.
W74-06671

OCEANOGRAPHIC FEATURES IN THE LEE OF THE WINDWARD AND LEEWARD ISLANDS: ERTS AND SHIP DATA,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
For primary bibliographic entry see Field 2E.
W74-06674

REMOTE SENSING OF OCEAN CURRENTS USING ERTS IMAGERY,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
For primary bibliographic entry see Field 2L.
W74-06675

BIOMASS IN THE UPWELLING AREAS ALONG THE NORTHWEST COAST OF AFRICA AS VIEWED WITH ERTS-1,
Delaware Univ., Newark.
K-H. Szekielda, and R. J. Curran.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1385-1401, 1973. 10 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Productivity, Oceanography, *Plankton, Ocean currents, Primary productivity, Data collections, Atlantic Ocean, *Pollutant identification.
Identifiers: *ERTS, *Upwelling(Oceans), Africa.

ERTS imagery was studied as a means of acquiring data on marine productivity. Light penetration in water is affected by plankton, algae, and dissolved and suspended matter. As a consequence, the composition of backscattered light from below the air-sea interface is determined by the nature of the constituents in the water column. In contrast to the absorption spectrum of chemically pure chlorophyll in solution, algae suspensions absorb and scatter light more uniformly throughout the visible part of the electromagnetic spectrum. Because of their spectral absorption and scattering properties, plankton concentration can be estimated by measuring the spectral backscattered radiance over water. Experiments using this approach were performed in upwelling regions along the northwest coast of Africa. Recordings parallel to the coast showed periodic variations in the chlorophyll concentration with the same spacing as the periodicity observed with ERTS-1 data. (See also W74-06619) (Knapp-USGS)
W74-06677

FIRST ERTS-1 RESULTS IN SOUTHEASTERN FRANCE: GEOLOGY, SEDIMENTOLOGY, POLLUTION AT SEA,
Institut Francais du Petrole, des Carburants et Lubrifiants, Rueil-Malmaison (France).
For primary bibliographic entry see Field 4A.
W74-06687

MAPPING OF SPOIL BANKS USING ERTS-1 PICTURES,
Ohio Univ., Athens. Dept. of Geology.
M. U. Ahmad, D. A. Kantner, and J. W. Antalovich.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1575-1582, 1973. 7 fig, 1 tab.

Descriptors: *Remote sensing, Satellites(Artificial), *Strip mining, *Ohio, Surveys, Mapping, Data collections, Vegetation, Soils, Hydrology, Pollutant identification.
Identifiers: *ERTS.

NASA's Earth Resources Technology Satellite (ERTS-1) is sending good quality pictures. Four pictures of different wave lengths (MSS 4, 5, 6, 7) were used in a study of two strip-mine areas in southeastern Ohio. The first area is near Piedmont Lake and the second area is near New Lexington. For the New Lexington area, color infrared pictures taken at an elevation of 18,000 feet were also used for correlation with the ERTS-1 imagery. MSS 5 and 7 are most useful in defining the stripped land and show that the hydrological and soil characteristics are remarkably different from those of the surrounding lands. (See also W74-06619) (Knapp-USGS)
W74-06695

AIR QUALITY INDICES FROM ERTS-1 MSS INFORMATION, PR 568,
MITRE Corp., McLean, Va.
E. L. Riley, S. Stryker, and E. A. Ward.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1583-1591, 1973. 3 fig, 1 tab, 5 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Turbidity, *Air pollution, Monitoring, Surveys, Data collections, Smog, Pollutant identification.
Identifiers: *ERTS, Air quality.

Comparison between ground-based atmospheric turbidity network measurements and the average scene grayness from ERTS MSS channel 4 data is in progress. Correlation between these two sources is promising. If continued correlation occurs for other ERTS-1 overflight dates and ground test sites, ERTS-1 will be useful for air quality studies and monitoring. (See also W74-06619) (Knapp-USGS)
W74-06696

UTILIZATION OF ERTS-1 DATA TO MONITOR AND CLASSIFY EUTROPHICATION OF INLAND LAKES,
Bendix Corp., Ann Arbor, Mich.
P. E. Chase, L. Reed, and V. E. Smith.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1597-1604, 1973. 3 fig, 1 tab, 5 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Lakes, *Eutrophication, *Limnology, Surveys, Mapping, Data collections, Wetlands, *Michigan, Pollutant identification.
Identifiers: *ERTS.

ERTS imagery was tested for use in estimating and monitoring trophic levels of inland lakes. Preliminary findings are that Michigan lakes and ponds of one acre or more are resolvable in bands 5, 6 and 7 of MSS imagery under fair conditions (haze and 70% cloud cover). In processed imagery, smaller features, including water color patterns, are evident within some lakes of 40 acres or more. Image distortion is minimal; discrimination of lakes and ponds from various wetlands is good. Subsequent ERTS and aircraft imagery will be correlated with detailed ground truth of water color and quality in eutrophic test lakes. (See also W74-06619) (Knapp-USGS)
W74-06698

ERTS-1 OBSERVES ALGAL BLOOM IN LAKE ERIE AND UTAH LAKE,
National Environmental Satellite Service, Washington, D.C.
A. E. Strong.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1605-1612, 1973. 5 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Eutrophication, *Lake Erie, Algae, Water circulation, Data collections, Currents(Water), Lakes, Limnology.
Identifiers: *ERTS, *Utah Lake.

During late summer when the surface waters of Lake Erie reach their maximum temperature, an algal bloom is likely to develop. Such phenomena have been noticed on other shallow lakes using ERTS-1 and characterize eutrophic conditions. The concentration of the algae into long streamers provides additional information on surface circulations. To augment the ERTS-1 MSS data of Lake Erie, an aircraft was flown to provide correlative thermal-IR and additional multiband photographs. The algal bloom is highly absorptive in the visible wavelengths but reverses contrast with the surrounding water in the near-IR bands. The absorption of shortwave energy heats the dark brown algal mass, providing a hot surface target for the thermal-IR scanner. (See also W74-06619) (Knapp-USGS)
W74-06699

USE OF ERTS-1 PICTURES IN COASTAL OCEANOGRAPHY IN BRITISH COLUMBIA,
Department of the Environment, Victoria (British Columbia). Marine Sciences Branch (Pacific Region).
For primary bibliographic entry see Field 2L.
W74-06707

APPLICATION OF ERTS-1 IMAGERY IN COASTAL STUDIES,
Army Engineer Div. South Pacific, San Francisco, Calif. Coastal Engineering Branch.
For primary bibliographic entry see Field 2L.
W74-06709

DETECTION OF TURBIDITY DYNAMICS IN TAMPA BAY, FLORIDA USING MULTISPECTRAL IMAGERY FROM ERTS-1,
Geological Survey, Tampa, Fla.
For primary bibliographic entry see Field 2L.
W74-06711

EFFECTS OF OIL DISPERSANTS AND OIL EMULSIONS ON MARINE ANIMALS,
Kristinebergs Zoologiska Station, Fiskebackskil (Sweden).
For primary bibliographic entry see Field 5C.
W74-06745

CHEMICAL ASPECTS OF BIOASSAY TECHNIQUES FOR ESTABLISHING WATER QUALITY CRITERIA,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
G. F. Lee.
Water Research, Vol 7, No 11, p 1525-1546, November 1973. 47 ref.

Descriptors: *Water quality standards, *Bioassay, *Methodology, *Reviews, Chemicals, Oxidation, Solubility, Solid wastes, Salt balance, Organic matter, Toxicity, Pesticides, Chelation, Trace elements, Hardness(Water), *Chemical analysis, Chemical properties, Oxidation-reduction potential, Biochemistry, Fish, Iron, Nitrilotriacetic acid, Detergents, Cadmium, Sorption, Hydrogen ion concentration, Acids, Polychlorinated biphenyls, Piscicides, Water quality standards.
Identifiers: Complexation, Ionic strength, Salt ratios, Toxaphene, EDTA, Errors, Error sources, Method validation.

Increasing emphasis is being placed on the use of bioassay techniques to evaluate potential water quality problems in the aquatic environment. Although the physical environment is carefully maintained, often less emphasis is placed on maintaining the proper chemical environment in bioassay tests. Considerations of oxidation state, solubility, complexation, ionic strength, type and amount of solids, salt ratios and concentrations and organic content are essential in extrapolating the results from the test conditions to the environment. The chemical history of the test organism must be controlled to insure meaningful results, and analytical measurements should be made to insure that the proper chemical species is maintained throughout the test period. If the environmental conditions are not duplicated, studies are needed to determine how the results are dependent on the test environment used. Examples in which changes in the chemical environment of a bioassay test may affect the results of the test are discussed and procedures for minimizing problems of this type are recommended. (Mortland-Battelle)
W74-06747

CULTURE STUDIES OF ENTEROMORPHA LINZA (L.) J.AG. AND ULVARIA OXYSPERMA (KUTZING) BLIDING (CHLOROPHYCEAE, ULVALES) FROM CENTRAL AMERICA,
North Carolina Univ., Wilmington. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W74-06749

YAMADAPHYCUS, A NEW GENUS OF THE DELESSERIACEAE (RHODOPHYTA),
Hokkaido Univ., Sapporo (Japan).
H. Mikami.
Phycologia, Vol 12, Nos 3/4, p 139-143, December 1973. 16 fig, 16 ref.

Descriptors: *Rhodophyta, *Marine algae, *Speciation, *Systematics, Marine plants, Plant morphology, Reproduction, Plant physiology, Plant groupings.
Identifiers: *Yamadaphycus carnosus, *Japan, Delesseria.

The structure and reproduction of Yamadaphycus carnosus gen. et sp. nov. from the southeastern coast of Hokkaido, Japan, are described, and the taxon's relationship to other members of Delesseriaceae is discussed. The structure of the apex belongs to Kylin's Delesseria type. The female and asexual reproductive organs occur on special proliferations that are formed in clusters and at random on both surfaces of the fronds. (Holoman-Battelle)
W74-06753

PHOSPHORIMETRIC DETERMINATION OF TRACES OF BORON,
Geneva Univ. (Switzerland). Dept. of Inorganic and Analytical Chemistry.
M. Marcantonatos, G. Gamba, and D. Monnier.
Analytica Chimica Acta, Vol 67, No 1, p 220-224, November 1973. 3 fig, 2 tab, 5 ref.

Descriptors: *Water analysis, *Sea water, *Boron, Chemical analysis.
Identifiers: *Phosphorimetry, Detection limits, Sample preparation, Chemical interference, Calibration curves.

Micro-amounts of boron in seawater and in solutions containing an interfering metal can be determined using the phosphorescent emissions which occur with the complexation of boric acid by dibenzoylmethane or benzoylacetone. Calibration curves were constructed using standard solutions prepared by heating nanogram quantities of boron as boric acid in sulfuric acid, cooling, and adding ether. Limits of detection were about 0.4 ng B/ml with dibenzoylmethane when emission was measured at 508 nm with a 2-mm dia. phosphorimetric cell and an excitation wavelength of 402 nm. The presence of Cr, Ce, Ni, Cu, Mg, Mn, Pb, Cd, Zn, Sn, Li, Na, K, Al, V, Fe, Co, Ag, Te, Hg, In, Tl, NH_4, F, Br, Cl, I, NO_3, SCN, PO_4, S_2O_3, and CH_3COO ions gave errors of less than 10 percent. Mo and W caused significant interference. Seawater samples were prepared for analysis according to the same procedure used for standard solutions substituting seawater for boric acid. The solutions for analysis should contain no more than 3 percent seawater. (Little-Battelle)
W74-06755

COMPLEXIMETRIC DETERMINATION OF PHOSPHATE,
Alfa Materials Technology, Inc., Pottstown, Pa. Research Lab.
A. De Sousa.
Analytica Chimica Acta, Vol 67, No 1, p 234-235, November 1973. 2 ref.

Descriptors: *Phosphates, *Methodology, *Aqueous solutions, *Pollutant identification, Water analysis, Chemical analysis, Chemical reactions, Volumetric analysis, Color reactions.
Identifiers: *Complexiметric titration, Accuracy, Ionic interference, Chemical interference, EDTA, Chemical indicator, Murexide.

The complexiметric method described for the determination of phosphate ion is based on the rapid quantitative precipitation of silver orthophosphate from a neutral or slightly alkaline phosphate solution. The freshly precipitated silver phosphate is dissolved in an ammoniacal solution of potassium tetracyanonickelate and titrated with EDTA to a visual endpoint with murexide as indicator. The time required for phosphate determination is about 30 min. The method described gave satisfactory results for the determination of phosphate in the range 10.0-150.0 mg; the accuracy varied from 1.0 percent to 0.5 percent over this range. There was no interference from moderate amounts of Al, Ni, Co, Mn, Zn, Cd, Cu, Pb, Ca, Sr, Ba, and Mg, but vanadate, chromate, molybdate, tungstate and halide ions interfered. (Holoman-Battelle)
W74-06757

A UNIVERSAL ION-SELECTIVE ELECTRODE BASED ON GRAPHITE PASTE,
Connecticut Univ., Storrs. Dept. of Chemistry.
For primary bibliographic entry see Field 2K.
W74-06758

AN EXAMINATION OF THREE STRAINS OF THE BLUE-GREEN ALGAL GENUS, FREMYELLA,
East Tennessee State Univ., Johnson City. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W74-06759

THE GENUS NEOCHLORIS STARR (CHLOROPHYCEAE, CHLOROCOCCALES),
Slippery Rock State Coll., Pa. Dept. of Biology.
P. A. Archibald.
Phycologia, Vol 12, Nos 3/4, p 187-193, December 1973. 9 fig, 3 tab, 12 ref.

Descriptors: *Aquatic algae, *Soil algae, *Chlorophyta, Plant morphology, Plant growth, Plant physiology, Speciation, Systematics, Cultures, Isolation, Plant groupings, Plant pigments, Microscopy.
Identifiers: *Neochloris, Neochloris texensis, Neochloris conjuncta, Neochloris vigenis, Culture media, Neochloris alveolaris, Neochloris cohaerens, Neochloris minuta, Nechloris oleabundans, Neochloris pseudoalveolaris, Neochloris terrestris, Neochloris wimmeri, Neochloris aquatica, Neochloris conjuncta, Neochloris fusispora, Neochloris gelatinosa, Neochloris pyrenoidosa, Neochloris seudostigmata.

Study and culture of five isolates of the genus Neochloris revealed three previously undescribed species. A morphological key to all current species of Neochloris as cultured under standard conditions is provided. Supplementary growth patterns and physiological attributes are reported. (Holman-Battelle)
W74-06760

SELECTRODE - THE UNIVERSAL ION-SELECTIVE ELECTRODE. PART VI. THE CALCIUM (II) SELECTRODE EMPLOYING A NEW ION EXCHANGER IN A NONPOROUS MEMBRANE AND A SOLID-STATE REFERENCE SYSTEM,
Technical Univ. of Denmark, Lyngby. Kemisk Laboratorium A.
J. Ruzicka, E. H. Hansen, and J. C. Tjell.
Analytica Chimica Acta, Vol 67, No 1, p 155-178, November 1973. 11 fig, 3 tab, 39 ref.

Descriptors: *Water analysis, Materials, *Fabrication, Stability, Selectivity, Calibrations, Calcium, Ions, Aqueous solutions, Design criteria, Volumetric analysis, Hydrogen ion concentration, Sea water, *Electrodes.
Identifiers: *Ion selective electrodes, *Calcium electrodes, Calibration curves, Chemical interference, Membrane electrodes, Selectrodes.

The correlation between extraction data and electrode behavior was used to explain the vital properties of organophosphate-based calcium electrodes, and in suggesting a new liquid ion exchanger, di-(n-octylphenyl) phosphoric acid. This compound was synthesized and used in various electrode constructions including a newly developed membrane selectrode with a solid-state inner reference system. The resulting calcium(II) selectrode, calibrated in a series of calcium buffers, was subjected to potential-pH measurements, and used in EDTA titrations. The selectivity parameters of this electrode towards Na(plus), H(plus) and other foreign ions were found to be substantially better than those of any other calcium sensors previously described. (See also W74-06765, W73-01079 and W73-08800) (Little-Battelle)
W74-06764

SELECTRODE - THE UNIVERSAL ION-SELECTIVE ELECTRODE. PART VII. A VALINOMYCIN-BASED POTASSIUM ELECTRODE WITH NONPOROUS POLYMER MEMBRANE AND SOLID-STATE INNER REFERENCE SYSTEM,
Lund Univ., (Sweden).
U. Fiedler, and J. Ruzicka.
Analytica Chimica Acta, Vol 67, No 1, p 179-193, November 1973. 6 fig, 2 tab, 26 ref.

Descriptors: *Potassium, *Water analysis, *Aqueous solutions, Calibrations, Measurement, Volumetric analysis, Selectivity, *Electrodes.
Identifiers: *Ion selective electrodes, Chemical interference, Potassium electrodes, Calibration curves, Membrane electrodes, Selectrodes.

A potassium electrode utilizing a solution of valinomycin in diphenylether and a porous membrane is compared with selectrodes in which the diphenylether has been replaced by a suitable plasticizer and the porous membrane support by a polymer net-work. The development of the polymer membrane allows the use of simplified selectrode construction with a 'solid-state' calomel reference system. Rules for a successful choice of a suitable solvent-polymer combination are suggested and used for development of new polyvinylchloride- and polyurethane-based membranes. (See also W74-06764, W73-01079 and W73-08800) (Little-Battelle)
W74-06765

MERCURY AS A HYDROSPHERIC POLLUTANT II. BIOLOGICAL HALF-TIME OF METHYL MERCURY IN FOUR MEDITERRANEAN SPECIES: A FISH, A CRAB, AND TWO MOLLUSCS,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco).
For primary bibliographic entry see Field 5C.
W74-06767

ENVIRONMENTAL MERCURY CONTAMINATION.
For primary bibliographic entry see Field 5B.
W74-06770

MERCURY CONTENTS OF BOTTOM SEDIMENTS FROM WISCONSIN RIVERS AND LAKES,
Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 5B.
W74-06777

MERCURY LEVELS IN WISCONSIN FISH,
Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 5B.
W74-06778

METHODS OF ANALYSIS FOR MERCURY AND ITS COMPOUNDS: A REVIEW,
Michigan Univ., Ann Arbor. School of Public Health.
R. G. Smith.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 97-136, 1972. 460 ref.

Descriptors: *Mercury, *Analytical techniques, *Pollutant identification, *Bibliographies, Pollutants, Heavy metals, Chromatography, Colorimetry, Fluorescence, Gravimetric analysis, Microscopy, Neutron activation analysis, X-ray analysis, Chemistry, Evaluation, Instrumentation, Testing procedures, Spectrophotometry, *Reviews.
Identifiers: Atomic absorption spectrophotometry.

Papers concerned with mercury analysis are reviewed. The substances most frequently analyzed are organic materials. These present many difficulties because the mercury must be separated from the organic matter for precise measurements by complex ashing or other processes. The methods are divided into two classifications: elemental, total, and inorganic mercury analysis methods; and methods for analysis of organic mercury compounds. The first group contains activation analysis, atomic absorption and fluorescence, chromatographic analysis, colorimetric, electrometric, gravimetric, micrometric, radiometric, spectrographic, titrimetric, x-ray and miscellaneous methods of analysis. The second group contains alkyl and non-alkyl methods. The most widely used methods of mercury determination are those using the introduction of the color-forming reagent, dithizone, and the flameless or 'cold vapor' atomic absorption techniques. A listing of sources includes paper on the various techniques of analysis and additional sources dealing with analytical considerations, errors, calibration procedures, ashing problems and other review articles. (See also W74-06770) (Jerome-Vanderbilt)
W74-06785

PREPARATION OF BIOLOGICAL SAMPLES FOR NEUTRON ACTIVATION ANALYSIS OF MERCURY,
Western New York Nuclear Research Center, Inc., Buffalo.
K. K. S. Pillay.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 137-141, 1972. 3 tab, 2 ref.

Descriptors: *Mercury, *Neutron activation analysis, *Testing procedures, Evaluation, *Organic matter, Pollutants, Heavy metals, Analytical techniques, Sampling, Fish, Gamma rays, Foods, Public health, Metals, *Pollutant identification.
Identifiers: *Biological samples, Gamma rays spectrometry.

Several problems arising out of improper handling of samples can often cause significant losses of mercury in neutron activation analysis of biological and environmental material. The initial findings of an investigation of cold ashing techniques and/or freeze-drying methods to prepare convenient analytical samples of mercury are presented. Analysis of three fish homogenate sam-

ples and human brain tissues was performed using neutron activation analysis without pre-processing, followed by chemical separation and gamma-ray spectrometry. This process showed good agreement with results obtained by cold atomic absorption analysis. Freeze dried samples were reanalyzed and showed an obvious loss of mercury. It seems that neither freeze-drying nor cold ashing procedures are satisfactory for preparation of analytical samples of biological tissues for neutron irradiation. A more effective technique for handling biological tissues which are not subjected to any pre-processing is presented. (See also W74-06770) (Jerome-Vanderbilt)
W74-06786

MERCURY CONTENT OF CANADIAN FOODS AND CEREALS DETERMINED BY DIFFERENT METHODS,
Food and Drug Directorate, Ottawa (Ontario).
H. M. Cunningham, and J. C. Meranger.
In: Environmental Mercury Contamination, Ann Arbor Publishers, Inc., Michigan, p 141-146, 1972. 4 tab.

Descriptors: *Mercury, *Foods, *Analytical techniques, Neutron activation analysis, *Spectrophotometry, Pollutants, Water pollution, Diets, Testing, Laboratory tests, Heavy metals, Absorption, Evaluation, *Pollutant identification, *Canada.
Identifiers: Atomic absorption, Dithizone technique, Spectrophotometry.

Every three months, mixed diet samples representing 12 major classes of foodare collected and analyzed for trace minerals and other constituents by various Canadian organizations. The Association of Official Analytical Chemists analyzed 10 food samples for mercury using a dithiazone technique which revealed that none of the samples contained more than 1 ppm of mercury. The Food and Drug Directorate analyzed wheat and flour samples using a flameless atomic absorption technique. None of the samples tested contained above 0.013 ppm mercury. A comparison of results from flameless atomic absorption analysis and from neutron activation analysis showed discrepancies which could not be accounted for. (See also W74-06770) (Jerome-Vanderbilt)
W74-06787

A SIMPLE, RAPID METHOD FOR THE DETERMINATION OF TRACE MERCURY IN FISH VIA NEUTRON ACTIVATION ANALYSIS,
Michigan Univ., Ann Arbor. Dept. of Chemistry.
J. M. Rottschafter, J. D. Jones, and H. B. Mark, Jr.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 146-151, 1972. 3 tab, 4 ref.

Descriptors: *Fish, *Neutron activation analysis, *Mercury, *Ion exchange, *Pollutant identification, Laboratory tests, Analytical techniques, Heavy metals, Chemical reactions, Evaluation, Instrumentation, Calibration, Foods, Food chains.

A modified version of the neutron activation analysis method employs an anion-exchange column to adsorb mercury as a HgC14 complex. The standard radiochemical technique of adding a hold-back carrier prevents large losses of the sample of mercury during digestion and during the chemical steps preceding ion exchange. Weighed fish tissue samples were irradiated along with a sample used as an internal standard. Samples were then digested, diluted, and passed through an ion exchange column. The resin was removed from the column and counted in order to determine its mercury contents. The results of this method compared favorably with results obtained by other laboratiries using different methods of analysis. The lower level of analysis is estimated to be 10 ppb plus or minus 20%. Bromide ions were found to be the only observable source of interference. Preparation time is lowered to about 10 to 15 minutes per sample through simultaneous running. (See also W74-06770) (Jerome-Vanderbilt)
W74-06788

DETERMINATION OF MERCURY BY NON-DESTRUCTIVE NEUTRON ACTIVATION ANALYSIS,
Environmental Research Group, Ann Arbor, Mich.
R. A. Copeland.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 151-153, 1972. 3 ref.

Descriptors: *Neutron activation analysis, *Laboratory tests, *Mercury, *Pollutant identification, Analytical techniques, Testing, Evaluation, Measurements, Heavy metals, Data collection, Metals, *Non-destructive tests.
Identifiers: Selenium.

A non-destructive neutron activation analysis method, which is useful when it is necessary to make multiple elemental analyses on limited quantities of organic and sediment samples, is outlined. The samples are irradiated, allowed to decay and counted. The data are then stored on magnetic tape and pulse height analyses are performed by computer. A correction method for the interference contributed by selenium-75 is presented which produces less than 20% change in most organic samples which have a mercury concentration of more than 0.5 ppm. The disadvantages of this method are the long instrument and irradiation times required. The advantages are the non-destruction of the substance and the fact that the long measurement periods provide data on approximately 20 elements in addition to mercury. (See also W74-06770) (Jerome-Vanderbilt)
W74-06789

DETERMINATION OF MERCURY IN BIOLOGICAL TISSUES,
Environmental Science and Engineering Corp., Nashville, Tenn.
A. R. Schulert, J. T. Davis, and D. G. Nicholson.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 153-154, 1972.

Descriptors: *Analytical techniques, *Mercury, Spectroscopy, Biochemistry, Fish, Heavy metals, Measurement, Evaluation, Laboratory tests, *Pollutant identification, *Spectrophometry.
Identifiers: *Atomic absorption spectrophotometry, Mercury pollution.

Four published procedures for the atomic absorption analysis of mercury in fish muscle were tested to ascertain their adequacy. The procedure from the Perkin-Elmer Atomic Absorption Manual is inadequate because the radio-tracer added to the system is removed only to the extent of 2-10%. The Association of Official Analytical Chemists procedure, in which the sample is acid-digested, works well for inorganic material but is not effective in measureing mercury in fish. A system of condensation of evolved mercury vapor in a 'cold finger' apparatus was workable although rather expensive, tedious and subject to logistics problems. The most satisfactory procedure involved the combustion of the sample in a 1,000 C furnace under a flow of oxygen, absorbing out water and oxides of carbon and nitrogen, and then measuring the atomic absorption of the mercury vapor. (See also W74-06770) (Jerome-Vanderbilt)
W74-06790

THE DETERMINATION OF ETHYLMERCURY IN BLOOD,
Imperial Chemical Industries, Ltd., Alderly Park (England). Industrial Hygiene Research Lab.
J. C. Gage.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 155-156, 1972. 5 ref.

Descriptors: *Analytical techniques, Separation techniques, *Mercury, *Inorganic compounds, *Organic compounds, Chemical reactions, Chemical analysis, Laboratory tests, Evaluation, Poisons, Pollutant identification.
Identifiers: *Ethylmercury, *Blood analysis.

Methods used in the determination of organic and inorganic mercury in animals have been based upon solvent extraction or the varying lability of different organic mercurials in the presence of an acid-cysteine reagent. In testing the blood of workmen exposed to mercurial seed dressing containing small portions of an ethylmercury salt, difficulty was encountered using the acid-cysteine method. Investigation showed that separate determination of organic and inorganic mercury could be effected, in the presence of a strong solution of stannous chloride in alkali, by first blowing off the mercury from the inorganic salts with nitrogen, then changing to air or oxygen in order to break down the ethylmercury. The area of the tracing obtained with known amounts of ethylmercury chloride indicates that conversion is complete. A limited number of experiments have indicated that methylmercury is much more stable than ethylmercury and attempts to modify the method for the analysis of methylmercury have been unsuccessful. (See also W74-06770) (Jerome-Vanderbilt)
W74-06791

THE DETERMINATION OF MONO- AND DIMETHYLMERCURY COMPOUNDS BY GAS CHROMATOGRAPHY,
Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
R. Hartung.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 157-161, 1972, 2 fig, 2 tab, 2 ref.

Descriptors: *Analytical techniques, *Gas chromatography, *Mercury, Separation techniques, Chemical reactions, Heavy metals, Organic compounds, Laboratory tests, Research and development, Measurement, *Pollutant identification, Sediments, Anaerobic conditions.
Identifiers: *Methylmercury.

A method for the determination of mono- and dimethylmercury in anaerobic sediments using gas chromatography is presented. The essential step in this method is the initial addition of a cysteine-borate buffer at pH 8.2 to the sample, in order to stabilize the dimethylmercury and to combine with any free monomethylmercury to form the water soluble cysteine adduct. The dimethylmercury is then extracted with toluene, converted to monomethylmercury and measured by electron-capture gas chromatography. This procedure improves the specificity of the test by producing a specific derivative and increases its sensitivity because of the strong electron affinity of methylmercuric bromide. Laboratory procedures and results of some studies using this method are presented. (See also W74-06770) (Jerome-Vanderbilt)
W74-06792

ANALYTICAL METHODOLOGY FOR MERCURY-DISCUSSION PAPER,
H. M. Benedict, J. N. Bishop, C. A. Burns, W. S. Ferguson, and J. C. Gage.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 161-162, 1972.

Descriptors: *Sampling, *Storage, Preservation, *Mercury, Stability, Fish, Analytical techniques, Separation techniques, Chemical reactions, Measurements, *Pollutant identification, Reviews.
Identifiers: *Sample preservation, Methylmercury.

Loss of mercury in sample storage and preparation presents unusual problems. Mercury loss in frozen fish stored in plastic bags was only 10% after a nine month storage period. Mercury in fish seems to be quite stable as long as the specimens have been properly preserved in nonplastic containers. The chelation of mercury from urine and water with ammoniumpyrolidinedithiocarbamate (APDC) and subsequent extraction into methylisobutylketone (MIBK) has been successful. When 0.2 ml of this extract was analyzed by routine atomic absorption techniques, sensitivities of 0.01 ppm to 0.005 ppm were reported. (See also W74-06770) (Jerome-Vanderbilt)
W74-06793

MERCURY CONCENTRATIONS IN HUMAN TISSUES AMONG HEAVY FISH EATERS,
New York State Dept. of Health, Albany.
For primary bibliographic entry see Field 5B.
W74-06812

AERIAL RADIOLOGICAL MEASURING SURVEY OF THE FORT CALHOUN STATION, FORT CALHOUN, NEBRASKA, AUGUST 9-10, 1972.
EG and G, Inc., Las Vegas, Nev.
Available from NTIS, Springfield, Va., ARMS-72-6-4. $4.00 per paper copy, $1.45 in microfiche. Report No ARMS-72-6-4, Oct 1973. 18 p, 3 fig, 3 tab, 3 ref.

Descriptors: *Remote sensing, *Surveys, *Radioactivity, Measurement, *Air pollution, Water pollution, *Water pollution sources, Soil contamination, Fallout, Radioisotopes, Monitoring, Population, Food chains, Public health, *Nebraska, Equipment, Instrumentation, Data collections, Mapping, Contours, Missouri River, Remote sensing.
Identifiers: *Gamma radiation, Pressurized water reactor.

The Aerial Radiological Measuring System (ARMS) was used to survey the area surrounding the Fort Calhoun Station during August 1972. The survey measured terrestrial gamma radiation. A high-sensitivity detection system collected gamma-ray spectral and gross-count data. The data were then computer processed into a map of a 625 square mile area showing isoexposure contours three feet above the ground. Exposure rates and isotopes identified are consistent with normal terrestrial background. (Houser-ORNL)
W74-06815

AERIAL RADIOLOGICAL MEASURING SURVEY OF THE AREA SURROUNDING THE PALISADES PLANT, SOUTH HAVEN, MICHIGAN, JULY 29, 1970.
EG and G, Inc., Las Vegas Nev.
Available from NTIS, Springfield, Va., as ARMS-70-6-8, $4.00 in paper copy, $1.45 in microfiche. Report No ARMS-70-6-8, Oct 1973. 18 p, 2 fig, 3 tab, 3 ref.

Descriptors: *Remote sensing, *Surveys, *Radioactivity, Measurement, *Air pollution, Water pollution, *Water pollution sources, Soil contamination, Nuclear powerplants, Effluents, Lake Michigan, *Michigan, Population, Food chains, Public health, Radioisotopes, Remote sensing.
Identifiers: *Gamma radiation, Pressurized water reactor.

The Aerial Radiological Measuring System (ARMS) was used to survey the area surrounding the Palisades Plant during July 1970. A high-sensitivity detection system collected gamma-ray spectral and gross-count data. The data were then computer processed into a map of a 300 square mile area showing isoexposure contours three feet above the ground. Exposure rates and isotopes identified are consistent with normal terrestrial background radiation. (Houser-ORNL)
W74-06816

AERIAL RADIOLOGICAL MEASURING SURVEY OF THE AREA SURROUNDING THE ENRICO FERMI ATOMIC POWER PLANT, MONROE, MICHIGAN, SEPTEMBER 1970.
EG and G, Inc., Las Vegas, Nev.
Available from NTIS, Springfield, Va., as ARMS-70-6-7. $4.00 in paper copy, $1.45 in microfiche. Report No ARMS-70-6-7, Sept 1973. 18 p, 3 fig, 3 tab, 3 ref.

Descriptors: *Remote sensing, *Surveys, *Radioactivity, *Monitoring, Rivers, Lakes, Creeks, *Air pollution, Water pollution, Water pollution sources, Nuclear powerplants, Effluents, Contours, Mapping, *Michigan, Food chains, Public health, Population, Radioisotopes, Remote sensing.
Identifiers: Gamma radiation, Sodium cooled fast reactor.

The Aerial Radiological Measuring System (ARMS) was used to survey the Enrico Fermi Atomic Power Plant and surrounding area during September 1970. The survey measured terrestrial background gamma radiation and included a plume track of the stack release gases. A high-sensitivity detection system collected gamma-ray spectral and gross-count data. The data were then computer processed into a map of a 277 square mile area showing isoexposure contours three feet above the ground. Results indicated the presence of isotopes normally found in the background radiation throughout the United States. The plume track revealed no radiation above background levels. (Houser-ORNL)
W74-06817

THE STACK MONITORING SYSTEM AT THE IDAHO CHEMICAL PROCESSING PLANT,
Allied Chemical Corp., Idaho Falls, Idaho. Idaho Chemical Programs Operations Office.
R. C. Girton, L. T. Lakey, and D. T. Pence.
Available from the National Technical Information Service, Springfield, Va., as ICP-1034; $4.00 per copy, $1.45 microfiche. Report ICP-3034, September 1973. 36 p, 6 fig, 1 tab, 8 ref.

Descriptors: *Monitoring, *Control systems, *Idaho, Operations, *Regulation, Effluents, Flow rates, Fuels, Nuclear powerplants, *Air pollution, Measurement, Assay, Radioactivity, Particle size, Migration, Dispersion, Distribution, Filters, Homogeneity, Evaluation, Assessments, Safety, Public health, Fallout, Water pollution sources.
Identifiers: *Fuel processing, *Chemical processing, Fuel elements, Stack.

The effluent monitoring system used to measure airborne particulate emissions from the Idaho Chemical Processing Plant is described in detail. The efficiency of the system has been evaluated through studies of particle migration as a function of size, particulate plateout, particle size distribution, type of filter paper, flow rates, and the homogeneity of the gaseous effluents. Several deficiencies of the system have been identified and recommendations for improvement to meet present and anticipated pollution regulations are presented. (Houser-ORNL)
W74-06824

NEW METHODS OF NITRITE AND NITRATE ANALYSIS FOR NATURAL WATERS,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
P. J. Canney.
Available from the National Technical Information Service as PB-231 366, $11.25 in paper copy, $1.45 in microfiche. M.S. Thesis, 1973. 155 p, 34 fig, 21 tab, 38 ref. OWRR A-051-WIS(1). 14-31-0001-3850.

Descriptors: *Organic compounds, *Nitrites, *Nitrates, *Separation techniques, Aromatic compounds, Chemical reactions, *Pollutant identification, Chemical analysis, Water analysis.
Identifiers: *Ortho-diamines, Reagents.

Several aromatic ortho-diamines were found to react with NO2. After optimizing the conditions for these reactions two reagents were selected for method development, namely, 2,3-DAF (2,3-diaminofluroene) and DABSe, (the monopiazselenol of 3,3'-diaminobenzidine). The DABSe reagent was found to have high sensitivity when used with a DCE (1,2-dichlordethane) extraction but could not be used without extraction. A DCE extraction using 2,3-DAF was found to have the highest sensitivity of all the reagents evaluated and had the versatility of use without extraction. Studies showed that Fe(III) and MnO2 could cause significant interference. However, sample filtration was found to eliminate all of the MnO2. High levels of Fe (III) could be removed by use of a cation exchange resin. Attempts to find new NO3 reducing agents which would perform with the new reagents were unsuccessful. The Cd-Hg reduction column was used for NO3 reduction; with analysis with 2,3-DAF or DABSe. The DABSe and 2,3-DAF methods are adequate for NO2 and NO3 analysis. They are highly sensitive and the DAF-aqueous procedure is somewhat simpler than the sulfanilic acid method because of the need for only one reagent addition. The 2,3-DAFaqueous procedure should not be used for water containing high levels of organic material. The potential for using these reagents in NO3 analysis is great if adequate reducing agents can be found. (Chesters-Wisconsin)
W74-06836

EVALUATION OF A MICROWAVE-INDUCED PLASMA SPECTROMETER FOR TRACE ANALYSIS,
Environmental Protection Agency, Athens, Ga. Southeast Environmental Research Lab.
W. R. Seitz.
Copy Available from GPO Sup Doc as EP1.23:660/2-73-009; $0.65; microfiche from NTIS as PB-231 390 $1.45. Environmental Protection Agency, Technical Series Report EPA-660/2-73-009, January 1974. 19 p, 3 tab, 25 ref. ROAP 16ADN-32.

Descriptors: *Analytical Techniques, *Spectroscopy, Microwaves, *Trace elements, Arsenic, Cadmium, Lead, Mercury, *Metals, *Water analysis, *Pollutant identification.
Identifiers: Plasma, Excitation.

A low pressure microwave-induced plasma in helium was evaluated as an excitation source for spectrochemical analysis of trace metals in water. The sample was introduced by evaporating a 5-microliter drop of solution on a wire filament and atomizing the solids by the discharge of a capacitor through the filament. The height of the resulting pulse from the photo detector was automatically recorded. Repeatability was about 10% and detection limits were 1 to 25 pg for As, Cd, Hg, and Pb. Slopes of calibration curves depended strongly on matrix and filament effects and the maximum solids loading of the filament was about 5 micrograms. (Hoover-EPA)
W74-06841

STORMWATER RUNOFF QUALITY FOR URBAN AND SEMI-URBAN/RURAL WATERSHEDS,
Purdue Univ., Lafayette, Ind. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5B.
W74-06851

A RADIOACTIVE ISOTOPIC CHARACTERIZATION OF THE ENVIRONMENT NEAR WISCASSET, MAINE: A PREOPERATIONAL SURVEY

IN THE VICINITY OF THE MAINE YANKEE ATOMIC POWER PLANT,
Maine Univ., Orono. Dept. of Physics.
C. T. Hess, C. W. Smith, H. A. Kelley, and F. C. Rock.
Avail: Supt. of Documents, U.S. Printing Office, Washington, D.C., $1.20 per copy. Radiation Data and Reports, Vol 15, No 2, p 39-52, Feb 1974. 1 fig, 7 tab, 14 ref, 3 append.

Descriptors: *Maine, *Monitoring, *Sampling, Air, Soils, *Radioactivity, Uranium, Thorium, Potassium, Cesium, Nuclear powerplants, *Survey, Sediments, Tritium, Precipitation(Atmospheric) measurement, Assay, Instrumentation, *Path of pollutants.
Identifiers: *Montsweag Bay(Maine), Booth Bay(Maine), Young's Creek(Maine).

An environmental radioactivity survey was conducted in the vicinity of the Maine Yankee Atomic Power Plant prior to the operation of this facility. Measurements of environmental radioactivity were made on samples of soil, sediment, well water, surface water, estuarine water, air particulates, air moisture, and precipitation. Natural radioisotopes in the uranium and thorium series and potassium-40 were found in most of the samples. Cesium-137 also was found in some samples. (Houser-ORNL)
W74-06855

(RADIATION DATA, SECTION II. WATER).
Office of Radiation Programs, Washington, D.C.
Avail: Supt. of Documents, U.S. Printing Office, Washington, D.C., $1.20 per copy. Radiation Data and Reports, Vol 15, No 2, p 74-78, February 1974. 2 fig, 1 tab, 4 ref.

Descriptors: *Radioactivity, *Assay, Assessment, Safety, Evaluation, Nuclear explosions, Fallout, *Sampling, Public health, Standards, Water quality, Municipal water, *Water analysis, *Path of pollutants, Potable water.
Identifiers: *Surveillance program, *Nevada Test Site.

The Environmental Protection Agency and other Federal, State, and local agencies operate extensive water quality sampling and analysis programs for surface, ground, and treated water. Most of these programs include determinations of gross beta and gross alpha radioactivity and specific radionuclides. Although the determination of the total radionuclide intake from all sources is of primary importance, a measure of the public health importance of radioactivity levels in water can be obtained by comparison of the observed values with the Public Health Service Drinking Water Standards. These standards, based on consideration of Federal Radiation Council (FRC) recommendations set the limits for approval of a drinking water supply containing radium-226 and strontium-90 at 3 pCi/liter and 10 pCi/liter, respectively. Higher concentrations may be acceptable if the total intake of radioactivity from all sources remains within the guides recommended by FRC for control action. Surveillance data from a number of Federal and State programs are published periodically to show current and long-range trends. Water sampling activities reported in Radiation Data and Reports are listed. Tabular data are given for all analytical results of water samples. (Houser-ORNL)
W74-06856

SEMIMICRODETERMINATION OF MERCURY(II) AND ZINC(II) BY PRECIPITATION FROM HOMOGENEOUS SOLUTION, USING CATION GENERATION TECHNIQUE,
Delhi Univ. (India). Dept. of Chemistry.
K. N. Johri, and K. Bakshi.
Microchemical Journal, Vol 18, No 5, p 497-501, October 1973. 3 tab, 12 ref.

Descriptors: Chemical precipitation, *Mercury, *Zinc, *Gravimeteric analysis, Ions, *Pollutant identification, Heavy metals, Aqueous solutions, Water analysis, *Ion exchange, *Separation techniques.
Identifiers: EDTA, Potassium thiocarbonate, Masking, Ammonium tartrate, Chemical interference.

A gravimetric procedure for the evaluation of milligram quantities of mercury(II) and zinc(II) when present along with adverse ions is based on the technique of masking one or more constituents while precipitating the others. Besides potassium thiocarbonate (PTC), EDTA and ammonium tartrate have been employed as masking agents, thereby affording selective precipitation. In alkaline medium, PTC causes the precipitation of basic thiocarbonates of mercury and zinc. However, by the masking action of EDTA or ammonium tartrate, not only the hydroxide precipitation is prevented but the thiocarbonate precipitate obtained is clean and dense, having better filterable properties. The procedure for the determination of mercury is not applicable in the presence of Bi(III), Pb(II), and Cd(II) ions as the latter ions are also precipitated out with Hg(II). EDTA and ammonium tartrate, when added, prevent the precipitation of Zn(II), Cu(III), Al(III), Mo(VI), As(III), Sb(III), and Sn(II) against mercury(II). Cu(II), Ni(II), and Co(II) remain in the solution as their soluble thiocarbonate complexes with an excess of PTC. Since EDTA masks zinc completely against PTC, it could not be used in the case of zinc. Separations of zinc(II) have been carried out by adjusting the required pH of the solution. In acidic solution, Mo(VI), Sn(II), Sb(III), As(III), Cd(II), Hg(II) ions are separated from alkaline solution by adding an excess of PTC. (Mortland-Battelle)
W74-06869

ON THE REACTION BETWEEN IODIDE AND MERCURY(II),
Cairo Univ., Giza (Egypt). Faculty of Science.
H. Khalifa.
Microchemical Journal, Vol 18, No 5, p 529-535, October 1973. 1 tab, 15 ref.

Descriptors: *Mercury, *Ions, *Volumetric analysis, *Electrodes, *Iodides, Pollutant identification, Acidity, Chlorides, Nitrates, Aqueous solutions.
Identifiers: Ion selective electrodes, Acetates, Platinum electrodes, Silver electrodes, Amalgam, EDTA.

A survey on the iodide-mercury(II) reaction and its analytical uses is given. Titrations of iodide with mercury(II) in various acidities, using nitrate, acetate, and chloride as titrants and silver or platinum amalgam as the indicator electrode, showed that mercury(II) nitrate is the best titrant giving 0.46 V/0.1 ml potential break in comparison with 0.14 V/0.1 ml of mercury(II) chloride and 0.35 V/0.1 ml of mercury(II) acetate, all titrants being 0.05 M in mercury(II). (Mortland-Battelle)
W74-06870

ELECTRON-DONOR-ACCEPTOR COMPLEXING REAGENTS IN THE ANALYSIS OF PESTICIDES. VI. INFLUENCE OF STRUCTURE IN DETECTION AND IDENTIFICATION,
Dalhousie Univ., Halifax (Nova Scotia). Trace Analysis Research Centre.
J. D. MacNeil, R. W. Frei, and O. Hutzinger.
Mikrochimica Acts, No 5, p 641-650, 1973. 4 fig, 2 tab, 13 ref.

Descriptors: *Pesticides, *Pollutant identification, *Mass spectrometry, Degradation(Decomposition), Colorimetry, *Chromatography.
Identifiers: *Thin layer chromatography, Spray reagents, Electron acceptors, Electron donors, Mass spectra.

Pesticides may be detected following thin layer chromatography by spraying the chromatogram with a reagent which forms a pi complex with the pesticide. The effect of various pesticide structures and substituents in choosing a suitable pi complexing reagent is discussed as well as the effect of these factors in influencing the color of the complex formed. Quantitative analyses may be performed in situ on the thin layer chromatogram and positive identification of the pi complexed compounds may be made by mass spectrometry. The procedure should be applicable for formulation analysis or studies of pesticide decomposition. The sensitivity of these reagents (1-10 micrograms) is not sufficient, however, for them to be regarded as having a useful potential in residue analysis. Their principal use will be in cases where a non-destructive colorimeteric method of detection offers an advantage. (See also W72-05440) (Mortland-Battelle)
W74-06871

ORGANIC FUNCTIONAL GROUP ANALYSIS VIA GAS CHROMATOGRAPY. III. DETERMINATION OF CARBAMATES BY REACTION WITH ALKALI,
Brooklyn Coll., N Y. Dept of Chemistry.
A S Ladas, and T S Ma
Mikrochimica Acta, No 5, p 853-862, 1973. 4 fig, 1 tab, 18 ref.

Descriptors: *Carbamate pesticides, *Gas chromatography, *Alkalis(Bases), Alcohol, *Pollutant identification, Instrumentation.
Identifiers: Methyl carbamate, Ethyl carbamate, Iso-propyl carbanilate.

A gas chromatographic procedure for the analysis of carbamates employs a specially prepared reaction tube, packed with a 10 percent mixture of potassium hydroxide in glass beads, placed inside the injection port of a Perkin-Elmer 900 Gas Chromatograph in front of the chromatographic column packed with Porapak Q.S. A solution of the carbamates (0.01-0.1 micromole) is injected directly into the gas chromatograph. The carbamates are reacted with the alkali present in the reaction tube and the alcohols produced are separated, detected and recorded. Standard calibration graphs of the alcohols are prepared in the same manner and the quantities of carbamates are determined. The procedure is fast and quantitative. (Mortland-Battelle)
W74-06872

METHOD OF PREPARING WASHED SUSPENSIONS OF ANAEROBIC BACTERIA FOR METABOLIC STUDIES,
National Chemical Research Lab., Pretoria (South Africa).
C. Roche, J. Albertyn, and A. Kistner.
Laboratory Practice, Vol 22, No 10, p 633-634, October 1973. 2 fig, 1 tab, 3 ref.

Descriptors: *Anaerobic bacteria, *Centrifugation, Metabolism, Oxidation-reduction potential, Cultures, Laboratory equipment, *Pollutant identification.
Identifiers: *Washed suspensions, Butyrivibrio, Sample preparation.

In preparing washed suspensions of anaerobic bacteria for various microbiological studies, it is essential to avoid any exposure of the organisms to air or oxygen. An apparatus that minimizes the risk of exposure during centrifugation is described along with procedures for its use. Culture vessels were de-aerated using gas mixtures that were passed through a catalytic gas purifier cartridge. Copper and butyl rubber tubing were used to minimize diffusion of oxygen into the purified gas. In producing and maintaining low redox potentials during washing the composition of the reducing solution was arranged to be similar in ionic concentration to the growth medium. Deionized water, which was boiled and prepared under a

blanket of oxygen-free gas, was used for preparing the media and mineral solution. Membrane filtration was also used. All transfers of media and solution were made with sterile syringes. A specific application of the procedure to cultures of Butyrvibrio species is described. (Mortland-Battelle)
W74-06875

STREAM POLLUTION AND A SIMPLIFIED DIVERSITY INDEX,
Oberlin Coll., Ohio.
D. A. Egloff, and W. H. Brakel.
Journal Water Pollution Control Federation, Vol 45, No 11, p2269-2275, November 1973. 2 fig, 3 tab, 22 ref.

Descriptors: *Water pollution, Natural streams, *Bioindicators, *Benthic fauna, Waste water(Pollution), Biological communities, Water quality, Water pollution effects, *Biota, Aquatic animals, Bottom sampling, Invertebrates, Water quality standards, Dissolved oxygen, Physicochemical properties, Water chemistry, Water temperature, Biochemical oxygen demand, Nitrates.
Identifiers: *Species diversity index, Macroinvertebrates, Species diversity, Plum Creek, Fecal coliforms, Orthophosphates.

Biological indexes of diversity of benthic macroinvertebrate communities were determined at seven stations in a stream subjected to pollution by secondarily treated domestic wastewater. Indexes based on three different levels of taxonomic classification (genus, order, and class) all reflected the effect of the discharge on the biological communities. The advantages of using an index of biological diversity based on higher taxonomic categories include (1) direct assessment of the biological impact of pollution, (2) a great savings in time and technical expertise usually required to identify biological specimens to low taxonomic categories, and (3) the retention of some taxonomic information, which is required for making many biological inferences, especially with respect to the effect of pollution on biological food chains. (Holoman-Battelle)
W74-06876

USING ARTEMIA TO ASSAY OIL DISPERSANT TOXICITIES,
National Marine Water Quality Lab., West Kingston, R.I.
E. J. Zillioux, H. R. Foulk, J. C. Prager, and J. A. Cardin.
Journal Water Pollution Control Federation, Vol 45, No 11, p 2389-2396, November 1973. 6 fig, 4 tab, 7 ref.

Descriptors: *Bioassay, Design criteria, *Brine shrimp, Methodology, Sea water, *Toxicity, Eggs, *Assay, Water quality standards, Lethal limit.
Identifiers: *Oil dispersants, Standard methods, Nauplii, Sodium dodecyl sulfate, Sample preparation, *Artemia.

Criteria established for a procedure to assay oil dispersants included the following: (1) The assay must not require special training or skills by a technical level person. (2) Only common laboratory equipment would be required. (3) Materials and time must be minimal. (4) The results must be accurate and available in a short time. (5) The end point must be quantitatively measurable. (6) The organism must be sensitive to chemical changes, yet suitable for laboratory tests. (7) The species must be commercially available, be capable of being raised in the laboratory, and not require care between assays. (8) Large numbers of the organisms must require small volumes of medium. (9) Neither the assay nor the organisms must require a permanent allotment of laboratory space. These criteria were satisifed at least partially by desigining a bioassay procedure which uses nauplii of Artemia salina in synthetic seawater under defined chemical and physical conditions. The brine shrimp are stored as eggs which are incubated and hatched when needed. Sodium dodecyl sulfate is used as a reference toxicant to indicate differences in the condition of organisms that may occur during the test. The procedures were used to compare 48 hr TL sub 50 values of six proprietary oil dispersants with that of sodium dodecyl sulfate. Factors and variations in method that may affect bioassay results are discussed. Conclusions are that Artemia is a suitable bioassay species to determine comparative toxicity of oil dispersant compounds but that it should not be used to determine limiting environmental concentrations for protection of marine life. (Little-Battelle)
W74-06877

NEW SPOT TESTS FOR NITRATES AND NITRITES,
Ain Shams Univ., Cairo (Egypt). Microanalytical Research Labs.
S. S. M. Hassan.
Microchemical Journal, Vol 18, No 5, p 486-490, October 1973. 9 ref.

Descriptors: *Nitrates, *Nitrites, *Aqueous solutions, *Chemical analysis, *Pollutant identification, Color.
Identifiers: Detection limits, Chemical interference, Sensitivity.

Nitrates can be determined by placing a drop of the test solution in a microtest tube with aqueous hydroquinone solution and HCl, covering the mouth of the tube with filter paper treated with Griess reagent, and heating. Development of a pink or red spot indicates nitrates. An alternative test involves cooling the aforementioned solution, shaking with ether, and placing one or two drops of this solution on filter paper spotted with tetra base. A blue stain indicates nitrates. The lower detection limit for both procedures is 50 micrograms of KNO3. Nitrites are determined by mixing a drop of test solution on a spot plate with one drop of Griess reagent. Nitrites produce a red color. The detection limit is 5 micrograms of KNO2. Nitrates are identified in the presence of nitrites by adding sodium azide to the test solution before applying one of the previously described procedures. The detection limit is 60 micrograms of KNO3. Nitrites can be detected in the presence of nitrates by the method described. The detection limit is 10 micrograms of KNO2. Further tests were conducted to detect interfering ions. (Little-Battelle)
W74-06878

QUANTITATIVE METHODS FOR PRELIMINARY DESIGN OF WATER QUALITY SURVEILLANCE SYSTEMS,
Raytheon Co., Portsmouth, R. I. Oceanographic and Environmental Services.
S. G. Chamberlain, C. V. Beckers, G. P. Grimsrud, and R. D. Shull.
Water Resources Bulletin, Vol 10, No 2, p 199-219, April 1974. 8 fig, 2 tab, 17 ref.

Descriptors: *Monitoring, *Water quality, *Water pollution control, Network design, Sampling, Cost-benefit analysis, Mathematical models, Data processing, *Indiana, *Illinois.
Identifiers: *Wabash River.

A preliminary phase of the design of water quality surveillance systems is the specification of sampling frequencies and station locations throughout the basin; that is, the development of an adequate space/time sampling plan. Quantitative methods were developed to identify candidate sets of sampling frequencies and station locations, and to establish priorities for implementing the different frequencies and locations. These methods are useful in cost/effectiveness analyses, and are based on the objective of pollution abatement. A spatial priority measure is dependent both on the water quality profile in the stream and on the information obtained from monitoring stations in other streams. A temporal sampling priority rating is a measure of the effectiveness of the surveillance system with respect to its ability to detect the violations in the standards. To illustrate the quantitative methods, the procedures were applied to the Wabash River Basin. (Knapp-USGS)
W74-06885

ANALYSIS OF THE FEASIBILITY OF AN EXPERIMENT TO MEASURE CARBON MONOXIDE IN THE ATMOSPHERE,
General Electric Co., Philadelphia, Pa.
M. H. Bortner, F. N. Alyea, R. N. Grenda, G. R. Liebling, and G. M. Levy.
Available from NTIS, Springfield, Va. 22151 as NASA CR-2303. Printed price $6.25 domestic; $8.75 foreign; $1.45 microfiche. National Aeronautics and Space Administration Contractor Report CR-2303, October 1973. 251 p, 42 fig, 45 tab, 35 ref, 2 append. NASA Contract NASA-10139.

Descriptors: *Air pollution, *Monitoring, *Instrumentation, Data collections, Pollutant identification, Optical properties.
Identifiers: *Carbon monoxide, Interferometers.

Atmospheric carbon monoxide was measured from a remote platform using the correlation interferometry technique. The method is feasible for obtaining a global carbon monoxide map and a vertical carbon monoxide profile. Data can be obtained with an accuracy of 10% using this technique on the first overtone band of CO at 2.3 micrometers. That band is much more suitable than the stronger fundamental band at 4.6 micrometers. Calculations for both wavelengths are presented to illustrate the effects of atmospheric temperature profiles, inversion layers, ground temperature and emissivity, CO profile, reflectivity, and atmospheric pressure. The applicable radiative transfer theory on which these calculations are based is described together with the principles of the technique. (Knapp-USGS)
W74-06917

SILVER CONCENTRATIONS IN ANTARCTIC SNOW AND FIRN,
Nevada Univ., Reno. Desert Research Inst.
J. A. Warburton, G. O. Linkletter, and L. G. Young.
Antarctic Journal, Vol 8, No 6, p 342-343, November-December 1973. 1 tab, 3 ref.

Descriptors: *Precipitation(Atmospheric), *Antarctic, Weather modification, Sampling, Spectrophotometry, Pollutant identification.
Identifiers: *Silver.

A worldwide 'baseline' for silver concentration in precipitation to which other measurements can be compared was made in Antarctica by virtue of its remote location and its high polar ice sheet. Samples were collected with a carefully cleaned stainless steel auger or polyethylene scoop, from pits. The average silver concentration for the antarctic snow and firn samples studied is 8 times 10 to the -13 power g silver per milliliter. This appears to provide an excellent baseline value for silver in precipitation. (Knapp)
W74-06930

PB-210 CONCENTRATION IN ICE MEASURED AT SOUTH POLE STATION,
Centre National de la Recherche Scientifique, Gif-sur-Yvette (France). Centre des Faibles Radioactivities.
J. Sanak.
Antarctic Journal, Vol 8, No 6, p 339, November-December 1973. 1 fig.

Descriptors: *Lead, *Snowpacks, *Antarctic, Precipitation(Atmospheric), Firn, Snow, Ice, Sampling, Lead radioisotopes, *Pollutant identification.

To test for Pb-210 at Amundsen-Scott South Pole Station, firn samples were collected in a 2-meter-deep pit. Each sample represented a 4-centimeter-thick layer of snow and was carefully collected and sealed in a polyethylene bag. Also an ice core was taken at a depth between 2 and 4 meters. The average decrease of the Pb-210 concentration yielded the rate of snow accumulation. The mean annual rate was 10.0 centimeters of water between 1952 and 1971. The variations of the Pb-210 concentration around the average value seem to be important and cannot be attributed to manipulation errors. (Knapp-USGS)
W74-06932

GROUND WATER QUALITY DATA FOR PLANNING, MONITORING AND SURVEILLANCE,
California State Dept. of Water Resources, Sacramento. Div. of Resources Development.
J. L. Welsh.
In: Proceedings of 9th Biennial Conference on Ground Water, Sept 13-14, 1973, Francisco Torres Conference Center, Goleta, Calif: California University Water Resources Center Report No 26, p 58-63, December 1973.

Descriptors: *Water quality, *Monitoring, *Groundwater, Data storage and retrieval, Data processing, Hydrogeology, Data collections, Hydrologic data, *California.

Interpretation of groundwater quality data must rest on a base of reliable knowledge of the geologic structure and the hydrologic regimen. The description of the resource quality must include the quality of each aquifer separately as well as the quality of the produced groundwater. The produced groundwater is a mixture of aquifer waters depending on the location of perforations in the well, aquifer yield characteristics and the pressures in the aquifers perforated. The description must be based on sufficient data to interpolate reliably between data points and present a clear picture of quality of groundwater areally and vertically. A greater problem exists in determining specific data requirements for surveillance of nonpoint or diffuse sources of pollution and to ascertain the effects of controls. A much broader area needs to be monitored because nonpoint sources by their nature affect large areas. The system used in California for processing water-quality data has the capability for retrieving and analyzing the stored data statistically and graphically as well as in standard listing forms. (See also W74-06942) (Knapp-USGS)
W74-06947

QUALITY OF GROUND WATER IN THE LOWER COLORADO RIVER REGION, ARIZONA, NEVADA, NEW MEXICO, AND UTAH,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 7C.
W74-06960

ATOMIC ABSORPTION DETECTOR FOR LIQUID-LIQUID CHROMATOGRAPHY,
Missouri Univ., Columbia. Dept. of Chemistry.
S. E. Manahan, and D. R. Jones, IV.
Analytical Letters, Vol 6, No 8, p 745-753, 1973. OWRR A-056-MO(3). 14-31-0001-3925.

Descriptors: *Chelation, Spectroscopy, *Chromatography, Nitribotriacetic acid, Analytical techniques, *Pollutant identification, *Ion exchange, Cations.
Identifiers: EDTA, *Atomic absorption, Detectors, *Chelating agents.

Because of their role in the solubilization and transport of heavy metal ions and algal nutrient metals, chelating agents are very important in natural waters and wastewaters. They have not been extensively studied, largely because of the lack of analysis methods for them. High-speed liquid chromatography potentially is one of the most useful methods for the analysis of aquatic chelating agents because of its ability to separate species in their natural medium (water). This technique has been handicapped by lack of sensitive and specific detectors. A detector system for chelating agents has been developed. The sample passes through a short column of chelating ion exchange resin bound to copper. An equivalent amount of copper is solubilized from the resin and is aspirated directly into an atomic absorption spectrophotometer set to measure copper. A peak with an area proportional to the amount of chelating agent is recorded. The method is accurate to approximately 3%. As little as 5x10 to the power -7 millimoles of EDTA or NTA can be detected. Interferences from divalent cations can be elminated by exchanging sodium for the divalent cations with an ion exchanger.
W74-06998

AN ATOMIC ABSORPTION ANALYSIS METHOD FOR CYANIDE,
Missouri Univ., Columbia. Dept. of Chemistry.
S. E. Manahan, and R. Kunkel.
Analytical Letters, Vol 6, No 6, p 547-553, 1973. OWRR A-056-MO(2). 14-31-0001-3825.

Descriptors: Pollution, *Cyanide, *Spectroscopy, Plating, Mining, Waste waters, Copper, Sewage, *Pollutant identification, Analytical techniques, Metals, Ions, Methodology.
Identifiers: *Atomic absorption, Stoichiometry, *Complexation, Plating, *Metal ions.

Complexing agents are species which bind to metal ions and generally serve to keep metals in solution. Many significant metals form strong complexes. Among such metals are iron, copper, and mercury. Complexation probably is very significant in the solubilization and transport of heavy metals through natural water systems and waste treatment processes. Therefore, a need exists for the development of methods for the analysis of complexing agents in water. Cyanide ion is a significant complexing agent and is also toxic. It is a common component of mining, metal refining, and plating waste. An atomic absorption analysis method for cyanide is described. The method depends upon the solubilization of copper(II) from an insoluble basic copper salt at pH 10. An amount of copper remaining in solution equivalent to 1/3 of the molar cyanide ion concentration originally present is measured to give cyanide ion concentration. Apparently the complex ion, Cu(CN)3, is the soluble copper complex, and no formation of cuprous cyanide was observed at low cyanide ion concentrations. The method is sensitive down to 2.0x10 to the power -5 M cyanide ion concentration. Reasonable levels of iron do not interfere. The recovery of cyanide from spiked secondary sewage effluent samples is demonstrated.
W74-06999

ORIGIN OF CIRCULAR BEDS OF THALASSIA (SPERMATOPHYTA:HYDROCHARITACEAE) IN SOUTH BISCAYNE BAY, FLORIDA, AND THEIR RELATIONSHIP TO MANGROVE HAMMOCKS,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
J. C. Zieman, Jr.
Bull Mar Sci. Vol 22, No 3, p 559-574. 1972. Illus.
Identifiers: *Aerial photography, Bays, *Biscayne Bay(Fla), Burrows, Callianassid, *Florida, Hydrocharitaceae, *Mangrove hammocks, Origin, Peat, Relationship, Rhizophora, Spermatophyta, *Thalassia, Worms, Estuaries.

Comparisons of aerial photographs of a mangrove shoreline and an adjacent estuarine area in southwestern Biscayne Bay, Florida, showed the presence of numerous circular to teardrop-shaped areas. The circular areas on shore are hammocks of mangroves and other tropical trees and they are over depressions in the bedrock which are filled with mangrove peat. The circular areas in the estuary are beds of T. testudinum. These nearly always occur over depressions in the bedrock that are filled with autochthonous mangrove (Rhizophora) peat. The peats reach a pH of 4.9 and a depth of 5 m. Thalassia beds are often surrounded by a white halo fo worm and callianassid burrows in the broken area at the periphery of the depressions in the bedrock. The effect of sediment depth on density and length of blades is shown. Dated mangrove peat from beneath a Thalassia bed 3 m below present sea level was 3680 yr old. In this area the mangrove shoreline receded as sea level rose, and the beds of Thalassia then colonized the planed-off hammocks.--Copyright 1973, Biological Abstracts, Inc.
W74-07022

INVESTIGATION OF BREWING WATER TREATMENT,
A. Totsuka, T. Sumikawa, H. Ogino, Y. Namba, and Y. Komuyama.
Rep Res Inst Brew. 143. p 40-48. 1971.
Identifiers: Ammonia, *Brewing waters(Treatment), Copper, Iron, Manganese, Methodology, Nitrites, Zinc, *Waste water treatment, *Pollutant identification, *Flame photometry.

Collecting the 44 brewing waters treated with various instruments, the changes of components before and after treatment were analyzed by flame photometry for K and Na, atomic absorption spectrophotometery for other metals, and conventional method for other components. To judge water treatments, the standard contents in water were as follows: Fe, Mn, Zn and Cu were less than 0.02 ppm, organic substances determined by KMnO4 consumption were less than 5.0 ppm, and ammonia and nitrite contents were less than 0.04 and 0.01 ppm, respectively. Only 2 samples were treated effectively. The reasons for poor treatments are either mis-management or mis-application of instruments. Celite and other filtration agents do not cause removal of ammonia and metals. Sand filtration must be used in combination with other treatments. Aeration or chlorination-sand filtration methods do not reach the standard level. The Fe bacterial method removes the Fe effectively but other components are not excluded. Active C treatment cannot reach the standard level because of contamination of minerals and the existence of unremovable substances. The manganese zeolite method is insufficient because of leakage of Mn from the packed column. Ion exchange resin is probably the most effective treatment but should be used in combination with other instruments. Though the incomplete growth and breakdown of flocculate occurs, the coagulation method removes Fe; but this method should be used in combination with other instruments.--Copyright 1973, Biological Abstracts, Inc.
W74-07023

THE MERCURY CONTENT OF PREHISTORIC FISH,
Michigan Univ., Ann Arbor. Museum of Anthropology.
E. N. Wilmsen, and J. T. Meyers.
Ecol Food Nutr. Vol 1, No 3, p 179-186. 1972. Illus.
Identifiers: Aplodinotus-grunniens, *Fish, Ictalurus-punctatus, *Mercury, Phylodictis-olivaris, Prehistoric, Channel catfish, Drum, Flathead catfish, Illinois, Apple Creek(Ill), Michigan, *Catfish, Pollutant identification.

Seventeen samples of fish remains were analyzed for Hg content by a neutron activation technique. Three samples were from Apple Creek, a Late Woodland site in central Illinois which is dated shortly after 400 A.D. Five samples were from the Schultz site in Saginaw County, Michigan, a Middle Woodland location slightly older than Apple Creek. The remaining 9 samples were from the

pre-Inca Chilca site located on the central coast of Peru. Freshwater species tested were Ictalurus punctatus (channel catfish), Pylodictis olivaris (flathead catfish), and Aplodinotus grunniens (drum). Five modern samples of these species from streams near Apple Creek were analyzed as a control. Peruvian salt water species have not yet been identified but are probably tuna and anchovy. Samples of the soil matrix in which the Chilca and Schultz specimens were found were also tested. Twelve of the prehistoric samples contained Hg in detectable quantities ranging from 0.014-9.463 ppm. Only one of the modern samples contained detectable Hg and neither soil sample had Hg in detectable amounts. The importance of archaeological data for establishing baselines for modern environmental evaluations is discussed. Implications of these data for modern disposal practices are considered.--Copyright 1973, Biological Abstracts, Inc.
W74-07026

5B. Sources Of Pollution

MERCURY IN THE ENVIRONMENT,
Hope Coll., Holland, Mich. Dept. of Chemistry.
D. H. Klein.
Copy available from GPO Sup Doc as EP1.23:660/2-73-008, $0.65; microfiche from NTIS as PB 231 256 $1.45. Environmental Protection Agency Technology Series Report EPA-660/2-73-008, December 1973. 23 p, 6 tab, 9 ref. EPA Project 16040 FRL.

Descriptors: *Mercury, *Metals, Water pollution, Air pollution, *Water pollution sources, Soil contamination, Sediments, Suspended solids, Path of pollutants, *Michigan, Treatment facilities.
Identifiers: *Air pollution sources, Sewage treatment plants, Coal-burning power plants.

Results are presented of studies of dilute discharges of mercury and some other metals into the characteristically low-metals environment of western Michigan, together with information on the transport of some of these metals through the environment, and on their sinks in the sediments. Atmospheric discharge sources include power plants, airports, asphalt plants, and general urban industrialization. Metals less volatile than mercury are deposited in surface soils near the point of discharge, but only a small portion of the mercury is deposited near the point of discharge. Sewage treatment plants represent a source of discharge of fairly large amounts of mercury-about 1000 lb per million population. This mercury is associated primarily with the suspended solids. In local lakes and rivers, mercury is also associated primarily with the suspended solids. In sediments, the concentrations of mercury and other metals correlate strongly with the organic content and the fraction of fine particulates. (Alford-EPA)
W74-06523

OXIDATION OF ORGANIC MATTER IN SEDIMENTS,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W74-06528

FRESHWATER BIOLOGY AND POLLUTION ECOLOGY: TRAINING MANUAL.
Environmental Protection Agency, Cincinnati, Ohio. Office of Water Program Operations.
For primary bibliographic entry see Field 5A.
W74-06558

THE IMPACT OF SLIMES-DAM FORMATION ON WATER QUALITY AND POLLUTION,
Department of Water Affairs, Pretoria (South Africa).
T. R. Rudd.
Journal of the South African Institute of Mining and Metallurgy, Vol 74, No 5, p 184-192, December 1973. 6 fig, 10 tab, 4 ref.

Descriptors: Water pollution sources, Impaired water quality, *Coal mine wastes, Pyrite, Sulfate, Fluorides, *Path of pollutants, Toxicity.
Identifiers: *Slimes dams, *Gold mine wastes, Fluorspar, *South Africa, Witwatersrand(So Afr), Natal(So Afr).

Slimes dams have a considerable effect on the quality of water for urban, industrial and mining use in large areas of South Africa, both within and beyond the mining areas where the dams were built. The main mineral pollutants are pyrites (FeS2) associated with gold and coal mining, and fluorspar (CaF2) from fluorspar mines as well as from some coal and iron mines. As fluorspar generally occurs in dolomitic areas there is a danger that it may poison major ground-water resources. The effect of coal mining on 2 typical rivers in Natal is discussed, and the spread of pollutants (sulphates and fluorides) from the Witwatersrand gold mines and their impact on urban and agricultural use of water downstream of the Barrage are illustrated. The diminishing sulphate content of certain tributaries indicates that in time the increase in pollution may be halted or reversed by stricter control over industrial wastes reaching the sewers and rivers, reclamation work on slimes dams and dumps, further leaching of the slimes, and decreased pumping by the mines. (DWA)
W74-06604

AN ECOLOGICAL ACCOUNT OF THE PAST AND FUTURE OF SOUTH AFRICAN RIVERS,
National Inst. for Water Research, Congella (South Africa). Regional Lab.
For primary bibliographic entry see Field 5C.
W74-06606

THE EFFECT OF POLLUTION ON THE VAAL RIVER BARRAGE AND THE QUEST FOR WATER QUALITY,
Rand Water Board, Johannesburg (South Africa).
R. J. Laburn.
The Civil Engineer in South Africa, Vol 16, No 2, p 62-65, February 1974. 2 fig.

Descriptors: *Water pollution, *Water pollution sources, *Water pollution control, Reservoir operation, Waste water treatment, Water reuse.
Identifiers: *South Africa(Vaal River).

The Rand Water Board supplies water from the Vaal River to a highly industrialized 16,400 sq km area in the Pretoria - Johannesburg-Vereeniging region which generates 60 per cent of the gross national product and has a population of 4 million people. In 1973 the Board supplied an average daily quantity of 1,360 ml/d. Water derived from Vaal Dam upstream of the Barrage is of good quality but accretions between Vaal Dam and the Barrage from tributaries which drain from areas of intensive mining and industrial activity have caused an accelerating increase in dissolved solids, especially sulphates, carbonates and chlorides, and accordingly in chlorine dosage for purification. Possible solutions discussed are the tracing and control of sources of pollution, the separation of different types of polluted water, reuse of sewage effluent, and a dual system of water supply whereby two qualities of water would be provided. Ways of financing these measures are considered. (DWA)
W74-06607

UTILIZATION OF PHOSPHORUS BY PHYTOPLANKTON IN PHOSPHORUS-RICH ENVIRONMENTS,
Georgia Inst. of Tech., Atlanta. School of Biology.
For primary bibliographic entry see Field 5C.
W74-06611

DENITRIFICATION AS A PATHWAY FOR NITRATE REMOVAL IN AQUATIC SYSTEMS,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
D. W. Nelson, L. B. Owens, and R. E. Terry.
Available from the National Technical Information Service as PB-231 305, $4.00 in paper copy, $1.45 in microfiche. Indiana Water Resources Research Center, Lafayette, Technical Report No. 42, December 1973. 82 p, 7 fig, 27 tab, 11 ref. OWRR-A-019-IND(3).

Descriptors: *Denitrification, *Anaerobic bacteria, *Lake sediments, *Sediment-water interface, *Nitrates, Nitrites, Dissolved oxygen, Anaerobic conditions, Organic compounds, Carbon, Sediments, Nitrogen, Isotopes.
Identifiers: Glucose, Organic carbon, N-15 isotope.

Denitrification was determined by decrease in total nitrogen in a water media or by a decrease in N-15 labelled nitrate in sediment systems. It was established that the numbers of denitrifying bacteria, pH, and nitrate concentration of most surface waters will support denitrification. The process is inhibited by high dissolved oxygen and low dissolved organic carbon. Low temperature also restricts denitrification. River water samples exhibited denitrification when amended with glucose and nitrate under anaerobic conditions, whereas, pond waters did not. The findings indicated that denitrification in the water phase is insignificant to the nitrogen status of most streams and lakes. However denitrification in sediments may result in a large removal of nitrate from aquatic systems each year. Due to the large denitrifying capacities of sediments, it seems likely that denitrification is limited primarily by the relatively low amounts of nitrate entering the sediment by seepage through the lake bottom or by diffusion of nitrate from the overlying water in response to a concentration gradient.
W74-06612

UNRECORDED POLLUTION AND DYNAMICS OF BIOCHEMICAL OXYGEN DEMAND,
Rutgers - The State Univ., New Brunswick, N.J.
W. Whipple, Jr., J. V. Hunter, S. L. Yu, J. P. Hewitt, and J. Cirello.
Available from the National Technical Information Service as PB-231 306, $4.00 in paper copy, $1.45 in microfiche. New Jersey Water Resources Research Institute, New Brunswick, March 1974, 77 p, 20 fig, 22 tab, 48 ref. OWRR A-025-NJ(4). 14-01-0001-3030.

Descriptors: *Water pollution sources, Water quality, *Biochemical oxygen demand, *Urban runoff, Water quality control, Nutrients, Oxygen demand, Urban areas, *New Jersey, Model studies.
Identifiers: Unrecorded pollution, *Non-point pollution sources, *Oxygen demand kinetics, *Water quality models, *Morristown(N.J.).

Results are presented of a four year investigation of the dynamics of biochemical oxygen demand in polluted streams, and of unrecorded origins of such pollution. Data were obtained from watersheds of differing characteristics, including undeveloped woodlands, row crops, single family suburban housing and urban areas. Samples were taken over about a 2 1/2 year period, and analyzed for both 5 day and longer period BOD. It was found that single family suburban housing and row crops in flat land provide only a moderate increase of organic pollution over the undeveloped areas; but that urban watersheds tested are major pollution sources. Very large increases in pollution loading were found for days of rainfall as compared to dry days. A special study of Morristown, N.J. provided a provisional measure of per capita organic pollution to be expected in a clean urban area without major industrial activities. Frequency distributions of the BOD concentrations were prepared. Also seasonal variations of the BOD loadings indicate that loadings much higher than annual average values could be expected for

spring and early summer months. Studies were made of the variation of biochemical oxygen with time, in order to apply to the water quality modelling of polluted streams. The classic first order model was found not to represent the actual situation very adequately. Other equations which have been suggested were also tested. Finally a new equation was derived which proved to be statistically more satisfactory, and relatively simple to apply. Certain new concepts are suggested for the application of BOD data to water quality modelling of polluted streams. (Whipple-Rutgers)
W74-06613

CHLORINE PRODUCTION DROPS AS DEMAND LAGS.
Chemical and Engineering News, Vol 49, No 46, p 10-11, November 8, 1971. 2 fig.

Descriptors: *Chlorine, *Industrial production, *Industrial wastes, *Mercury, Water pollution, Plastics, Solvents, Pulp and paper Industry, Air pollution, Pollution abatement, *Demand.

The annual production of chlorine has been dropping from 6-7% per year. The reason is that chlorine's largest markets, including vinyl chloride, chlorinated solvents, and paper production face declining business. The mercury pollution problem has had little effect on chlorine capacity. Only two plants out of 30 reporting had stopped using mercury. Loss of mercury in water wastes has been reduced on an industry average to 2% of the January 1, 1970 level. Chlorine producers are now working to reduce emissions of mercury to the atmosphere. One plant had to shut down, being unable to cope with the problem. The mercury cell use is declining. Most new plants will probably use diaphragm cells. (Oleszkiewicz- Vanderbilt)
W74-06766

ENVIRONMENTAL MERCURY CONTAMINATION.
Ann Arbor Science Publishers, Inc., Ann Arbor, Michigan, 1972, R. Hartung and B. D. Dinman, editors. 349 p.

Descriptors: *Mercury, *Environmental effects, *Analytical techniques, *Public health, Pollutants, Water pollution, Air pollution, Soil contamination, Wastes, Effluents, Toxicity, Agricultural chemicals, Organic compounds, Inorganic compounds, Chemical reactions, Poisons, Distribution patterns, Fish, Bioassay, Birds, Laboratory tests, Path of pollutants, Food chains, Sediments, Aquatic life, Pathology, Biochemistry.

This volume is a compilation of much of the available knowledge on the subject of mercury contamination. Papers were presented at the International Conference on Environmental Mercury Contamination, held in Ann Arbor, Michigan, September 30, 1970-October 2, 1970. Discussion material has been added to most of these papers to improve their content and readability. A comprehensive coverage of the topic is presented by dividing the papers into four groups: the occurrence of mercury in the environment and man; methods of analysis; environmental dynamics of mercury; and the biological effects of mercury compounds. (See W74-06771 thru W74-06814) (Jerome-Vanderbilt)
W74-06770

SOURCES OF MERCURY IN THE ENVIRONMENT,
Michigan State Univ., East Lansing. Inst. of Water Research.
F. M. D'Itri.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 5-25, 1972. 76 ref.

Descriptors: *Water pollution sources, *Mercury, *Agricultural chemicals, *Chemical wastes, *Industrial wastes, *Fossil fuels, Pollutants, Wastes, Toxins, Metals, Effluents, Heavy metals, Sewage effluents, Organic compounds, Inorganic compounds, Metallurgy, Water quality control, Electrical equipment, Environmental effects, Air pollution, Coals.
Identifiers: *Methylmercury, Phenylmercury, Chlor-alkali production.

Two major sources of mercury are named; the natural occurrence of elemental mercury found in the earth's crust, and the mercury introduced into the environment from various human activities. Based on 1968 statistics, the largest industrial consumptions of mercury were in the electrical apparatus (26.6%) industry, industrial control instrument manufacture (10.6%), the manufacture of chlor-alkali products (23.1%), and in the phenyl mercury derivatives used in paint manufacturing (14.4%). Other areas of mercury consumption included agricultural slimicides, dental preparations, and metallurgical processing. The total amount of mercury consumed in 1968 was over 5.7 million pounds. Mercury enters the environment directly from nearly all the manufacturing processes, resulting from a failure to utilize the appropriate pollution abatement systems, and through the use of agricultural products containing organo-mercuric compounds. Indirect introduction of mercury into the environment results from the use, misuse and disposal of industrial and consumer products containing mercury. Fossil fuels also contain small amounts of mercury which account for a considerable amount of mercury released because of the use of large quantities of these substances. (See also W74-06770) (Jerome-Vanderbilt)
W74-06771

SOME ESTIMATES OF NATURAL LEVELS OF MERCURY IN THE ENVIRONMENT,
Hope Coll., Holland, Mich. Dept. of Chemistry.
D. H. Klein.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 25-29, 1972. 1 fig, 7 ref.

Descriptors: *Mercury, *Estimating, *Sampling, *Distribution patterns, Pollutants, Air pollution, Water pollution, Soil contamination, Statistics, Data processing, Geochemistry, Transfer, Lakes, Ponds, Streams, Atmosphere, *Path of pollutants.

It is estimated that natural weathering, including river and stream transport, transfers mercury through the environment at a rate of about 5000 tons per year. Another 5000 tons per year is estimated to be involved in manmade transport systems. It is important to know the natural levels of mercury in the environment in order to calculate the amount of mercury contamination due to human activities. Air pollution study readings taken at an elevation of 10,000 ft about 20 miles offshore from the San Francisco Bay region gave mercury concentrations averages slightly below 1 ng/cubic meter. Atmospheric measurements over land ranged from 1 to 50 ng/cu.m. with the average level being 3 ng/cu.m. and high levels in industrial or mining areas. Soil samples from the St. Clair industrial region indicate that atmospheric mercury transport is highly dependent upon wind and rain factors. Data from 67 samples taken from fresh water lakes, ponds, and rivers in the northeastern U.S. are presented as a concentration frequency diagram. The mean level is about 0.05 ppb, while the values are up to 2.8 ppb. The figures presented are subject to further refinement since natural levels are likely to vary with the geology of a given region. (See also W74-06770) (Jerome-Vanderbilt)
W74-06772

THE MERCURY POLLUTION PROBLEM IN MICHIGAN,
Michigan Dept. of Natural Resources, Lansing. Water Resources Commission.
W. G. Turney.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 29-31, 1972.

Descriptors: *Mercury, *Michigan, *Industrial wastes, *Water pollution sources, *Algicides, Pollutants, Air pollution, Soil contamination, Water pollution, Heavy metals, Soil, Lakes, Rivers, Coals, Analysis, Chemical analysis, Atmosphere, Electric power industry.

Possible sources of environmental mercury contamination in Michigan were investigated. The Wyandotte Chemical Company was found to be discharging from 10 to 20 pounds of mercury per day, while a small General Electric plant released approximately 1500 pounds of elemental mercury per year into the local environment. Although there was a fishery in the area near the G. E. Plant, no damage was found. Phenylmercury acetate was used by many communities and industries as an algicide and slimicide in air conditioning cooling towers but it is no longer used or manufactured in Michigan. Seals and other equipment in water treatment facilities contain some mercury which could be of some danger as contaminating agents. Coal from southeastern Ohio which is used by two Michigan power companies was analyzed and found to contain 0.5 ppm mercury. Since an analysis of power plant ash indicates insignificant mercury content it was concluded that this mercury was released into the atmosphere. (See also W74-06770) (Jerome-Vanderbilt)
W74-06773

MERCURY IN FISH IN THE GREAT LAKES,
Michigan Dept. of Natural Resources, Lansing. Fish Div.
J. D. Bails.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 31-37, 1972. 5 fig, 2 ref.

Descriptors: *Mercury, *Water pollution sources, *Sampling, Chemical analysis, *Fish, *Lake Michigan, *Lake Erie, Pollutants, Heavy metals, Data collections, Analytical techniques, Rock bass, Walleye, Catfish, Yellow perch, Chemical wastes, Great Lakes, Path of pollutants, Food chains.
Identifiers: *Lake St. Clair.

Sampling of fish in the Great Lakes region has been practiced since it was first discovered that mercury was a hazard. However, extensive sampling was initiated only after the Lake St. Clair incident in March 1970 when Canada announced that 12,000 pounds of walleye from Lake St. Clair were to be destroyed because of mercury contamination. Until 1970 a random approach was taken to determine the species the number of fish which exceeded 0.5 ppm mercury. This did not provide the data on a given species which is necessary for understanding of the problem. In July 1970 sampling stations were established in Michigan waters along with standards for sample size, species and portions to be analyzed. Walleye, yellow perch, catfish and rock bass were chosen as index species. The highest levels of mercury were found in walleye from Lake St. Clair while lower levels were found in walleye from lake Erie. Mercury concentrations in walleye ranged from a high of 3 ppm to 1 ppm. The pattern was the same for yellow perch with values ranging from 2.2 ppm to 0.2 ppm. Several factors which complicate the evaluation of data are listed. Although a decline in the level of mercury pollution should be detected with the passage of time, the fish taken from Lake St. Clair will not be suitable for human comsumption for a number of years. (See also W74-06770) (Jerome-Vanderbilt)
W74-06774

SURVEY OF MERCURY CONCENTRATIONS IN FISHES OF LAKES ST. CLAIR, ERIE, AND HURON,
Bureau of Commercial Fisheries, Ann Arbor, Mich. Technological Lab.
R. A. Greig, and H. L. Seagran.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 38-45, 1972. 3 fig, 5 tab.

Descriptors: *Mercury, *Distribution patterns, *Lake Huron, *Lake Erie, *Fish, *Sampling, Pollutants, Water pollution, Heavy metals, Great Lakes, Walleye, Drums, White bass, Yellow perch, Bioindicators, Data processing, Analysis.
Identifiers: *Lake St. Clair.

Findings are summarized of a preliminary survey of mercury concentrations in fish collected over the period from March 27 to May 8, 1970 from the U.S. waters of Lakes Erie, Huron, and St. Clair. These findings are related to geographic area and species differences. Data from Lake St. Clair show that essentially all the fish examined contained mercury concentrations considerably in excess of the U.S. Food and Drug Administration's 0.5 ppm 'action level'. In Lake Erie, samples of walleye, drum, white bass, and yellow perch were taken from the eastern, central and western basins and compared for mercury concentration. Walleye from the western basin contained the highest concentration at 1.5 ppm, while drum from the central basin contained the lowest concentration at 0.2 ppm. Tables list several species of fish, ranked on a scale according to the amount of mercury contained in their tissues. A comparison of the contamination of the three lakes was made using yellow perch as a biological indicator. The highest mercury levels were found in Lake St. Clair and the extreme western portion of Lake Erie, while Lake Huron samples showed relatively lower concentrations. (See also W74-06770) (Jerome-Vanderbilt)
W74-06775

MERCURY IN WILD ANIMALS, LAKE ST. CLAIR, 1970,
Bureau of Sport Fisheries and Wildlife, Laurel, Md. Patuxent Wildlife Research Center.
E. H. Dustman, L. F. Stickel, and J. B. Elder.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 46-52, 1972. 3 tab, 6 ref.

Descriptors: *Mercury, *Bioindicators, *Waterfowl, *Path of pollutants, Pollutants, Water pollution, Heavy metals, Biology, Analysis, Analytical techniques, Birds, Reproduction, Data collection, Evaluation, Toxins, Spectrophotometry, Methylation, Atomic absorption spectrophotometry.
Identifiers: *Lake St. Clair.

A preliminary assessment of mercury residues was made for samples of body tissues, eggs and food items removed from the stomachs of water fowl of 4 species, 11 other species of birds, garter snakes and 2 species of frogs taken from the area around Lake St. Clair. Analysis for total mercury was made employing atomic absorption spectrometry with a 'boat modification'. Results, expressed on a wet weight basis, are presented in tables. Mercury residues in many birds appeared to be undesirably high when compared to known harmful amounts. The residues found in tissues of fisheating birds (blue herons and common terns) far exceeded those in other species and were within the range found to be fatal in laboratory experiments. Eggs were found to contain residues of a level considered harmful to reproduction. Since many of these birds are migratory, mercury from Lake St. Clair will find its way to areas far from the source. (See also W74-06770) (Jerome-Vanderbilt)
W74-06776

MERCURY CONTENTS OF BOTTOM SEDIMENTS FROM WISCONSIN RIVERS AND LAKES,
Wisconsin Dept. of Natural Resources, Madison.
J. G. Konrad.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 52-58, 1972. 1 fig, 1 tab, 6 ref.

Descriptors: *Wisconsin, *Mercury, Rivers, *Sediments, *Distribution patterns, Pollutants, Water pollution, Water pollution sources, Heavy metals, Wastes, Industrial wastes, Sampling, Analytical techniques, Bottom sediments, Clays, Sands, Silts, Sewage effluents, Spectrophotometry, Lakes.
Identifiers: *Methylation, Atomic absorption spectrophotometry.

A survey was conducted during the spring of 1970 to determine the location of mercury deposits and elucidate the natural background levels in bottom sediments of lakes and rivers. Samples were collected from 168 locations of 27 rivers and streams which were chosen to reflect discharges of various municipal and industrial wastes and to determine background levels. Flameless atomic absorption analysis was used. Background levels ranged from <0.01 ppm to 0.05 ppm in sandy sediments and from 0.05 ppm to 0.15 ppm in organic and clay sediments. Industrial and municipal systems discharge significant amounts of mercury resulting in high concentrations in some areas; up to 684 ppm in one place. It appears that various water and sediment characteristics, such as pH, control and release of mercury from the bottom sediments. Sludge and effluents from some treatment facilities were also analyzed to determine their contribution to mercury contamination of the environment. The discharge of mercury from a large municipal treatment facility may be as high as 0.5 pounds per day. Public water supplies were found to contain no detectable amounts of mercury. All bottom sediments contain at least a trace of mercury. (See also W74-06770) (Jerome-Vanderbilt)
W74-06777

MERCURY LEVELS IN WISCONSIN FISH,
Wisconsin Dept. of Natural Resources, Madison.
S. J. Kleinert.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 58-70, 1972. 1 fig, 1 tab, 7 ref.

Descriptors: *Mercury, *Path of pollutants, *Fish, *Industrial wastes, *Wisconsin, Pollutants, Water pollution, Water pollution sources, Heavy metals, Walleye, Suckers, Bioindicators, Analytical techniques, Evaluation, Sampling, Spectrophotometry, Sediments, Pulp wastes.
Identifiers: Chor-alkali industry.

A survey was conducted during the spring of 1970 to determine mercury residue levels in fish from a variety of waters in Michigan. Although suckers, goldfish and walleye were the most frequently sampled species, up to 20 different types of fish are included in the survey, representing the population of Wisconsin waters. Determination using atomic absorption spectrometry was done on 1,116 samples representing 2,144 fish taken from 103 locations. Mercury levels in fish taken from water remote from any known source of mercury averaged 0.19 ppm mercury and the values ranged from 0.01 ppm to 0.60 ppm. Different species contained various amounts of mercury and, generally, larger fish had higher concentrations than smaller fish. Fish containing an average of over 0.5 ppm mercury were taken from three areas and public warning was issued for the areas. In general, higher levels of mercury residue were found in fish exposed to waste water discharged from pulp and paper mills and chlor-alkali plants. Mercury is being replaced by a safer substance in the wood processing plants but deposits of mercury in sediments will continue to contaminate for a number of years. (See also W74-06770) (Jerome-Vanderbilt)
W74-06778

MERCURY IN THE LAKE MICHIGAN ENVIRONMENT,
Environmental Research Group, Ann Arbor, Mich.
R. A. Copeland.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 71-76, 1972. 4 fig, 4 ref.

Descriptors: *Mercury, *Plankton, *Sediments, *Lake Michigan, *Distribution patterns, Pollutants, Water pollution, Air pollution, Water pollution sources, Heavy metals, Analysis, Metals, Aquatic microorganisms, Phytoplankton, Zooplankton, Plankton nets, Benthos, Great Lakes, Runoff.

During 1969-70 the Great Lakes Research Division of the University of Michigan established a grid of 21 stations on Lake Michigan, where samples of phytoplankton, zoolplankton, benthos, water and sediments were taken for analysis of 30 elements including mercury. The average value of mercury for phytoplankton was 2.2 ppm, for zooplankton 0.9 ppm and for benthos 1.4 ppm, dry weight. Wet weight values would be approximately 0.44, 0.2, and 0.3 ppm, respectively. As these values were below the 0.5 ppm maximum permissible concentration it appeared that Lake Michigan was still relatively free of mercury contamination. No isolated sources of mercury entering the lake were found. The low concentrations in the southern end of the lake indicated that contamination from airborne mercury resulting from the burning of fossil fuels was negligible. The mercury in the lake was assumed to result from surface runoff as values along the shore are higher than in the center of the lake. (See also W74-06770) (Jerome-Vanderbilt)
W74-06779

INVESTIGATION OF MERCURY CONTAMINATION IN THE TENNESSEE VALLEY REGION,
Tennessee Valley Authority, Chattanooga.
O. M. Derryberry.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 76-79, 1972. 2 fig.

Descriptors: *Mercury, *Data, *Analysis, *Fish, *Tennessee Valley Authority, Pollutants, Water pollution, Water pollution sources, Heavy metals, Metals, Sediments, Management, Reservoirs, Virginia, Alabama, Streams, *Industrial wastes.
Identifiers: Pickwick Reservoir(Ala), North Fork Holston River(Va), Chlor-alkali industry.

Mercury compounds in water resulted in fish-kills in the Tennessee Valley in July 1968 and in the spring of 1969. Action was taken by the Tennessee Valley Authority to analyze samples of fish, water and sediment from 26 reservoirs, and 4 stream reaches. Mercury was found only in Pickwick Reservoir in northern Alabama and the North Fork Holston River in southwest Virginia. Although mercury levels in fish from the Pickwick Reservoir reach 2.4 ppm, the mercury concentration in the water was found to be below the standard of 5.0 ppb proposed by the U.S. Public Health Service. Both areas were closed to fishing. The major sources of mercury in the Tennessee Valley were 3 large caustic-chlorine plants which have taken action to eliminate the mercury discharges. The TVA will continue to monitor the water in that area. Two maps show sampling points and indicate areas of contamination. (See also W74-06770) (Jerome-Vanderbilt)
W74-06780

DISTRIBUTION OF MERCURY IN THE ENVIRONMENT OF MINAMATA BAY AND THE INLAND ARIAKE SEA,
Kumamoto Univ. (Japan). Medical School.
T. Takeuchi.

In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 79-81, 1972. 1 fig, 2 ref.

Descriptors: *Distribution, *Mercury, *Sediments, *Industrial wastes, Pollutants, Water pollution, Water pollution sources, Metals, Heavy metals, Fish, Shellfish, Measurements, Patterns, Evaluation, Crabs, Food chains, Animal pathology, Pathology, Toxins, Crabs, Lobsters.
Identifiers: *Japan(Minamata Bay), Methylation, Poisoning.

In 1959 investigations suggested that mercury was the agent responsible for Minamata disease. The sediments and aquatic life of Minamata Bay were found to have high concentrations of mercury. Sediment from a drainage channel which led to the bay from several chemical plants contained a maximum mercury concentration of 2010 ppm (wet weight). The concentration dropped sharply with distance from the point of discharge, to concentrations of 40 to 59 ppm in the central portion of the bay. At the mouth of the bay which leads to the sea, concentrations were 22 ppm at 1 km and 12 ppm at 1.5 km from the point of discharge. Sediments directly outside Minamata Bay contained only 0.4 to 3.4 ppm Hg. Fish and seafoods caught in the Bay contained from 1 to 36 ppm Hg; the same seafoods outside the Bay in the Shiranue Sea contained from 1-13.5 ppm Hg; and in similar catches in other uncontaminated Japanese waters concentrations never exceeded 1 ppm Hg. (See also W74-06770) (Jerome-Vanderbilt)
W74-06781

MERCURY LEVELS IN A SAMPLE OF MICHIGAN RESIDENTS,
Michigan Dept. of Public Health, Lansing.
K. R. Wilcox, Jr.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 82-85, 1972. 4 tab.

Descriptors: *Mercury, *Food chains, *Public health, Pollutants, Water pollution, Heavy metals, Path of pollutants, Analytical techniques, Bioindicators, Laboratory tests, Pathology, Biochemistry, *Michigan, Great Lakes, Fish, Toxins, Neutron activation analysis, Foods.
Identifiers: *Methylmercury poisoning, *Lake St. Clair.

Twenty-four individuals who frequently ate fish taken from Lake St. Clair were tested for mercury concentrations in their urine with generally negative results. Twenty similar individuals were tested for mercury in their blood. The values, expressed in ng/ml, ranged from 7 to 51.5, with a mean of 17.8. The men had a mean of 22 ppb, while the women had a mean of 12.8 ppb. For the 6 individuals who were still eating fish at the time of the test, the mean was 26.6 ppb while for the 14 who had stopped eating fish two months before, the mean value was only 14.1 ppb. Additional test were performed on samples of hair, showing that there were higher levels of mercury in those persons who had continued to eat fish. The difference in average levels between those who continued to eat fish and those who stopped was consistent with the half-life of excretion of methylmercury. (See also W74-06770) (Jerome-Vanderbilt)
W74-06782

MERCURY IN HUMANS IN THE GREAT LAKES REGION,
Ontario Dept. of Health, Toronto. Environmental Health Services Branch.
E. Mastromatteo, and R. B. Sutherland.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 86-90, 1972, 1 tab.

Descriptors: *Fish, *Public health, *Great Lakes, *Foods, Water pollution, Water pollution sources, Heavy metals, Environmental effects, *Mercury, Human pathology, Bioindicators, Laboratory tests, Paths of pollutants, Biochemistry, Chemical analysis, Neutron activation analysis, Food chains, Canada.
Identifiers: Tolerance levels, Blood, Hair, Urine specimens.

Results from investigations of mercury accumulation in humans are reported. One-hundred-thirty-five residents of the Great Lakes region were tested for mercury concentrations in their urine, with results within the normal range of mercury excretion. Samples of hair, blood and urine as well as histories of fish consumption were taken from 30 individuals in northwestern Ontario. Generally, those who did not eat fish from contaminated waters had the lowest mercury concentration in their hair while those who ate fish from contaminated water had higher concentrations up to 96 ppm, in their hair. The mercury in hair correlated with the number of meals of fish consumed per week. The 9 persons who did not eat contaminated fish had mercury levels below 35 ppb in their blood, while most values for those who ate contaminated fish ranged from 20 to 80 ppb and one individual had a level of 155 ppb. It is believed that the problem of mercury contamination is more widespread than first assessed and that some high concentrations in areas far from industry may result from natural mercury deposits. (See also W74-06770) (Jerome-Vanderbilt)
W74-06783

THE OCCURRENCE OF MERCURY IN THE ENVIRONMENT AND MAN, DISCUSSION PAPER,
Michigan Dept. of Natural Resources, Lansing.
J. Bails, T. W. Clarkson, H. M. Cunningham, W. Fulkerson, and L. Goldwater.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 90-92, 1972, 3 ref.

Descriptors: *Mercury, *Watersheds(Basins), *Diets, Pollutants, Water pollution, Water pollution sources, Heavy metals, Environmental effects, Sediments, Fish, Distribution, Foods, Testing, Analytical techniques, Fossil fuels, Toxicity.
Identifiers: Tolerance level.

Some mercury has been found in sediments throughout the major watersheds of the United States. In places where no industrial sources were evident, as much as 4 ppb mercury were found in the effluents of waste treatment plants. Although methods of detection of mercury are available, there is some question as to the precision of available analytical techniques in assessing low levels of mercury contamination. The average dietary intake of mercury ranges from 5 to 20 micrograms per day. Fish seem to be the major source of dietary mercury. Fruits and vegetables contain mercury at about 20 to 50 ppb, beef and pork contain about 50 to 140 ppb, liver and kidney contain 100 to 200 ppb, and dry milk powders, about 140 ppb (dry weight). Normal cooking procedures do not reduce methylmercury content. Human hair is being used as an indicator of mercury in humans in some studies, and values from 3 to 6 ppb are considered typical for 1970. Some data on the extreme mercury levels in blood and hair in North America are considered to be at the low toxic limit by Swedish investigators, giving cause for concern. (See also W74-06770)
W74-06784

METHODS OF ANALYSIS FOR MERCURY AND ITS COMPOUNDS: A REVIEW,
Michigan Univ., Ann Arbor. School of Public Health.
For primary bibliographic entry see Field 5A.
W74-06785

PREPARATION OF BIOLOGICAL SAMPLES FOR NEUTRON ACTIVATION ANALYSIS OF MERCURY,
Western New York Nuclear Research Center, Inc., Buffalo
For primary bibliographic entry see Field 5A.
W74-06786

MERCURY CONTENT OF CANADIAN FOODS AND CEREALS DETERMINED BY DIFFERENT METHODS,
Food and Drug Directorate, Ottawa (Ontario).
For primary bibliographic entry see Field 5A.
W74-06787

A SIMPLE, RAPID METHOD FOR THE DETERMINATION OF TRACE MERCURY IN FISH VIA NEUTRON ACTIVATION ANALYSIS,
Michigan Univ., Ann Arbor. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W74-06788

DETERMINATION OF MERCURY BY NON-DESTRUCTIVE NEUTRON ACTIVATION ANALYSIS,
Environmental Research Group, Ann Arbor, Mich.
For primary bibliographic entry see Field 5A.
W74-06789

DETERMINATION OF MERCURY IN BIOLOGICAL TISSUES,
Environmental Science and Engineering Corp., Nashville, Tenn.
For primary bibliographic entry see Field 5A.
W74-06790

THE DETERMINATION OF ETHYLMERCURY IN BLOOD,
Imperial Chemical Industries, Ltd., Alderly Park (England). Industrial Hygiene Research Lab.
For primary bibliographic entry see Field 5A.
W74-06791

THE DETERMINATION OF MONO- AND DIMETHYLMERCURY COMPOUNDS BY GAS CHROMATOGRAPHY,
Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
For primary bibliographic entry see Field 5A.
W74-06792

ANALYTICAL METHODOLOGY FOR MERCURY-DISCUSSION PAPER,
For primary bibliographic entry see Field 5A.
W74-06793

FACTORS IN THE TRANSFORMATION OF MERCURY TO METHYLMERCURY,
Institute for Water and Air Pollution Research, Stockholm (Sweden).
A. Jernelov.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 167-172, 1972, 2 ref.

Descriptors: *Mercury, *Water pollution, Aerobic conditions, Hydrogen ion concentration, Pollutants, Heavvy metals, *Chemical reactions, Aquatic environment, Environmental effects, Sediments, Anaerobic conditions, Microbial degradation, Bacteria, Fungi, Oxidation, Surface waters.
Identifiers: *Methylation, *Methylmercury, *Sweden.

A discussion of the transformation of bivalent inorganic mercury, elemental mercury and phenylmercury into methylmercury and its movement through the aquatic environmental is presented.

The main factors considered are the oxidation of elementary mercury, the methylation of mercuric sulfide, the effects of sediment on the conversion of mercury, the effects of pH, anaerobic and aerobic conditions, and the long term effects of mercury in water. The three major mercury compounds released into the aquatic environment generally move into the sediments first. The oxidation of elemental mercury occurs in most fresh waters, converting it to bivalent mercury. In the sediments the general microbiological activity is related to the methylation of mercury. Methylation in fresh water appears to be higher under low pH, aerobic conditions, but methylation also occurs under anaerobic and higher pH conditions. It seems that mercury remains in sediments and in the aquatic environment long after its introduction. Proposed methods of speeding the recovery of mercury from the environment do not appear feasible at this time. (See also W74-06770) (Jerome-Vanderbilt)
W74-06794

THE ROLE OF FOOD CHAINS IN ENVIRONMENTAL MERCURY CONTAMINATION,
Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
R. Hartung.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 172-174, 1972. 1 fig.

Descriptors: *Toxins, *Mercury, *Food chains, *Path of pollutants, *Biological communities, Pollutants, Food pyramids, Organic compounds, Inorganic compounds, Transfer, Movement, Stability, Solubility, Public health, Biochemistry.
Identifiers: Methylmercury, Biological half-life.

Although not completely understood, the transport of toxic substances through the food chain is of major concern because those species which occupy the peak, such as predatory animals and man, may receive inordinately high exposure to those substances. The critical analysis of the food chains and their role in the biological dynamics of mercury is complex because of the large number of mercury compounds which occur in the environment under appropriate natural conditions. The basic conceptual components in the concentration of toxicants in the food chain are the absorption routes and efficiency of toxicant travel into the body, the concentration factor of the toxicants in ratio to total body burden, the biological half-life determined from excretion and metabolism, and the ecological community structure which transports the substance. The different mercury compounds (HgS, Hg(++), RHg (+), and RHgR(+) in the environment have different solubilities, stabilities and lipid-water partition coefficients, resulting in different transport characteristics. The analysis of total mercury is an oversimplification of the problem and much more study of the subject is needed. (See also W74-06770) (Jerome-Vanderbilt)
W74-06795

MERCURY AND FOOD CHAINS,
Institute for Water and Air Pollution Research, Stockholm (Sweden).
A. Jernelov.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 174-177, 1972, 1 ref.

Descriptors: *Path of pollutants, *Food chains, *Mercury, *Birds, *Fish, Pollutants, Seed treatment, Animal pathology, Freshwater fish, Pikes, Analysis, Sampling, Data collections, Laboratory tests, Transfer, Water pollution, Aquatic environment.
Identifiers: Methylmercury, Methylation, Whitefish, *Sweden.

Several studies investigating the transport of mercury in food chains and methylation of mercury are reported. Mercury in the feathers of seed-eating birds was measured to find a correlation between those concentrations and mercury content in dressed seed. The feathers contained high amounts until such seed treatment was discontinued in 1965. Since then significant drops in mercury concentration have been reported. A fair correlation between mercury levels in the feathers of fish-eating birds and mercury in fish was observed. A complex study analyzed mercury levels in Northern pike, the contents of their stomachs (usually whitefish) and the contents of the stomachs of those fish (bottom fauna) from contaminated and uncontaminated waters. It was found that a certain amount of mercury results from the diet of the organism and additional mercury is incorporated directly from the water. Another investigation indicated that a certain microorganism present in the surface slime of Northern pike during the late winter and early spring has a high mercury methylation rate. (See also W74-06770) (Jerome-Vanderbilt)
W74-06796

DISTRIBUTION OF MERCURY IN RESIDUAL SOILS,
Colorado School of Mines, Golden. Dept. of Chemistry.
P. B. Trost, and R. E. Bisque.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 178-196, 1972, 6 fig, 9 tab, 14 ref.

Descriptors: *Mercury, *Soil contamination, Soil horizons, Laboratory tests, Pollutants, *Distribution, Soil chemistry, Humic acids, Soil analysis, Sampling, Path of pollutants, Soil properties, Humus, Clays, Measurement, On-site data collections, Evaluation, Solubility, Vapors, *Oregon, *Path of pollutants.
Identifiers: *Residual soils.

A method for the differentiation of vaporous soil mercury and non-vaporous soil mercury by comparison of the mercury content in the organic-rich and clay-rich soil horizons was applied to samples from southwest Oregon. Field samples were analyzed for their mercury and humic acid (i.e., both the humic and fulvic fractions) content and the relative clay distribution was determined. Certain variables affect the distribution of the mercuric ion, Hg (++), and of mercury vapor in residual soils. It appears that humic acid solutions are capable of increasing the solubility of certain mercury compounds. The solubility of cinnabar in organic-rich soil horizons may far surpass its solubility in organic-poor soil horizons. Soil mercury distributions are controlled primarily by humus matter. No correlation was observed between the mercury and clay contents in these soil horizons. Humic-acid-type soil organics also control the distribution of vaporous mercury in soils to a far greater extent than clay. Laboratory studies and field studies are outlined and experimental results are presented. (See also W74-06770) (Jerome-Vanderbilt)
W74-06797

RESEARCH NEEDS: STUDY OF THE ENVIRONMENTAL DYNAMICS OF MERCURY,
Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
R. Hartung.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 197-198, 1972.

Descriptors: *Research priorities, *Mercury, *Environmental effects, *Food chains, *Path of pollutants, Pollutants, Transfer, Chemical properties, Physical properties, Toxicity, Chemical reactions, Analysis, Evaluation, Water pollution, Human pathology, Organic compounds, Inorganic compounds.
Identifiers: *Mercury pollution, Methylation, Organomercuric compounds.

A brief outline is presented of some of the important studies that are necessary for a clearer understanding of the behavior and effects of environmental mercury. Different mercury compounds must be studied to determine their physical and chemical properties. Air and water transport mechanisms, along with storage and interconversions in sediments and soils need to be investigated in order to understand the complex multiple transport systems in the environment. The methylation processes are of major importance in understanding the toxicological impact of environmental mercury. The behavior of methylmercury and its movement through the food chain must be understood in order to determine the effects of mercury contamination in the environment upon man. (See also W74-06770) (Jerome-Vanderbilt)
W74-06798

ENVIRONMENTAL DYNAMICS OF MERCURY: DISCUSSION PAPER,
Rochester Univ. N. Y.
T. W. Clarkson, A. J. Coble, F. M. D'ltri, J. C. Gage, and L. Goldwater.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 198-201, 1972, 3 ref.

Descriptors: *Mercury, *Ion transport, *Reviews, *Vitamin B, Pollution, Heavy metals, Water pollution, Transfer, Chemical reactions, Aquatic environment, Toxicity, Stability, Solubility, Ions, Inorganic compounds, Organic compounds, Evaluation, Sediments.
Identifiers: *Methylation, Environmental dynamics.

The process of methylation of mercury is examined. Recent studies indicate there may be both nonenzymatic methylation of mercury by methylated vitamin B-12 from bacterial extracts and enzymatic methylation involving the addition of mercuric ions to the sulfhydryl group of cysteine or homocysteine. The sediments would most frequently contain a high proportion of the total mercury in an aquatic system. There are some cases in which the water would contain a high percentage of the total mercury, but rarely, if ever, is it found mainly in the biomass. The methylating process is inhibited by sulfides which join with mercury to form mercuric sulfide. The overall rate of methylation of mercury in the environment is low, requiring the presence of free Hg (++) ion. So far, it has not been possible to differentiate clearly between inorganic and organic mercury in natural aquatic environments. Because some of the present theories of environmental dynamics are based on small samples, more data are needed to form a statistically sound model for mercury transport phenomena. (See also W74-06770) (Jerome-Vanderbilt)
W74-06799

DOSE-RESPONSE RELATIONSHIP ASSOCIATED WITH KNOWN MERCURY ABSORPTION AT LOW DOSE LEVELS OF INORGANIC MERCURY,
Michigan Univ., Ann Arbor. School of Publich Health.
For primary bibliographic entry see Field 5C.
W74-06800

SURFACE ELECTROMYOGRAPHY IN CHRONIC INORGANIC MERCURY INTOXICATION,
Michigan Univ., Ann Arbor. Dept. of Industrial Engineering.
For primary bibliographic entry see Field 5C.
W74-06801

BIOTRANSFORMATION OF ORGANO-MERCURIALS IN MAMMALS,
Rochester Univ., N.Y. Dept. of Radiation Biology; and Rochester Univ., N. Y. Dept. of Biophysics.
For primary bibliographic entry see Field 5C.

W74-06802

THE BINDING OF INORGANIC AND ORGANIC MERCURY COMPOUNDS (HG 203) TO CONSTITUENTS OF NORMAL HUMAN BLOOD,
Creighton Univ., Omaha, Nebr.
For primary bibliographic entry see Field 5C.
W74-06803

BIOLOGICAL REACTIONS AND PATHOLOGICAL CHANGES IN HUMAN BEINGS AND ANIMALS CAUSED BY ORGANIC MERCURY CONTAMINATION,
Kumamoto Univ. (Japan). Medical School.
For primary bibliographic entry see Field 5C.
W74-06804

THE DOSE-RESPONSE RELATIONSHIP RESULTING FROM EXPOSURE TO ALKYL MERCURY COMPOUNDS,
Michigan Univ., Ann Arbor. School of Public Health.
For primary bibliographic entry see Field 5C.
W74-06805

THE RELATIONSHIP BETWEEN MERCURY CONCENTRATION IN HAIR AND THE ONSET OF MINAMATA DISEASE,
Kumamoto Univ. (Japan). School of Preventive Medicine.
For primary bibliographic entry see Field 5C.
W74-06806

ORGANIC MERCURY POISONING IN ALAMOGORDO, NEW MEXICO,
New York State Dept. of Health, Albany.
For primary bibliographic entry see Field 5C.
W74-06807

SURVIVAL AND REPRODUCTION OF RING-NECKED PHEASANTS CONSUMING TWO MERCURIAL FUNGICIDES,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W74-06808

DOSE-RESPONSE RELATIONSHIPS AFTER EXPOSURE OF SWINE TO ORGANO-MERCURIAL COMPOUNDS,
Saskatchewan Univ., Saskatoon. Western Coll. of Veterinary Medicine.
For primary bibliographic entry see Field 5C.
W74-06809

DETECTION AND APPRAISAL OF SUBCLINICAL INTOXICATIONS,
Duke Univ. Medical Center, Durham, N.C.
For primary bibliographic entry see Field 5C.
W74-06810

APPROACHES TO THE DETECTION OF SUBCLINICAL MERCURY INTOXICATIONS: EXPERIENCE IN MINAMATA, JAPAN,
Kumamoto Univ. (Japan). Medical School.
For primary bibliographic entry see Field 5C.
W74-06811

MERCURY CONCENTRATIONS IN HUMAN TISSUES AMONG HEAVY FISH EATERS,
New York State Dept. of Health, Albany.
R. F. Korns.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 329-331, 1972. 2 tab.

Descriptors: *Mercury, *Fish, *Diets, *Toxicity, *Public health, Pollutants, Organic compounds, Inorganic compounds, Analytical techniques, Food chains, Measurements, Evaluation, Poisons, Biochemistry, Great Lakes, Water pollution, Spectrophotometry, Fishing.
Identifiers: *Hair, Atomic absorption, Methylation, Spectrophotometry.

Hair from individuals who were known to fish in Great Lakes water was analyzed for mercury by cold vapor atomic absorption. For most of these individuals, the fish represented a substantial and frequent part of their diet. Most of these subjects were Negroes and Puerto Ricans. A total of 22 heavy fish eaters and 7 comparable control subjects were studied. One person was found to have 11.6 ppm mercury in her hair and had eaten fish seven days a week and occasionally twice a day. The average level of mercury in the hair of fish eaters was 3.7 ppm. The average mercury concentration in the hair of the control group was 0.9 ppm. (See also W74-06770) (Jerome-Vanderbilt)
W74-06812

EPIDEMIOLOGICAL APPROACHES TO THE STUDY OF SUBCLINICAL EFFECTS OF MERCURY INTOXICATION,
Michigan Univ., Ann Arbor. School of Public Health.
I. T. T. Higgins.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 331-341, 1972. 1 fig, 3 tab, 4 ref.

Descriptors: *Mercury, *Toxicity, *Surveys, *Human population, *Epidemiology, Pollutants, Poisons, Analytical techniques, Testing procedures, Methodology, Sampling, Population, Ecology, Human pathology, Diseases, Pathology.
Identifiers: *Subclinical effects.

In an epidemiological approach to the investigation of subclinical mercury intoxication the main emphasis is placed on the selection of a population for study and comparison of that population to other groups. Subclinical effects are those which are not obvious but can be detected by careful examination. Most of these symptoms are nonspecific and can not be used for indices of mercury contamination unless rigorous criteria are satisfied. The main criteria are: discrimination, reproducibility, validity, simplicity and acceptability. Each of these criteria is considered in detail. Dose-response relationships must be studied by plotting an estimate of dosage against the proportions of subjects showing the subclinical effect or clinical effects. Occupational groups exposed to mercury and communities living in areas with high levels of environmental mercury are suitable populations for investigations of mercury intoxication. The variation of effects on a given population should be examined and long term implications should be followed and assessed. Any control measures to be instituted on the basis of subclinical investigations should be carefully weighed against ecological considerations. (See also W74-06770) (Jerome-Vanderbilt)
W74-06813

BIOLOGICAL EFFECTS OF MERCURY COMPOUNDS, DISCUSSION PAPER,
Rochester Univ., N. Y.
For primary bibliographic entry see Field 5C.
W74-06814

AERIAL RADIOLOGICAL MEASURING SURVEY OF THE FORT CALHOUN STATION, FORT CALHOUN, NEBRASKA, AUGUST 9-10, 1972.
EG and G, Inc., Las Vegas, Nev.
For primary bibliographic entry see Field 5A.
W74-06815

AERIAL RADIOLOGICAL MEASURING SURVEY OF THE AREA SURROUNDING THE PALISADES PLANT, SOUTH HAVEN, MICHIGAN, JULY 29, 1970.
EG and G, Inc., Las Vegas Nev
For primary bibliographic entry see Field 5A.
W74-06816

AERIAL RADIOLOGICAL MEASURING SURVEY OF THE AREA SURROUNDING THE ENRICO FERMI ATOMIC POWER PLANT, MONROE, MICHIGAN, SEPTEMBER 1970.
EG and G, Inc., Las Vegas, Nev.
For primary bibliographic entry see Field 5A.
W74-06817

THE EXREM III COMPUTER CODE FOR ESTIMATING EXTERNAL RADIATION DOSES TO POPULATIONS FROM ENVIRONMENTAL RELEASES,
Oak Ridge National Lab., Tenn. Radiation Shielding Information Center.
D. K. Trubey, and S. V. Kaye.
Available from NTIS, Springfield, Va., as ORNL-TM-4322; $5.45 in paper copy, $1.45 in microfiche. Report No ORNL-TM-4322, Dec 1973. 85 p, 10 ref, 2 append.

Descriptors: *Radioactivity, Environment, Effluents, Measurement, *Water pollution sources, *Air pollution, *Soil contamination, *Computer programs, Population, Public health, Estimating, Forecasting.
Identifiers: Dose, *Dose rate(Radiation), Dose equivalent rate, Total dose equivalent.

EXREM III is a computer code to estimate the dose equivalent rate and the total dose equivalent from beta, positron, electron, and gamma radiation resulting from submersion in contaminated water, submersion in contaminated air, and exposure to a contaminated surface. There can be more than one environmental release, and exposure can begin at any time after the first release. EXREM III considers contributions from environmental releases and from nuclide decay chains. For a particular problem the user may choose to calculate either dose rates, or the total doses, or both for any of the three modes of exposure. A separate solution array is printed for each mode of exposure. EXREM III is a revised version of EXREM II which was available earlier. The principal revisions include treatment of positron and electron radiations, selection of nuclear data from a data base, variable dimensioning of large data arrays, and free field input. The code is available from the Radiation Shielding Information Center. (Houser-ORNL)
W74-06818

AQUATIC VEGETATION OF THE OTTOWA RIVER NEAR CHALK RIVER NUCLEAR LABORATORIES (CRNL),
Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs.
For primary bibliographic entry see Field 5C.
W74-06819

GEOLOGIC AND HYDROLOGIC BACKGROUND FOR SELECTING SITE OF PILOT-PLANT REPOSITORY FOR RADIOACTIVE WASTE,
Geological Survey, Denver, Colo.
H. Barnes.
Bulletin of the Association of Engineering Geologists, Vol 11, No 1, p 83-92, 1974. 1 fig, 8 ref.

Descriptors: *Survey, Sodium compounds, Sodium chloride, Mining, *Sites, *Rock mechanics, Hydrology, Mine drainage, *Radioactive waste disposal, Geology, Safety, Assessment, Evaluation, Kansas, *New Mexico, Colorado, Utah, Arizona, Louisiana, Gulf Coastal Plains, Waste treatment, Liquids.

The U.S Geological Survey recently completed a series of studies designed to help the Advanced Research Projects Agency and the U.S. Atomic Energy Commission evaluate selected rock types and areas in the United States as potential sites for underground emplacement of noxious or radioactive wastes. The rock types selected were salt and impermeable argillaceous rocks. The areas investigated include the Permian salt basin (especially that part in southeastern New Mexico), the Paradox basin in Utah and Colorado, the Supai salt basin and Luke salt body in Arizona, and the northern Gulf Coast salt-dome province. Of these rock types and areas, the bedded salt deposits of southeastern New Mexico and the Paradox basin seem to be the most promising sites for underground emplacement of noxious or radioactive wastes. (Houser-ORNL)
W74-06820

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE PROPOSED ALVIN W. VOGTLE NUCLEAR PLANT UNITS 1, 2, 3, AND 4.
Directorate of Licensing (AEC), Washington, D. C.
Available from the National Technical Information Service, Springfield, Va., as Docket No. 50424-59; $10.60 per copy, $1.45 microfiche. Report No. Docket 50424-59, 50425-56, 50426-56, and 50427-56, March 1974. 383 p, 46 fig, 44 tab, 138 ref, 12 append.

Descriptors: *Nuclear powerplants, *Effluents, Environment, Administrative agencies, *Comprehensive planning, *Sites, Geology, Investigations, Hydrology, Seismology, Climatology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis, *Georgia.
Identifiers: *Environmental impact statements, *Pressurized water reactors, *Savannah River(Ga).

This final environmental statement was prepared in compliance with the National Environmental Policy Act. The proposed Alvin W. Vogtle Nuclear Plant would be located on the Georgia side of the Savannah River near the AEC Savannah River Plant. Each of the four units will employ a pressurized water reactor cooled by a closed-cycle cooling system of natural-draft cooling towers using water from the Savannah River. Environmental impacts are assessed and after consideration of alternatives an environmental benefit-cost summary was compiled. Environmental factors considered include climate, hydrology (surface water and ground water), ecology including aquatic life, cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in effluent water. The conclusion was to issue a construction permit for the facility subject to the following conditions: (1) Monitoring for chlorine as specified; (2) water temperatures controlled within limits specified; (3) follow requirements of discharge water relative to minimizing adverse effects to Beaverdam Creek; (4) follow established procedures during construction and operation to minimize any irreversible damage to the environment. (Houser-ORNL)
W74-06821

A CRITICAL REVIEW OF SOLID RADIOACTIVE WASTE PRACTICES AT NUCLEAR POWER PLANTS,
Oak Ridge National Lab., Tenn.
A. H. Kibbey, and H. W. Godbee.
Available from the National Technical Information Service, Springfield, Va., as ORNL-4924; $5.45 per copy, $1.45 microfiche. Report No. ORNL-4924, March 1974. 70 p, 13 fig, 2 tab, 19 ref, 3 append.

Descriptors: *Nuclear powerplants, *Waste disposal, *Radioactivity, *Reviews, Waste storage, Waste treatment, Liquids, Waste disposal, Assay, Assessment, Census, Transportation, Underground waste disposal, Water pollution, Soil contamination, Water pollution sources.
Identifiers: *Waste burial.

The relationships between solid radioactive waste (radwaste) volume, curie content, and size and number of shipments were studied. These radwaste variables were normalized on the basis of thermal megawatt-hours. All operating light water reactors (LWRs), starting with Dresden Unit 1, were considered from first criticality through December 31, 1972. Plant operating reports and docket materials, supplemented with earlier similar open literature summaries, were the main sources of information. In addition, selected plants known to be planning or undergoing revisions in solid radioactive waste handling procedures were contacted directly. Waste core components were excluded from the analysis because this study was concerned mainly with the trends of routine solid radwaste generated from operation of the liquid waste treatment system. The routine wastes considered in this study are filters, filter sludges, spent demineralizer resins, evaporator concentrates, and dry compressible wastes which are shipped for offsite burial. In the overall analysis, these are grouped together and referred to as total solid radwaste shipped. (Houser-ORNL)
W74-06825

ENVIRONMENTAL SCIENCES DIVISION ANNUAL PROGRESS REPORT FOR PERIOD ENDING SEPTEMBER 30, 1973,
Oak Ridge National Lab., Tenn.
S. I. Auerbach, D. J. Nelson, and E. G. Struxness.
Available from the National Technical Information Service, Springfield, Va., as ORNL-4935; $7.60 per copy, $1.45 microfiche. Report No. ORNL-4935, March 1974. 173 p, 62 fig, 38 tab, 111 ref.

Descriptors: *Environment, *Ecology, *Ecosystems, *Computer programs, *Model studies, Toxicity, Soil contamination effects, Water pollution effects, Absorption, Sorption, Adsorption, Strontium, Plutonium, Food chain, Public health.

Progress is reported in development of computer codes, and model studies concerned with environmental hazards. Waste management studies included mathematical models to follow the movement of water and radionuclides in terrestrial environments. Assessment of environmental impacts of reactor stations is continuing. Behavior patterns, survival, growth, reproduction, and population responses of fish are of major concern. In aquatic ecosystem studies, investigations were carried out in radionuclides cycling, radiation effects, and toxicant formation in condenser cooling systems. Terrestrial radionuclide cycling and effects, toxic materials in the environment, plutonium in mesic and humid environments, and a study of terrestrial and aquatic system interaction are discussed. (Houser-ORNL)
W74-06826

BUFFER CAPACITY IN AQUATIC ECOSYSTEMS,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
F. G. Pohland, and W. R. Bolton.
Available from the National Technical Information Service as PB-231 469, $3.75 in paper copy, $1.45 in microfiche. Report ERC-0474, March 1974, 43 p, 10 fig, 3 tab, 11 ref, append. OWRR A-033-GA(1). 14-31-0001-3510.

Descriptors: *Hydrogen ion concentration, *Acid-base equilibrium, Water chemistry, Acid streams, *Organic wastes, Organic loading, *Anaerobic conditions, Ecosystems, Ecology, Model studies, Water pollution sources, Water pollution control, *Chemical reactions, Forecasting.
Identifiers: *Buffer capacity, Biological stabilization.

Stream water quality and ecological balance can be substantially affected by pH changes. The change in the pH that one would otherwise expect to be induced by the influx of acidic or alkaline wastes can be significantly reduced by the buffering action of indigenous biochemical reactions. Accurate prediction of the magnitude of induced pH change thus requires information on the strength of the natural buffer system and on its resistance to the effects of various wastes. Analysis of system pH response and buffer capacity was approached through an example of anaerobic biological stabilization of waste organic materials. Simulation of the recognized sequential conversion of complex organic materials through acid production and methane fermentation permitted identification of some of the primary processes and provided a basis for the development of an acid-base equilibrium model reflective of buffer capacity during either normal or distressed conditions. The model can be used to predict the effects of organic wastes on natural aquatic ecosystems and therby provides potentially important input to control the operation of conventional waste treatment processes. Algorithms were developed from the model for iterative solution for pH, buffer capacity, or the adjustment necessary to obtain a desired pH or buffer capacity. The model requires input description of the modeled anaerobic ecosystems that can be determined by explicit or suggestive analysis. The models, computer programs, and example solutions are presented. (James-Georgia)
W74-06829

QUALITY IMPROVEMENT OF FEEDLOT LAGOON WATER BY PERCOLATION THROUGH SOIL UNDER NATIVE PASTURE,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 5D.
W74-06830

MODELING AND OPTIMIZATION OF TRANSIENT COOLING WATER DISCHARGE FROM POWER GENERATING PLANTS,
Kansas State Univ., Manhattan. Dept. of Industrial Engineering.
C. L. Hwang, and L. T. Fan.
Available from the National Technical Information Service as PB-231 354, $3.25 in paper copy, $1.45 in microfiche. Kansas Water Resources Research Institute, Manhattan, Contribution No. 130, December 1973. 33 p, 9 fig, 18 ref. OWRR B-030-KAN(6). 14-31-0001-3592.

Descriptors: *Water quality control, *Optimization, *Thermal pollution, *Regional analysis, *Management, Model studies, Control, *Kansas, Cooling water, Dispersion, Aeration, Waste water treatment, Powerplants.
Identifiers: Thermal pollution control, Water quality models, Optimal control, Regional water quality management.

The present research has yielded a series of publications. They contain the results of: (1) Compilation of water quality data and parameters, and hydrology of Kansas streams and rivers. The compilation could serve as a convenient source of information and should be useful for constructing mathematical models that are relevant to the water quality control and water resource management. (2) The effect of thermal discharge on stream water quality. A modified transient version of the Streeter-Phelps model and of Dobbin's dispersion model along with the energy balance equation is employed to analyze the effects of waste heat discharge from power plants on stream water quality. (3) Water quality control by artificial aera-

tion of stream receiving thermal and organic waste discharges. The location and number of diffuser type aerators to be installed along the stream are determined so as to maintain the stream DO content above a certain minimum requirement. A procedure is also presented for determining the optimal artificial aeration control policy to maintain the water quality. (4) A basin-wide management of water quality of a river which receives thermal and organic wastes. At-source treatment of these pollutants is carried out to control the water quality. (5) Optimal control of cooling water discharge from a power plant. The optimal policy permits a power plant to operate at the highest possible capacity and at the same time to maintain the highest possible water quality.
W74-06832

DISTRIBUTION OF AUTOTROPHIC NITRIFYING BACTERIA IN A POLLUTED STREAM,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Environmental Science.
For primary bibliographic entry see Field 5C.
W74-06834

MATHEMATICAL MODEL FOR BARGED OCEAN DISPOSAL OF WASTES,
Tetra Tech, Inc., Pasadena, California.
C. Y. Koh, and Y. C. Chang.
Copy Available from GPO Sup Doc as EP1.23:660/2-73-029, $4.85; microfiche from NTIS as PB-232 018, $1.45. Environmental Protection Agency, Technology Series Report EPA-660/2-73-029, December 1973. 583 p, 29 fig, 14 tab, 68 ref, 2 append. EPA Project 16070FBY.

Descriptors: *Mathematical models, *Waste disposal, Sewage sludge, Liquid wastes, Barges, *Waste dilution, *Dispersion, Computer programs, Model studies, *Settling velocity, Great Lakes.
Identifiers: *Dredge spoils, Ocean dumping, *Ocean disposal.

Theoretical and experimental studies were performed on the dispersion and settling of barge disposed wastes in the ocean. A computer program based on the mathematical model has also been written. Comparison of predictions with experiments, both in this study and from previous investigations were found to be good. Example solutions based on the model for prototype situations are also presented. The waste is assumed to consist of two phases, (1) a solid phase characterized by constituents with various densities and fall velocities, and (2) a liquid phase. The methods of disposal considered include (1) discharge from a bottom a bottom opening hopper barge, (2) pumped discharge through a nozzle under a moving barge, and (3) discharge into the barge wake. The effects of ambient horizontal currents, density stratification, variation of diffusion coefficients are incorporated in the model. Three phases of dispersion are envisioned: (1) a convective phase, (2) a collapse phase, and (3) a long term diffusion phase. Transition between phases is accomplished automatically in the numerical model. In addition, the collapse phase may (a) be replaced by, or (b) include a bottom spreading phase. Under certain circumstances, the collapse phase is bypassed. Every attempt has been made to minimize the amount of input required in the use of the numerical model. Th integration steps and grid sizes are all automatically chosen by the model. Both detailed printout and graphic output are incorporated. The solution may also be terminated at the end of any of the three phases of dispersion. (See also W72-01987) (EPA)
W74-06837

THE RUNOFF OF WATER AND NUTRIENTS FROM WATERSHEDS TRIBUTARY TO CAYUGA LAKE, NEW YORK,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
G. E. Likens.
Available from the National Technical Information Service as PB-231 477, $4.50 in paper copy, $1.45 in microfiche. Technical Report 81, February 1974. 124 p, 47 fig, 34 tab, 20 ref. OWRR A-029-NY(2).

Descriptors: *Lakes, *Watersheds(Basins), *Runoff, *Nutrients, Water chemistry, *New York, Measurement, Water quality, Streams, Sampling, Water analysis, Precipitation, Outlets, Freshwater, Hydrologic data, Statistical methods, Ecosystems, Trophic level, Regression analysis.
Identifiers: *Cayuga Lake(New York).

In June 1970, a detailed study was initiated to measure the water and nutrient inputs for Cayuga and Seneca Lakes via streams and precipitation. Data from the Cayuga Lake watershed are reported herein. The Finger Lakes play a major role in recreation and water supply as well as affect the general economy of the region in a variety of ways. The Cayuga Lake drainage area is described, including geologic, land use, and climatic considerations. Methods and procedures are discussed. Watershed boundaries for each tributary were identified and marked on a map of the Cayuga Lake Basin composited from U.S.G.S. topographic sheets. Streamflow was continuously gauged in only 4 of the major tributaries in the adjacent watershed to Cayuga Lake. Stream velocity was measured with a Gurley Pigmy Current Meter. Regression analysis was made between the continuously gauged streams and the instantaneous measurements from the ungauged streams; generally, the regression with the highest correlation coefficient was used. Streamwater samples were collected either weekly or biweekly by hand or with a non-metallic water sampler. Chemical analyses were made with a Perkin-Elmer Model 403 atomic absorption spectrophotometer. Since continuous, proportional samples were not obtained of runoff, a linear regression analysis was made between discharge and measured nutrient concentration for the monitored tributaries and lake outlet. Study results are discussed in detail. It was found that streamwater chemistry varies considerably throughout the Cayuga Lake Basin. (Bell-Cornell)
W74-06848

WATER AND NUTRIENT BUDGETS FOR CAYUGA LAKE, NEW YORK,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
G. E. Likens.
Available from the National Technical Information Service as PB-231 478 $4.00 in paper copy, $1.45 in microfiche. Technical Report 83, March 1974. 91 p, 10 fig, 45 tab, 61 ref, append. OWRR A-029-NY(3).

Descriptors: *Lakes, Ecosystems, *New York, *Nutrients, Hydrologic aspects, *Trophic level, Watersheds(Basins), Water quality, *Measurement, Precipitation, Streams, Runoff, Outlets, Discharge(Water), Freshwater, Hydrologic data, Statistical methods, Eutrophication, Oligotrophy, Water chemistry, Biological properties.
Identifiers: *Cayuga Lake(New York).

A study initiated in June 1970 to measure the nutrient inputs for Lake Cayuga via streams and precipitation is reported. Hydrologic components including runoff, outlet discharge and lake renewal time, and hydrologic budget are discussed and nutrient budgets are considered. Although light is important, the input and availability of nutrients undoubtedly determines the ultimate trophic status of a freshwater ecosystem. The in situ turnover rate and the flux (direction and rate) of nutrients across the ecosystem's boundaries are of diagnostic value in determining the trophic status of a lake. Quantification of such inputs and outputs for ecosystems may be used to construct budgets and observe balancing mechanisms. Biotic functions within the ecosystem's boundaries are tempered by and respond to these external fluxes. The effect of the natural condition or managed state of the watershed then, in regulating the quantity and quality of drainage outputs (aquatic ecosystem inputs), is vital to this relationship. The studies were undertaken on the Cayuga Lake watershed to measure the nutrient and water inputs and outputs by geologic and meteorologic vectors for the lake ecosystem. (Bell-Cornell)
W74-06849

STORMWATER RUNOFF QUALITY FOR URBAN AND SEMI-URBAN/RURAL WATERSHEDS,
Purdue Univ., Lafayette, Ind. Dept. of Environmental Engineering.
F. T. R. McElroy III, and J. M. Bell.
Available from the National Technical Information Service as PB-231 482 $5.00 in paper copy, $1.45 in microfiche. Purdue University Water Resources Research Center Technical Report No. 43, February 1974. 156 p, 28 fig, 52 tab, 30 ref. OWRR-C-3277(3713)(1).

Descriptors: *Urban runoff, *Storm runoff, *Water quality, *Urban drainage, Coliforms, Biochemical oxygen demand, Suspended solids, Sampling, Watersheds(Basins), Hydrographs, *Indiana, Land use.
Identifiers: Rural runoff, *Pollutographs, Fecal coliforms, *Urban watersheds, *Rural watersheds, *West Lafayette(Ind), Flushing.

Samples of stormwater runoff from an urban and a semi-urban/rural watershed were collected at established gaging-sampling stations. The pollutional characteristics of the runoff for the two watersheds were different. The peak BOD, suspended soils, total coliform and fecal coliform tended to be higher from the urban watershed, but there was considerable range in concentration. A 'first flush' of suspended solids and BOD was exhibited at the urban sampling station while this was not so evident at the semi-urban/rural station. Mass emission pollutographs of BOD and suspended solids showed that the concentration and flow both affected the shape of the pollutograph. The flow hydrograph had a very dramatic effect on the shape and magnitude of the pollutograph. Comparing the two watersheds as to unit 'pounds per day per acre-MGD', the stormwater runoff from the semi-urban/rural watershed had suspended solid and BOD values ranging from .14 to 4.3 lb/day/acre-MGD and from .07 to .14 lb/day/acre-MGD, respectively. The urban watershed had BOD values ranging from 7 to 25 lb/day/acre-MGD and suspended solids ranging from 2 to 8 lb/day/acre-MGD. (Wiersma-Purdue)
W74-06851

A RADIOACTIVE ISOTOPIC CHARACTERIZATION OF THE ENVIRONMENT NEAR WISCASSET, MAINE: A PREOPERATIONAL SURVEY IN THE VICINITY OF THE MAINE YANKEE ATOMIC POWER PLANT,
Maine Univ., Orono. Dept. of Physics.
For primary bibliographic entry see Field 5A.
W74-06855

(RADIATION DATA, SECTION II. WATER).
Office of Radiation Programs, Washington, D.C.
For primary bibliographic entry see Field 5A.
W74-06856

ENVIRONMENTAL ASPECTS OF PLUTONIUM AND OTHER ELEMENTS, A SELECTED ANNOTATED BIBLIOGRAPHY.
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5C.
W74-06857

ON THE SELECTION OF A GROUND DISPOSAL SITE BY SENSITIVITY ANALYSIS,
Kyoto Univ., (Japan). Dept. of Sanitary Engineering.
S. Morisawa, and Y. Inoue.
Health Physics, Vol 26, No 3, p 251-161, March 1974. 4 fig, 6 tab, 21 ref.

Descriptors: *Radioactive waste disposal, Soils, Groundwater, *Radioisotopes, *Migration, *Dispersion, Movement, Safety, Evaluation, Assessment, Sites, Analysis, Ecology, Path of pollutants, Food chains, Public health.
Identifiers: *Dose calculations, Sensitivity analysis.

Disposal of radioactive wastes in the ground is not allowed in Japan at present mainly because of the difficulties in estimating the ground migration of radionuclides and in evaluating the internal dose caused by these wastes. Based on certain assumptions the migration pattern was set down in a previous paper, and the internal dose was estimated. In this paper, the desirable conditions for the ground disposal of radioactive wastes and the approximate method for estimating the internal dose are discussed by means of a sensitivity analysis. Eighteen out of some 26 factors in the three ecological paths through which leaked radionuclides migrate (i.e., drinking water, sea foods and plants) are quantitatively examined by sensitivity analysis. The relationships between the internal dose and the many factors concerned are shown in the tables. The difference between strict calculation and approximation of internal dose is also examined. The approximation is shown to be useful especially for the quick estimation of the safety of a site for the ground disposal of radioactive wastes. (Houser-ORNL)
W74-06858

241-T-106 TANK LEAK INVESTIGATION.
Atlantic Richfield Hanford Co., Richland, Wash.
Available from NTIS, Springfield, Va., as ARH-2874; $4.00 per copy, $1.45 microfiche. Report ARH-2874, Nov 1973. 48 p, 8 fig, 1 tab, 11 ref, append.

Descriptors: *Nuclear wastes, *Water pollution sources, Waste disposal, Water pollution, *Storage tanks, Leakage, Underground storage, *Washington, Seepage, Groundwater movement, Permeability, Soil contamination, Soils, Water table, Assessment, Safety, Evaluation, Public health.
Identifiers: Waste storage, *Hanford site(Wash).

On June 8, 1973, the 241-T-106 underground liquid waste storage tank, located on the U.S. Atomic Energy Commission's Hanford reservation, was confirmed as leaking. It was predicted that the leaked waste would be retained by the dry sediment well above the water table. A study was instigated to confirm this prediction. Results show the deepest penetration was 27 meters below the ground surface or 35 meters above the water table (approximately 87 and 116 feet, respectively). Based on these results and the basic knowledge of liquid movement in Hanford sediments, further movement of the radioactivity from its present location will be negligible. (Houser-ORNL)
W74-06861

BEHAVIOR OF RADIOIODINE IN THE ENVIRONMENT AND IN MAN,
Comitato Nazionale per l'Energia Nucleare, Ispra (Italy). Division Protezione Sanitaria e Controlli.
F. Breuer, and M. DeBortoli.
Available from NTIS, Springfield, Va., as RT/PROT(73)13; $6.25 per copy, $1.45 microfiche. Report CNEN-RT/PROT(73)13, 1973. 80 p, 3 fig, 21 tab, 129 ref.

Descriptors: Iodine, *Iodine radioisotopes, *Environment, *Radioisotopes, Behavior, Ecology, Fallout, Air pollution, Water pollution, Soil contamination, Absorption, Food chains, Human population, Public health, Degradation(Decomposition), Data collections, Aquatic plants, Marine algae.
Identifiers: *Decay, *Half-life.

A collection of data and information is presented for those who have the task of evaluating the consequences of radioiodine releases to the atmosphere. Data and comments are provided: on the physico-chemical state of radioiodine, also in connection with the different sources (fallout and nuclear plants); on the methods for its removal from air; on the mechanisms and parameters of interest in the deposition from air onto vegetation (dry and wet deposition) and the successive depletion; on the radioiodine transfer from grass to milk; on the metabolism in the adult and in the child, from a dynamic point of view and in relation with the stable iodine intake. Finally, the most practically useful data for radiation protection purposes are derived, for chronic as well as for acute contamination situations; for the latter the administration of stable iodine to reduce the dose is also considered. (Houser-ORNL)
W74-06862

GROUND-WATER HYDROLOGY OF NORTHERN NAPA VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2F.
W74-06880

MATERIALS INPUT OF LAKE CHAMPLAIN: A SYNOPTIC APPRAISAL,
Vermont Univ., Burlington. Dept. of Zoology.
For primary bibliographic entry see Field 2H.
W74-06882

GROUNDWATER TRACING WITH POST SAMPLING ACTIVATION ANALYSIS,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 2F.
W74-06889

NITRIC OXIDE SORPTION BY CALCAREOUS SOILS: II. EFFECT OF MOISTURE ON CAPACITY, RATE, AND SORPTION PRODUCTS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
S. Miyamoto, R. J. Prather, and H. L. Bohn.
Soil Science Society of America Proceedings, Vol 38, No 1, p 71-74, January-February 1974. 6 fig, 3 tab, 8 ref.

Descriptors: *Sorption, *Nitrogen, *Waste disposal, Path of pollutants, Air pollutants, Calcareous soils, Soil disposal fields.
Identifiers: *Nitric oxide, *Land disposal(Wastes).

At room temperature, the nitric oxide (NO) sorption capacity of calcareous soils increased with the presence of moisture in an air + NO stream (1.5% NO by volume) and in the soils. The largest increase, up to 10-fold or approximately to the acid-titratable basicity of soils, occurred when NO and H2O were sorbed simultaneously by initially dry soils from a moist air (humidity > 95%) + NO stream. The sorption rates were proportional to the unused portion of the capacity with the rate constants ranging from 0.02 to 0.03 per min for NO and 0.01 to 0.015 per min for H2O under simultaneous sorption. Initially moist soils sorbed NO from a dry air (humidity < 5%) + NO stream until the soils dried. The rate of NO sorption slowed at initial soil water suctions less than approximately 1 bar. Sorbed NO was recovered as nitrate and reacted with the basicity in moist soils. Less than 20% of the sorbed nitrogen was lost upon heating at 105 deg C for 24 hours. (Knapp-USGS)
W74-06894

KINETICS OF THE PHOSPHATE INTERACTION WITH CALCITE,
Utah State Univ., Logan. Dept. of Soil Science and Biometeorology.
R. A. Griffin, and J. J. Jurinak.
Soil Science Society of America Proceedings, Vol 38, No 1, p 75-79, January-February 1974. 6 fig, 1 tab, 19 ref.

Descriptors: *Phosphates, *Calcite, *Sorption, *Adsorption, Thermodynamics, Solubility, Kinetics, Free energy, Soil chemistry, Mineralogy, Water chemistry.

Phosphate interaction with calcite did not proceed in the absence of the calcite surface. The kinetics of interaction could be described by two simultaneous reactions. The first reaction was second-order and was ascribed to the adsorption of phosphate on the calcite surface. The second reaction was first-order and was associated with the surface arrangement of phosphate clusters into calcium phosphate heteronuclei. Solubility criteria show that at low phosphate concentrations the ultimate calcium phosphate surface mineral formed was hydroxylapatite. Desorption kinetics were studied by using an anion exchange resin technique. The desorption process could be described as two simultaneous first-order reactions. The desorption mechanism corresponds to the dissolution of a surface nucleated calcium phosphate mineral, with the second reaction step being the desorption of phosphate from the calcite surface sites. The rate constants for adsorption and desorption were determined at four temperatures between 0 deg C and 40 deg C and were used to compute the activation energies of adsorption and desorption. In addition, the enthalpy of activation, the entropy of activation, and the free energy of activation for both the adsorption and desorption processes were computed. (Knapp-USGS)
W74-06895

AZIDE AND ETHYLENETHIOUREA MOBILITY IN SOILS,
Agricultural Research Service, Beltsville, Md. Agricultural Environmental Quality Inst.
C. S. Helling, and S. M. Thompson.
Soil Science Society of America Proceedings, Vol 38, No 1, p 80-85, January-February 1974. 2 tab, 27 ref.

Descriptors: *Translocation, *Pesticide kinetics, *Leaching, *Path of pollutants, *Chromatography, Movement, Analytical techniques, Pesticide residues, Soil water movement, Sorption, Herbicides.

Movement of pesticides in soil was studied using a masking technique developed for visualizing nonradioactive compounds on soil thin-layer chromatographic plates. To determine azide mobility, leached plates were sprayed with a kaolinite slurry in 95% ethanol, air-dried, and resprayed with 2% Fe(N03)3 in 5% HN03. The average mobility of azide in four mineral soils was 0.87, and in a muck 0.21; it is thus quite mobile in most soils. The form of azide (NaN3, KN3, or KN3 + K2C03) did not affect mobility. 2-Imidazoli-dinethione (ethylenethiourea, or ETU), a degradation product of ethylenebis (dithiocarbamate) fungicides, was evaluated after masking with kaolinite + alumina (1:2), sprayed onto soil plates in 95% ethanol. Nitroprusside and Grote's reagents were useful chromogenic reagents. Mobility was also determined by autoradiography; average mobilities for four mineral soils ranged from 0.83 to 100, decreasing to 0.61 in a muck. Although weakly adsoebed from solution, ETU is immobilized by drying the soil before leaching. 2-Imadazolidone (ethyleneurea) and possibly sulfur were detected in soil incubated 7 days with ETU. (Knapp-USGS)
W74-06896

NITROGEN MINERALIZATION-WATER RELATIONS IN SOILS,
Agricultural Research Service, Beltsville, Md. Agricultural Environmental Quality Inst.
G. Stanford, and E. Epstein.
Soil Science Society of America Proceedings, Vol 38, No 1, p 103-106, January-February 1974. 3 fig, 1 tab, 8 ref.

Descriptors: *Nitrogen, *Soil chemistry, *Water chemistry, *Soil moisture, Moisture tension, Regression analysis, Porosity, Soil texture, Nitrification, Denitrification, Path of pollutants.
Identifiers: *Mineralization(Soil nitrogen).

The relationships between soil N mineralization, soil water content, and matric suction were studied in nine soils of widely differing chemical and physical properties. Highest N mineralization rates occurred between matric suctions of 1/3 to 0.1 bar, in which range 80% to 90% of the total pore space was filled with water. In the range from optimum soil water content (1/3 to 0.1 bar) to 15 bars, a near-linear relation generally existed between amounts of mineral N accumulated and soil water contents. With increasing dryness, N mineralization continued to decline. Water levels above optimum often reduced mineral N accumulations, presumably because of denitrification. Upon expressing the values for N mineralization (Y) and soil water content (X) for each soil on a relative basis with respect to maximum N mineralized (Y = 100) and associated optimum soil water content (X = 100), the regression of Y on X did not differ among soils. Regression coefficients for common (based on covariance) and total regressions, respectively, were 1.07 and 1.02. Corresponding Y-intercepts were -2 and -4. A reasonable approximation of the regression is Y = X. (Knapp-USGS)
W74-06897

MINERAL NITROGEN MOVEMENT INTO SUBSOILS FOLLOWING CONTINUED ANNUAL FERTILIZATION FOR CORN,
Minnesota Univ., St. Paul. Dept. of Soil Science.
J. M. MacGregor, G. R. Blake, and S. D. Evans.
Soil Science Society of America Proceedings, Vol 38, No 1, p 110-113, January-February 1974. 2 fig, 2 tab, 15 ref.

Descriptors: *Path of pollutants, *Fertilizers, *Nitrates, *Leaching, Nitrification, Dentrification, Ammonia, Nitrogen, Soil water movement, Percolation, Irrigation effects, Tile drainage.

Nitrogen movement was studied in two clay loam soils fertilized in planting for corn (Zea mays L.) for 10 or 15 growing seasons at annual rates of 0, 44.8, or 268.8 kg N/ha. After 10 growing seasons, little NO3-N remained below drainage tile depth in Le Sueur clay loam. After 11 growing seasons on untiled Forman clay loam, considerable NO3-N was found at depths to 6 or 7 meters. After 15 years, appreciable nitrate occurred to the 10-m depth. The average rates of movement of the NO3 front for the 10 and the 15-year periods were 1.7 and 1.9 mm/day, respectively. Concentrations of ammonium N were similar under all fertilizer treatments. Annual N additions failed to significantly increase corn grain yields on Le Sueur clay loam but significantly increased yields on Forman clay loam. (Knapp-USGS)
W74-06898

ESTIMATING SOIL EROSION FROM THE REDISTRIBUTION OF FALLOUT CS-137,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 2J.
W74-06901

WANDO RIVER ENVIRONMENTAL QUALITY STUDIES, AN INTERIM REPORT.
South Carolina Water Resources Commission, Columbia.
April 1973. 115 p, 17 fig, 6 tab, 11 ref.

Descriptors: *Estuaries, *Water quality, *South Carolina, Environment, Data collections, Hydrologic data, Harbors.
Identifiers: *Wando River(S.C.).

The South Carolina Water Resources Commission designed and conducted an environmental quality study of a portion of the Wando River and an adjacent tract of highland during the period July 1972 through March 1973. The findings are suitable for environmental impact statements for port development in the vicinity of Hobcaw Creek. The Wando River is less turbid and contains less undesirable soluble and sedimentary materials than the other major tributaries of the Charleston Harbor estuary. The quality of water at the mouth of Wando River is significantly affected by flows originating in the Cooper River resulting in a degradation of aquatic conditions. There is a gradual and dramatic improvement of quality upstream in proportion to the distance from Charleston Harbor. Development along the lower reaches will probably not result in additional deterioration to water quality since such conditions already exist. Nor will such developments seriously affect upstream quality providing industrial effluents are nontoxic to marine forms and are otherwise adequately treated. (Knapp-USGS)
W74-06919

DISTRIBUTION OF METALS IN BALTIMORE HARBOR SEDIMENTS,
Environmental Protection Agency, Annapolis, Md. Annapolis Field Office.
O. Villa, Jr., and P. G. Johnson.
Middle Atlantic Region-III Technical Report 59, January 1974. 64 p, 20 fig, 20 tab, 31 ref.

Descriptors: *Heavy metals, *Chesapeake Bay, *Distribution patterns, *Path of pollutants, *Water pollution sources, Bottom sediments, Lead, Copper, Chromium, Cadmium, Zinc, Nickel, Manganese, Mercury, Spectrophotometry, Flame photometry, *Maryland.
Identifiers: *Baltimore Harbor.

In order to develop a current inventory of metals contamination of Baltimore Harbor, sediment samples were collected at 176 stations and analyzed for Pb, Cu, Cr, Cd, Zn, Ni, Mn and Hg using atomic absorption spectrophotometry. Concentration levels were compared with levels found in another highly industrialized harbor complex, other estuarine systems and in Chesapeake Bay sediments geographically removed from the Harbor. Distribution patterns of various metals were related to industrial and municipal inputs. Concentrations of all metals analyzed from the Harbor were about 3 to 50 times greater in value than their counterparts from the Chesapeake Bay. Distribution of metals generally reflected the inputs from the large industrial complex which Baltimore Harbor supports. In black colored sediments mercury, copper, lead and cadmium probably exist as sulfides. Particle size can play a significant role in adsorption reactions of metallic species. Baltimore Harbor and the Chesapeake Bay have generally similar sand, silt and clay ranges, with both averaging about 84% silt and clay. Differences in concentration between the systems were therefore not attributed to variations in particle size. (Knapp-USGS)
W74-06924

ANALYSIS OF IODINE IN ANTARCTIC SNOW,
Nevada Univ., Reno. Desert Research Inst.
M. S. Owens, and J. A. Warburton.
Antarctic Journal, Vol 8, No 6, p 343-344, November-December 1973. 2 fig, 2 ref.

Descriptors: *Iodine, *Precipitation(Atmospheric), *Antarctic, Chemical analysis, Sampling, Neutron activation analysis, Pollutant identification.

Snow collected in Antarctica at Byrd Station in 1969 and 1970, and at Byrd, Siple and Pole Stations in 1971 and 1972 at depths down to 6 meters was analyzed for iodine. Analysis is by ion exchange concentration, followed by neutron activation analysis. Polyethylene bags and containers are a source of iodine contamination of aqueous solutions. In a typical case, water with an initial concentration of less than 5 times 10 to the 13 power grams per milliliter increased to 30 times 10 to the -13 power grams per milliliter after storage in a 20 liter polyethylene bottle for 1 month. (Knapp-USGS)
W74-06929

SILVER CONCENTRATIONS IN ANTARCTIC SNOW AND FIRN,
Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 5A.
W74-06930

GROUND WATER POLLUTION FROM SUBSURFACE EXCAVATIONS: PART II--POLLUTION FROM WELLS.
Water Well Journal, Vol 28, No 4, p 55-56, 58-59. April 1974. 6 tab.

Descriptors: *Water pollution sources, *Water wells, *Waste disposal wells, Excavation, Water pollution control, Path of pollutants, Water quality.

Groundwater pollution often results from subsurface excavations--excavations of all types including water wells. Any time a hole is constructed which provides a possible avenue to bypass the surface filtering system, the chance for pollution is increased. Waste disposal wells are a relatively recent development and are becoming increasingly popular as restrictions on the discharge of noxious and obnoxious fluids to surface waters become more stringent. As of mid-1972 at least 246 such wells had been constructed in the United States. Some of the wastes that are being injected contain chemicals that are relatively toxic and will persist indefinitely in the subsurface environment. Monitoring of the subsurface environment is quite difficult in comparison with monitoring of the surface. If contamination of usable groundwater or other resources should occur, decontamination may be difficult or impossible. (See also W74-06277) (Knapp-USGS)
W74-06933

TRANSFORMATION OF IRON IN A WATERLOGGED SOIL AS INFLUENCED BY REDOX POTENTIAL AND PH,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
S. Gotoh, and W. H. Patrick, Jr.
Soil Science Society of America Proceedings, Vol 38, No 1, p 66-71, January-February 1974. 5 fig, 1 tab, 32 ref.

Descriptors: *Iron, *Soil chemistry, *Water chemistry, Oxidation, Hydrogen ion concentration, Reduction(Chemical), Oxidation-reduction potential, Anaerobic conditions.

The distribution of different forms of iron in a waterlogged soil was studied over a wide range of closely controlled redox potential and pH conditions. Increases in water soluble and exchangeable iron were favored by a decrease in both redox potential and pH. The critical redox potentials for iron reduction and consequent dissolution was between +300 mV and +100 mV at pH 6 and 7, and -100 mV at pH 8, while at pH 5 appreciable reduction occurred at +300 mV. The distribution between water soluble and exchangeable iron fractions was highly pH dependent with a decrease in pH at a given redox potential increasing the relative amount of ferrous iron in the soil solution at the expense of that on the exchange complex. A thermodynamic approach to the equilibria

between solid phase ferric oxyhydroxide and a water soluble species of iron (Fe(+2) indicated that it was largely governed by the Fe(+2) - Fe(OH)3 system in which the ferric oxyhydroxide was a mixture of goethite and amorphous material. (Knapp-USGS)
W74-06934

SOLUTE MOVEMENT THROUGH DISTURBED AND UNDISTURBED SOIL CORES,
North Dakota State Univ., Fargo. Dept. of Soils.
D. K. Cassel, T. H. Krueger, F. W. Schroer, and E. B. Norum.
Soil Science Society of America Proceedings, Vol 38, No 1, p 36-40, January-February 1974. 9 fig, 19 ref.

Descriptors: *Solutes, *Translocation, *Soil water movement, *Unsaturated flow, *Path of pollutants, Nitrification, Dispersion, Leaching, Chlorides, Nitrates.
Identifiers: Miscible displacement.

Displacement of nitrate and Cl-36 were measured in disturbed (reconstituted horizon by horizon) and undisturbed soil profiles of Aberdeen loam and Beotia loam representing strong and moderate soil structure, respectively. Each soil core was 30 cm in diameter and at least 80 cm high. Mean water content of the undisturbed soil profile was greater and mean bulk density less than the corresponding values for the disturbed cores for each soil. For example, disturbance increased mean water content by 0.07 for Beotia loam with a 0.01 g/cc decrease in bulk density; disturbing Aberdeen decreased bulk density from 1.47 to 1.30 g/cc but increased mean water content only 0.03. The disturbed soils required greater throughput volume of distilled water to displace the solutes and had smaller dispersion coefficients than the undisturbed soils. For a given effluent sample, relative nitrate concentration was consistently greater than relative Cl-36 concentration due to nitrification occurring within both the disturbed and undisturbed soil profiles during the 24-week period. (Knapp-USGS)
W74-06935

PROCEEDINGS NINTH BIENNIAL CONFERENCE ON GROUND WATER.
Water Resources Center University of California, Davis, Cal. 95616. Price $4.00. Conference held Sept 13-14, 1973, Francisco Torres Conference Center, Goleta, Calif: California University Water Resources Center Report No 26, December 1973. 154 p.

Descriptors: *Groundwater, *California, *Water resources development, *Water pollution control, Water law, Institutions, Governments, Federal water pollution control act, Regulation, Planning.

The theme of the 9th biennial groundwater conference (California) is a consideration of the growing awareness of factors affecting groundwater quality. Discussed are research findings that relate to quality of water contained in underground aquifers, of water dependent upon a conjunctive or interfacing use between surface water and groundwater aquifers, and related topics concerning activity on the overlying land encompass land-use planning and the consequences for groundwater quality. Operating processes, procedures and programs functioning to use, develop and manage groundwater resources are discussed. Agencies, organizations and individuals involved in the complex array of operating procedures followed in groundwater management present a range of viewpoints to strengthen the basic hypothesis of this conference: that optimal management of groundwater resources requires explicit concern for explicit operational procedures applying to groundwater quality. Institutional settings in which the operating procedures and processes take place with regard to management and use of groundwater resources are considered. Problems encountered by agencies, organizations and individuals charged with the management and decision-making responsibilities relative to groundwater use and development include needs for improved data and reconsideration of laws and operational procedures, better evaluation of total environmental impact, and more consideration of the economic and social consequences of development, use and management of water resource systems. (See W74-06943 thru W74-06956) (Knapp-USGS)
W74-06942

CONJUNCTIVE OPERATION OF SOUTHERN CALIFORNIA GROUND WATER BASINS WITH THE STATE WATER PROJECT,
Southern California Metropolitan Water District, Los Angeles.
For primary bibliographic entry see Field 4B.
W74-06943

GROUND WATER QUALITY MODELS: WHAT THEY CAN AND CANNOT DO,
Water Resources Engineers, Inc., Walnut Creek, Calif.
D. E. Evenson, G. T. Orlob, and T. C. Lyons.
In: Proceedings of 9th Biennial Conference on Ground Water, Sept 13-14, 1973, Francisco Torres Conference Center, Goleta, Calif: California University Water Resources Center Report No 26, p 38-45, December 1973. 10 ref.

Descriptors: *Water quality, *Groundwater, *Mathematical models, Reviews, Simulation analysis, Data collections, Model studies.
Identifiers: *Water quality models.

Groundwater quality models are reviewed. Although at present groundwater quality models have generally been designed to deal with conservative substances, principally the mineral salts, this need not be a real limitation. Soil scientists and agricultural engineers have studied the complex interactions not only between cations and anions in solution, but also between dissolved quality constituents and the soil, and the use of these constituents by crops. Given the quality of infiltrating water and the characteristics of the soil column a model can simulate the quality of water effluent from the soil profile where it enters either the saturated soil column, tile underdrains or an adjacent stream. The primary mechanisms that distribute quality constituents in the saturated portion of the groundwater basin are advection (flow) and dispersion (flow variation). The techniques for formulating realistic models are available and apparently are adequate. What may not be available or adequate is a body of data upon which to build practical quality models of actual systems. Groundwater quality models developed to date, like their counterparts--groundwater quantity models--have been basically two-dimensional, although some crude approximations have been made to account for transport along a third axis. Groundwater basin models have usually been two-dimensional in plan, while sea water intrusion models have been formulated as two-dimensional in profile. Technically, there are no real obstacles to development of a computer program for three-dimensional groundwater quality (or quantity) simulation. Reliable groundwater quality models are strongly dependent upon a capability to describe the movement of groundwater. Quantity and quality models are interactive. The development of groundwater quality models requires processing of data, usually in large amounts. Preliminary development and testing of quality models may provide the first indications of data weaknesses that can be remedied by future action. (See also W74-06942) (Knapp-USGS)
W74-06944

GEOTHERMAL DEVELOPMENT AND SOUTHWEST STORAGE BASINS,
Bureau of Reclamation, Boulder City, Nev. Region 3.
For primary bibliographic entry see Field 4B.
W74-06945

PROTECTING GROUND WATER QUALITY--SOME PROBLEMS AND SOLUTIONS,
Luhdorff (E.E.) Co., Woodland, Calif.
E. E. Luhdorff, Jr.
In: Proceedings of 9th Biennial Conference on Ground Water, Sept 13-14, 1973, Francisco Torres Conference Center, Goleta, Calif: California University Water Resources Center Report No 26, p 53-57, December 1973.

Descriptors: *Water wells, *Public health, *Water pollution control, *California, Regulation, Aquifer testing.

Some areas of well construction are not related to the problems of providing sanitary protection of the well at the surface, but rather to the protection of the groundwater quality of the lower aquifers. One of the major problems in well design and construction is knowing which aquifer should be used in the completion of the well. It is highly desirable to know the quality of water each aquifer contains and ideally its transmissibility, to predetermine how much water will be produced from the well and what its ultimate quality will be. In order to predetermine the conditions which will exist within a completed well, it is advantageous to test individual aquifers in the well before its completion. Regulations are being authored, adopted and administered in California on local levels by a growing number of counties and cities. (See also W74-06942) (Knapp-USGS)
W74-06946

GROUND WATER QUALITY DATA FOR PLANNING, MONITORING AND SURVEILLANCE,
California State Dept. of Water Resources, Sacramento. Div. of Resources Development.
For primary bibliographic entry see Field 5A.
W74-06947

EFFECTS OF SEWAGE DISPOSAL AND RECLAMATION ON GROUND WATER QUALITY,
California State Dept. of Public Health, Sacramento. Environmental Sanitation Div.
For primary bibliographic entry see Field 5D.
W74-06948

EFFECTS OF SOLID WASTE DISPOSAL ON GROUND WATER QUALITY,
L. A. Burch.
In: Proceedings of 9th Biennial Conference on Ground Water, Sept 13-14, 1973, Francisco Torres Conference Center, Goleta, Calif: California University Water Resources Center Report No 26, p 78-84, December 1973.

Descriptors: *Landfills, *Water pollution sources, California, Garbage dumps, Leaching, Biochemical oxygen demand, Heavy metals, Groundwater, Bacteria.

Solid wastes may be the source of several types of water polluting substances. Leachate from refuse may have a BOD as high as 20,000 mg/liter and the COD may be equally as high. Leaching may cause an increase in mineral content of groundwater, as illustrated by major increases in TDS, hardness, chloride, and sulfate. The electrical conductivity may be as high as 25,000 micromhos with chloride concentrations commonly exceeding 2,000 mg/liter. Refuse may contain high densities of coliform, fecal coliform and fecal streptococci organisms and a landfill may provide an ideal habitat for survival and possible regrowth of these organisms; leaching may physically transport such microorganisms out of the landfill. Various organic and inorganic chemicals may be disposed of in a landfill and be present in a discharge from a

landfill. Solid wastes may adversely affect groundwater by two processes--the percolation of leachate and the migration of carbon dioxide gas from the buried solid wastes into the underlying groundwater. The geologic and hydrologic characteristics of a disposal site control the effects that these two processes may have on groundwater quality. Geologic factors include the type of materials underlying a site, their ability to retard the movement of leachate or carbon dioxide to the groundwater, or soil reactions with the percolating waste products. Pertinent hydrologic factors include the position of the groundwater and its proximity to the disposal site and the rate and direction of groundwater movement. (See also W74-06942) (Knapp-USGS)
W74-06949

SLUDGE DISPOSAL TO LAND,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
P. F. Pratt.
In: Proceedings of 9th Biennial Conference on Ground Water, Sept 13-14, 1973, Francisco Torres Conference Center, Goleta, Calif: California University Water Resources Center Report No 26, p 85-93, December 1973. 2 tab, 6 ref.

Descriptors: *Water pollution sources, *Groundwater, *Sludge disposal, *Fertilizers, Nitrates, Heavy metals, Trace elements, Salts, Salinity.
Identifiers: Land disposal(Wastes).

The effects of land use of sludges on groundwater quality depend on the chemical constituents that remain or become soluble and the volume of drainage water that moves from the soil-root system and eventually becomes part of the groundwater. The main problems are nitrates and the soluble cations Ca, Mg, Na and the anions HCO3, SO4 and Cl. If sludges are added at rates adequate to provide the proper amounts of available nitrogen, the available phosphorus requirements of crops will usually be met if not exceeded. However, the reactions of phosphorus with soils and with mineral constituents (calcium, aluminum and iron ions or colloids) in the sludge itself will insure that the phosphorus moves downward very slowly. The only exception would be in sands, in which case the downward migration of phosphorus compounds might be of concern over a long period of time but would still be f at least an order of magnitude slower than the movement of nitrate or chloride. The development of undesirable levels of trace elements in soils as a result of using sludges as a source of nutrients is a slow process and depends on the particular sludge and its rate of use, the soil, and the crops grown. An example of the time involved is provided by the use of liquid digested sludge on agricultural lands in Hertfordshire, England. In this case, the West Hertfordshire Main Drainage Authority has set a tentative limit of no more than 30 years for the use of its sludge. (See also W74-06942) (Knapp-USGS)
W74-06950

AGRICULTURAL WASTES AND GROUND WATER QUALITY,
California Univ., Davis.
R. S. Ayers.
In: Proceedings of 9th Biennial Conference on Ground Water, Sept 13-14, 1973, Francisco Torres Conference Center, Goleta, Calif: California University Water Resources Center Report No 26, p 94-96, December 1973.

Descriptors: *Water pollution sources, *Farm wastes, Leaching, Fertilizers, Groundwater, Water pollution control, *California.

Irrigated agriculture's waste products include salts concentrated by evapotranspiration, residues of fertilizers and soil amendments not picked up by crops, and animal manures from dairy and feed lots. The contamination can be minimized by establishing a favorable balance where export of pollutants balances import, and at a sufficiently low level of pollutant that beneficial uses are not affected. (See also W74-06942) (Knapp-USGS)
W74-06951

THE FEDERAL ROLE AND LEGISLATIVE TRENDS IN CONTROL OF GROUND WATER QUALITY,
Environmental Protection Agency, San Francisco, Calif. Region IX.
For primary bibliographic entry see Field 5G.
W74-06952

CURRENT STATE BOARD ACTIVITIES IN GROUND WATER QUALITY MANAGEMENT,
California State Water Resources Control Board, Scramento.
For primary bibliographic entry see Field 5G.
W74-06953

IMPACT OF WATER POLLUTION CONTROL LEGISLATION ON MEETING FUTURE WATER NEEDS IN CALIFORNIA,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 5G.
W74-06954

GROUND WATER POLLUTION--FROM THE WASTE DISCHARGER'S VIEWPOINT,
Gilbert (J.B.) and Associates, Sacramento, Calif.
For primary bibliographic entry see Field 5G.
W74-06955

ENVIRONMENTAL QUALITY: AS AN OBJECTIVE OF GROUND WATER MANAGEMENT,
California State Dept. of Water Resources, Sacramento.
M. H. Remy.
In: Proceedings of 9th Biennial Conference on Ground Water, Sept 13-14, 1973, Francisco Torres Conference Center, Goleta, Calif: California University Water Resources Center Report No 26, p 126-131, December 1973.

Descriptors: *Water pollution control, *Groundwater, *Federal water pollution control act, Monitoring, Regulation, Water quality act, Planning, California, Water law.

Groundwater managers in California can do several things to obtain and impart information needed for wise management of resources. This integration of environmental information into the planning process need not await governmental regulation of the resource. First, much of the basic data on well activities can be obtained from well logs required to be filed under the Water Code. Both diligent enforcement of this filing requirement and increased efforts to make the public aware of such filing requirements will increase the volume and quality of vital data. Secondly, groundwater agencies should make every effort to prepare meaningful and complete environmental impact reports for activities they intend to carry out which might significantly affect the environment. Since groundwater basins are characteristically subject to the assertion of private rights, water resources managers should also begin to use environmental impact reports as a means of communicating with the public. (See also W74-06942) (Knapp-USGS)
W74-06956

COOPERATIVE GULF OF MEXICO ESTUARINE INVENTORY AND STUDY, FLORIDA: PHASE 1 AREA DESCRIPTION,
National Marine Fisheries Service, St. Petersburg Beach, Fla. Gulf Coast Fisheries Center.
For primary bibliographic entry see Field 2L.
W74-06995

RADIOECOLOGICAL RESEARCHES IN FRESHWATER AND TERRESTRIAL ENVIRONMENT, (IN ITALIAN),
O. Ravera
Ateneo Parmense Sez Ii Acta Nat Vol 7, No 1, p 15-25, 1971. (English summary)
Identifiers: Ecological studies, Environment, *Italy(Ispra), Terrestrial environment, *Radioecology, *Research.

The results of 9 yr of radioecological research in Ispra, Italy are reported.--Copyright 1973, Biological Abstracts, Inc.
W74-07009

INFLUENCE OF SOME HYDROLOGICAL PARAMETERS ON CHANGES IN THE RADIOACTIVITY OF THE WATERS OF THE RIVERS CZARNA PRZEMSZA AND PRZEMSZA,
Wojewodzkie Przedsiebiorstwo Wodociagow Kanaliz, Katowice (Poland).
J. Kwapulinski, and T. Zubik
Acta Hydrobiol. Vol 14, No 3, p 257-271, 1972. Illus.
Identifiers: Hydrological parameters, *Poland(Czarna Przemsza-Przemsza Rivers), *Radioactivity, Rivers, Water level, Water temperature, *Water flow, *Dry residue, Reception basin area.

The influences of some hydrological parameters (water level, water temperature, area of the reception basin, dry residue and water flow) on the specific radioactivity of the water were studied. Based on the studies and the known coefficient of flow changeability and dry residue, the relationship between parameters on any stretch of the river can be established. No correlation between the specific radioactivity of the water and dry residue of flow was found.--Copyright 1973, Biological Abstracts, Inc.
W74-07019

WATER POLLUTION AND BIOLOGY, (IN POLISH),
Polskie Towarzystwo Przyrodnkow im Kopernika, Warsaw.
K. Starmach.
Wszechswiat. 3, p 61-62, 1972.
Identifiers: *Biology, Detergents, Industrial wastes, Pesticides, *Poland, Pollution, Rivers, Sewage, *Water pollution, Effluents.

So-called purified sewage drained into natural water bodies polluted the water. Various types of pollution such as industrial effluents, detergents, commercial fertilizers, pest conrol measures, and others are discussed, and also in some cases the negative influence of mechanical soil cultivation and improper regulation of rivers. Standards for defining the quality of natural water based on biological criteria and strict control of such standards should be established. About 42% of the river waters in Poland are polluted to the point of being unusable.--Copyright 1973, Biological Abstracts, Inc.
W74-07020

DYNAMICS OF CHANGES IN THE CONCENTRATION OF FLUORINE COMPOUNDS EMITTED BY THE PHOSPHORUS FERTILIZER MANUFACTURING ESTABLISHMENT IN POZAN, AND THEIR INFLUENCE ON SURFACE AND UNDERGROUND WATERS AND ON THE ATMOSPHERE WITHIN TH E LIMITS OF THE CITY OF POZNAN, (IN POLISH),
Medical Academy, Poznan (Poland).
A. Jankowiak, Z. Szulczewski, P. Fierek, O. Fiksinska, and L. Pawlak.
Biul Sluzby Sanit Epidemiol Wojewodztwa Katowickiego. Vol 16, No 1, p 95-99. 1972.
Identifiers: Cities, Disposal, Environmental, *Fertilizer manufacture, *Fluorine, *Phosphorus, *Poland(Poznan), Waste waters, *Potable water, Public health, Springs, Well water, *Air pollution.

The concentration of F in drinking water springs in the area studied was lower than optimal values. Well water showed a lower F content than water from municipal waterworks. The phosphorus fertilizer manufacturing establishment was a serious source of air pollution. Filtering installations were not sufficiently efficient in checking infiltration of F into the air. Systematic control of the F content in the air is needed to protect the people living in the vicinity of the factory.--Copyright 1973, Biological Abstracts, Inc.
W74-07021

NITROGEN-FIXING ACTIVITY IN UPLAND AND FLOODED RICE FIELDS,
T. Yoshida, and R. R. Ancajas.
Soil Sci Soc Am Proc. Vol 37, No 1, p 42-46. 1973. Illus.
Identifiers: *Acetylene reduction, Flooded crops, Methodology, *Nitrogen-fixing activity, Oryza-sativa, Paddy fields(Rice), Rhizosphere, *Rice fields.

The acetylene reduction and 15N methods showed that under field conditions of rice (Oryza sativa L.) culture N fixation ranging 3-63 kg/ha occurred in soil, water and the rice plant rhizosphere. The greatest fixation occurred in the rhizosphere and was more pronounced under flooded than under upland conditions. The N fixing activity in flooded soils increased after the panicle initiation stage of the rice plant. It was higher in the planted soil than in the unplanted soil.--Copyright 1973, Biological Abstracts, Inc.
W74-07024

EFFECT OF PLANT GROWTH AND FORM OF NITROGEN FERTILIZER ON DENTRIFICATION FROM FOUR SOUTH AUSTRALIAN SOILS,
Waite Agricultural Research Inst., Glen Osmond (Australia).
For primary bibliographic entry see Field 2G.
W74-07039

DISTRIBUTION AND CIRCULATION OF ARSENIC THROUGH WATER, ORGANISMS AND SEDIMENTS OF LAKE MICHIGAN,
Michigan Univ., Ann Arbor. School of Natural Resources.
I. S. Seydel.
Arch Hydrobiol. Vol 71, No 1, p 17-30. 1972.
Identifiers: *Arsenic, Canada, Circulation, Distribution, *Lake Michigan, *Neutron activation analysis, Organisms, Plankton, Sediments, Water pollution sources, Lakes, Path of pollutants, *Lake Superior, Benthos.

The arsenic water, sediment, plankton and benthos samples from Lake Michigan and Lake Superior (USA, Canada) were measured by means of neutron activation analysis. The samples of Lake Superior served as comparison since Lake Superior is thought to be relatively unpolluted because of low industrialization on the shoreline as well as in the drainage area. Certain geological features of both the lakes suggest that in the natural state Lake Superior should have a higher As content than Lake Michigan. This investigation shows clearly that Lake Michigan has become enriched with As. The high As values of the sediments and the low As values of the water are due to the geochemical behavior of the As. Sources of As are listed.--Copyright 1973, Biological Abstracts, Inc.
W74-07046

5C. Effects Of Pollution

NITROGEN TURNOVER IN IMPOUNDMENTS,
Oklahoma State Univ., Stillwater. Dept. of Zoology.
D. W. Toetz.
Available from the National Technical Information Service as PB-231 199; $4.75 in paper copy, $1.45 in microfiche. Oklahoma Water Resources Research Institute Final Technical Completion Report (1973). 29 p, 5 fig, 8 tab, 8 ref. OWRR A-023-OKLA(2).

Descriptors: Aquatic plants, *Nutrients, Water pollution effects, Ammonia, Impoundments, Model studies, Midges, *Absorption, Rhizomes, Root systems, Isotopes, Leaves, Eutrophication.
Identifiers: *Michaelis-Menton model, *Potemogeton nodosus, *Ceratophyllum, *N-15 isotope.

The relationship between growth of aquatic plants and their nutrient supply is poorly understood. One object was to learn if the Michaelis-Menton model describes the relationship between the uptake of NH4 and the concentration of NH4 in solution. A hyperbola resulted when uptake of NH4 by Ceratophyllum (v) was plotted against the concentration of NH4 in solution (S). Linearity between v and S existed at concentrations less than 7 mg NH4-N(1)-1, suggested that a model for first order saturation kinetics might be appropriate. However, uptake was depressed by one-half at low temperatures and some of the uptake was apparently related to processes which are not completely passive. Another objective was to determine if hydrophytes could absorb ammonia through the root and rhizome system and, subsequently, translocate the absorbed nitrogen to stems and leaves. Uptake and translocation of 15N occurred in three species of hydrophytes. In the laboratory 90% of Potemogeton nodosus tested took up the isotope by roots and rhizomes and approximately 50% had the isotope in stem and leaf organs. Specific uptake rates for plants with enriched parts were highly variable: 0.02 to 40.08 micrograms NH4-N (mg N Root-Rhizome day) -1. Roots, rhizomes, stems and leaves of P. nodosus became enriched with 15N labeled ammonia which had been injected into the lake sediments.
W74-06505

MICRO-ECOSYSTEMS SIMULATION OF PRIMARY PRODUCTION IN THERMAL AND ACID MINE WATER LOADINGS RELATED TO WATER USE OF THE MONONGAHELA RIVER,
West Virginia Univ., Morgantown. Dept. of Biology.
Edward C. Keller, Jr.
Available from the National Technical Information Service as PB-231 234; $9.00 in paper copy, $1.45 in microfiche. West Virginia Water Research Institute, Morgantown, Completion Report, 1973. 442 p, 149 fig, 51 tab, 162 ref, 5 append. OWRR B-001-WVA(4). 14-31-0001-3351.

Descriptors: *Acid mine water, *Primary productivity, Ecosystems, Ecology, Phytoplankton, *Simulation analysis, *Thermal pollution, *West Virginia, *Chlorophyta, Mine water, Water pollution, Water quality, Aquatic microorganisms, Aquatic productivity, Plankton, Heat pollution, Pollution(Thermal), Acidity, Hydrogen ion concentration.
Identifiers: *Monongahela River(W Va), Micro-ecosystems.

Laboratory experiments indicated that the major controlling variables of primary growth and production were pH and total acidity. Buffering systems in the experiments significantly affected total productivity, but river water had very low buffering capacity. Significant modifications occurred in the estimated carrying capacities and general growth characteristics resulting from interactions of the acid mine water, thermal modification, and sewage inputs. Field experiments showed phytoplankter diversity to be significantly affected by acid mine water, there being extremely low diversity in the acid-mine-water feeder streams. Multiple regression analyses on biomass production in the river demonstrated that environmental and chemical variables examined at the Rivesville site were much more predictable than those at Fort Martin. The pH level accounted for 40 percent of the variation at Rivesville. Hardness, calcium, and magnesium were major predictors at Fort Martin, downriver. The total regression model predicted some 70 percent of the variation at Rivesville, only 58 percent at Fort Martin on differential growth analyses; and about 64 percent at Rivesville; and about 40 percent at Fort Martin on the original data.
W74-06507

COLIFORM BACTERIA GROWTH AND CONTROL IN AERATED STABILIZATION BASINS,
Crown Zellerbach Corp., Camas, Wash. Environmental Services Div.
For primary bibliographic entry see Field 5D.
W74-06520

OXIDATION OF ORGANIC MATTER IN SEDIMENTS,
Washington Univ., Seattle. Dept. of Oceanography.
M. M. Pamatmat, R. S. Jones, H. Sanborn, and A. Bhagwat.
Copy available from GPO Sup Doc as EP1.23:660/3-73-005, $1.30 microfiche from NTIS as PB-231 248 $1.45 . Environmental Protection Agency, Ecological Research Series, Report EPA-660/3-73-005, September 1973. 104 p, 24 fig, 12 tab, 48 ref. EPA Project 16070 EKZ.

Descriptors: *Anaerobic conditions, Benthos, Biodegradation, Biochemical oxygen demand, Bottom sediments, Humic acids, *Oxidation, *Oxygen demand, *Organic matter, Pacific Northwest U.S., *Water pollution effects, *Metabolism, *Washington, *Absorption.
Identifiers: Anaerobic metabolism, Dehydrogenase activity(Sediments), Oxygen debt, Metabolic heat release, Microcalorimetry, Lake Washington, Puget Sound, Sediment nutrient release.

Techniques were developed for sampling undisturbed sediment interface, and measuring oxygen uptake by intact sediment cores, dehydrogenase activity of sediment bacteria, and metabolic heat release by benthic organisms. Dehydrogenase activity, a relative measure of anaerobic metabolism, was calibrated by direct microcalorimetry to provide estimates of actual metabolism under field conditions. The oxygen debt of sediments was determined by a dichromate method. Laboratory experiments were conducted to determine the relationship between oxygen uptake, loss of carbon, and release of silicate, nitrate, ammonia, and phosphate by sediments. The oxygen consumption at 33 stations in Puget Sound was measured each season to provide baseline data for this estuary. The original working hypothesis, that total oxygen uptake represents a measure of total metabolism in the sediment column appears erroneous, at least in organically rich sediment where anaerobic metabolism may greatly exceed aerobic metabolism. As sedimentation rate of oxidizable organic matter increases, as in cases of organic pollution and eutrophication, anaerobic metabolism becomes an important process that is measurable by dehydrogenase assay. In less organic sediments, the rate of oxygen uptake may be a fair estimate of total metabolism. Furthermore, it is a useful index of equilibrium conditions among the various factors that affect the rate of oxygen uptake, e.g. oxygen tension, temperature, turbulence, available metabolizable energy, composition of community, etc. (EPA)
W74-06528

PHYTOPLANKTON POPULATIONS IN RELATION TO DIFFERENT TROPHIC LEVELS AT WINNIPESAUKEE LAKE, NEW HAMPSHIRE, U.S.A.,
New Hampshire Univ., Durham. Dept. of Botany.

H. W. Yeo, and A. C. Mathieson.
Available from the National Technical Information Service as PB-231 206 $12.25 in paper copy, $1.45 in microfiche. New Hampshire Water Resources Research Center Completion Research Report No. 9, February 1973. 155 p. 77 fig, 10 tab, 49 ref. OWRR A-019-NH(1).

Descriptors: *Phytoplankton, *Trophic level, New Hampshire, Phosphates, Nitrates, Silicates, Primary productivity, Distribution, Cyanophyta, Eutrophication, Nutrients, Water pollution effects, Indicators, Period of growth, Water temperature, Systematics, Nitrites, Chlorophyta, Diatoms, Chrysophyta, Euglenophyta.
Identifiers: *Winnipesaukee Lake(N.H.), Species diversity, Compound index, Dinophyta, Baccilariophyta, Cryptophyta, Xanthophyta.

The composition, abundance, and seasonal periodicity of phytoplankton at Lake Winnipesaukee, New Hampshire were determined. Eight stations were established to identify their phytoplankton floras and trophic levels. The Chlorophycean species usually dominated each monthly count. Aside from nutrients, the most influential factors affecting algal growth were light, temperature, and organic pollution. Nutrient enrichment experiments were conducted to evaluate their effect on primary productivity of natural phytoplankton populations. Phytoplankton was primarily comprised of Chlorophyceae, Cyanophyceae, Bacillariophyceae, and Chrysophyceae. Cynaophyceae usually dominated the phytoplankton in the number of cells although not in number of species. Different trophic levels appear to exist in the same lake. When applied to the entire lake, the collective indices designated a mesotrophic status to the lake with the Compound Index being the most useful in designating the trophic levels. The three lakes, Winnipesaukee, Newfound and Winnisquam have similar floras except that Winnipesaukee has a far greater number of species. Presence of 45 of the 60 algal genera most tolerant to organic pollution indicates the large impact of organic pollution in Winnipesaukee. Potentially troublesome taxa of algae. Aphanizomenon flos-aquae, Anabaena flos-aquae, Gloeotrichia echinulata, Polycystis aeruginosa, and Anabaena scheremetievi were found throughout the lake. (Jones-Wisconsin)
W74-06529

HYDROBIOLOGICAL STUDIES 3.
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
Academia Publishing House, Prague, Czechoslovakia. 1973. 310p. 127 fig, 64 tab, 267 ref.

Descriptors: *Reservoirs, *Limnology, *Hydrobiology, Radioisotopes, Fertilization, Zooplankton, Carp, Primary productivity, Chemical properties, Physical properties, Mathematical studies, Drainage, Odor, Surveys, Water quality, Eutrophication, Potable water, Statistical methods, Marl, Indiana.
Identifiers: Lipno Reservoir(Czechoslovakia), Vltava Cascade(Czechoslovakia), Dyje River(Czechoslovakia), Klicava Reservoir(Czechoslovakia), Luzicka Nisa(Czechoslovakia), Marl lakes, Bohemia.

Czechoslovak reservoir limnology was studied including the amount of net zooplankton in stations at varying depths, primary production of phytoplankton, and some chemical and physical properties of water in shallow Lipno Reservoir. Temperature, transparency and concentration of some chemical constituents were also investigated in this reservoir. Primary production rates of two series of four interconnected calcareous lakes of northeastern Indiana were studied to ascertain factors controlling low productivity in marl lakes. Comparative experiments were carried out with nitrogen and phosphorus enrichment of small ponds with various breeding stages of carp fry. Effect of mineral fertilizers and fry on plankton development as well as on physics and chemistry of water, was followed in comparative experiments. Annual cycle and seasonal dynamics of zooplankton in backwaters of flooded River Dyje, South Moravia are described, biomass and its changes with regard to individual zooplankton associations determined, and results compared with those from other regions and water types. A survey was made of the water quality of 58 reservoirs in Czechoslovakia; 48 of these are located in the Elbe drainage area and 5 in Luzicka Nisa area. The major factors affecting odor in Klicava Reservoir was found to be anoxic conditions. (See W74-06531 thru W74-06533) (Jones-Wisconsin)
W74-06530

PRODUCTIVITY INVESTIGATIONS OF INTERCONNECTED MARL LAKES (I). THE EIGHT LAKES OF THE OLIVER AND WALTERS CHAINS, NORTHEASTERN INDIANA,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
R. G. Wetzel.
In: 'Hydrobiological Studies 3,' Academia Publishing House, Prague, Czechoslovakia, 1973, p 91-143. 19 fig, 7 tab, 41 ref.

Descriptors: *Productivity, *Marl, *Lakes, Indiana, Hardness(Water), Calcium, Cations, Physicochemical properties, Baseline studies, Hydrogen ion concentration, Carbonates, Trophic level, Photosynthesis, Bacteria, Organic matter, Light penetration, Oxygen, Systematics.
Identifiers: Oliver Chain Lakes(Indiana), Walters Chain Lakes(Indiana).

Approximately 15% of northern Indiana lakes are marl lakes, exhibiting high pH, alkalinity, and divalent cations. Causal relationships between low photosynthetic metabolism in marl lakes and regulatory mechanisms influencing primary productivity were investigated. The analysis involved two series of four interconnected marl lakes, each indicating some of the unique characteristics of the trophic ontogeny of marl lakes. Carbon-14 techniques were employed simultaneously from April 1963 through March 1964 to measure in situ rates of primary production. Major physical and chemical characteristics were determined concomitantly. Annual mean rates of primary production in the end basins, both receiving a majority of runoff and containing higher levels of organic matter, were double those of the central lakes. In progression from marl lakes of low production rates to those exhibiting increased productvity within an interconnected series, there exist factors characteristic of calcareous waters that suppress growth. Central among these interactions is the carbonate complex and resultant effects on organic matter and cycling utilization, and indirect complexing function of organic compounds. These effects are eventually counterbalanced, a result of several complex edaphic and morphometric factors, to permit increased sustained rates of production. (See also W74-06530) (Jones-Wisconsin)
W74-06533

UPTAKE OF NATURAL RADIOISOTOPES BY AQUATIC ORGANISMS,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
J. Justyn.
In: 'Hydrobiological Studies 3, 'Academia Publishing House, Prague, Czechoslovakia, 1973, p 145-171. 18 fig, 3 tab, 40 ref.

Descriptors: *Absorption, *Radioisotopes, *Aquatic populations, Indicators, Radium radioisotopes, Uranium radioisotopes, Potassium radioisotopes, Radioactive wastes, Algae, Plankton, Mosses, Aquatic plants, Mathematical studies, Daphnia, Crustaceans, Cyanophyta, Mollusks, Insects, Fish.
Identifiers: *Natural radioisotopes, Beta activity, Czechoslovak uranium mines.

Under natural conditions in an experimental cascade below the outfall from an abandoned uranium mine and in another 30 localities of surface waters and sources uptake of radium 226, uranium, gross beta activity and K-40 by aquatic organisms was studied. Also the uptake of radium 226 and gross beta activity was studied in aquatic organisms under laboratory conditions using five types of mine waters from Czechoslovak uranium mines. In general the aquatic organisms proved very good indicators of natural radioactive water contamination. Special attention was given to a plankton mixture of Daphnia and green monocellular algae. Mathematical relation between the natural radioactivity accumulated in various aquatic organisms and in water from their environment was drawn and the possibilities of using this relation as indication of natural radioactive contamination tested. Correlation of contents of Ra-226, uranium, gross beta activity and gross beta activity corrected to K-40, respectively, in ashes of filamentous algae, Bryophyta and other species and in the environmental water was found to represent an exponential function of the radioactive content of water. (See also W74-06530) (Jones-Wisconsin)
W74-06534

THE EFFECT OF MINERAL FERTILIZATION AND OF CARP FRY ON THE COMPOSITION AND DYNAMICS OF PLANKTON,
Vysoka Skola Zemedelska, Lednice (Czechoslovakia). Biological Station.
B. Losos, and J. Hetesa.
In: 'Hydrobiological Studies 3,' Academia Publishing House, Prague, Czechoslovakia, 1973, p 173-217. 16 fig, 4 tab, 51 ref.

Descriptors: *Ponds, *Fertilization, *Fish, *Plankton, *Primary productivity, Nitrogen, Phosphorus, Zooplankton, Daphnia, Copepods, Phytoplankton, Physical properties, Chemical properties, Dynamics, Cyanophyta, Diatoms, Chlorophyta, Rotifers, Crustaceans.
Identifiers: Carp fry.

Comparative experiments were carried out with nitrogen and phosphorus enrichment of small ponds with various stages of carp fry breeding. Effect of mineral fertilizers and fry on development of pond plankton and on physics and chemistry of water was investigated. Significant differences in plankton species composition were ascertained only between ponds with and without the fry, regardless of fertilization type. Various combinations and amounts of fertilizers had no substantial effects on plankton species composition. Only quantitative differences for some species were ascertained between ponds fertilized in different ways. In ponds without fry, water had no vegetation color and transparency was nearly to the bottom (100-150 cm). Species composition of phytoplankton was roughly the same in all ponds without fry. Zooplankton species composition was different in ponds with fry. Soon after stocking, a sudden depression of large cladocerans, Daphnia, was observed. After Daphnia had been consumed by the fry, small carnivorous copepods, Acanthocyclops vernalis, overcrowded. Rate of fry growth was significantly affected by the change of the zooplankton composition. When the fry consumes large Daphnia, its growth curve was steep; when feeding upon small copepods, fish growth slowed. (See also W74-06530) (Jones-Wisconsin)
W74-06535

ANNUAL CYCLE OF ZOOPLANKTON IN BACKWATERS OF THE FLOOD AREA OF THE DYJE,
Brno Univ., Musov (Czechoslovakia). Biological Station.
S. Osmera.
In: 'Hydrobiological Studies 3,' Academia Publishing House, Prague, Czechoslovakia, 1973, p 219-256. 19 fig, 5 tab, 48 ref.

Descriptors: *Cycles, *Zooplankton, *Backwater, *Flood plains, Seasonal, Copepods, Biomass, Crustaceans, Rotifers, Physicochemical properties, Dominant organisms, Annual, Aquatic plants.
Identifiers: *Dyje River (Czechoslovakia).

Zooplankton development is described in four types of backwaters with special regard to typical communities and their characteristic changes throughout the year. Biomass and its changes with regard to individual zooplankton associations were determined and results compared with those from other regions and water types. After an almost uniform amount of Copepoda in the winter, the total zooplankton is washed out during floods. A vernal increase of zooplankton occurs after disconnection of the backwaters. There is a second appearance of Copepoda, the majority of which are replaced later by Cladocera remaining until depression of the flora in the submerged vegetation. In open water areas, Cladocera are replaced by Rotatoria and pelagial species of Copepoda. From early summer, the number of zooplankton decreases. After an overturn until early winter, developmental stages, later even adult specimens of Copepoda, again appear; these persist all winter using the adequate oxygen supply. Nearly all zooplankton disappear in regions with oxygen deficits during the winter, only males of Copepoda and larvae of Chaoborus remaining. The conclusion drawn from a comparison of research is that Crustacea dominate reservoirs containing submersed vegetation while Rotatoria dominate where vegetation is lacking. (See also W74-06530) (Jones-Wisconsin)
W74-06536

SURVEY OF RESERVOIRS IN BOHEMIA AND THEIR WATER QUALITY,
Hydraulic Research Inst., Prague (Czechoslovakia).
V. Rozmajzlova-Rehackova.
In: 'Hydrobiological Studies 3,' Academia Publishing House, Prague, Czechoslovakia, 1973, p 257-282. 15 fig, 2 tab, 10 ref.

Descriptors: *Reservoirs, *Water quality, *Limnology, Water pollution effects, Surveys, Iron, Chemical oxygen demand, Dissolved oxygen, Drainage area, Hydrogen ion concentration, Hardness(Water), Phosphorus, Phytoplankton, Eutrophication, Forests, Plankton.
Identifiers: *Bohemia(Czechoslovakia), Elbe River(Bohemia), Luzicka Nisa(Bohemia).

Survey was made of water quality of 58 reservoirs in Czechoslovakia in 1965; 48 of these are located in the drainage area of the Elbe River and five in the Luzicka Nisa. Sixteen were water supply reservoirs while the remainder served for power production, the supply of industrial and irrigation waters, flood control, or pisciculture and recreation. Hydrogen ion concentration varied between 4.7 and 9.4, with most reservoirs around 7.0. The quantity of planktonic organisms in individual reservoirs varied widely. A typical water-bloom, formed by Aphanizomenon, Anabaena, and Microcystis was found during a single collection of samples only in three reservoirs. No close relationship existed between forested drainage areas and the quantity of phytoplankton in the reservoirs. When the forested percentage of the drainage area was high, total phosphorus in water decreased, but there was a small concentration of phosphorus even when the forested percentage was low. Only reservoirs whose drainage area displayed a low forested percentage showed a high degree of water hardness, while a low degree of hardness was found in reservoirs whose drainage area had a low of high forested percentage. The most polluted reservoir received pulp-mill wastes. (See also W74-06530) (Jones-Wisconsin)
W74-06537

CONTRIBUTION TO THE INVESTIGATION OF ODOURS IN WATER,
Hydraulic Research Inst., Prague (Czechoslovakia).
P. Popovska.
In: 'Hydrobiological Studies 3,' Academia Publishing House, Prague, Czechoslovakia, 1973, p 283-310. 18 fig, 6 tab, 24 ref.

Descriptors: *Odor, *Reservoirs, Dissolved oxygen, Hydrogen ion concentration, Depth, Decomposing organic matter, Statistical methods, Sediments.
Identifiers: Klicava Reservoir(Czechoslovakia).

The odor nuisance was studied in the Czechoslovak Klicava reservoir. Water samples were taken in regular 3-week intervals from January 1965 to August 1966, and odor strength of the water determined in each sample. By statistical methods it was proved that autotrophs (mainly diatoms) are not the primary constituents affecting its organoleptic properties. Using statistical methods it was shown that there is no relation between the quantities of fungi, the manganese bacterium Leptothrix echinata, and the water odor. The relationship between odor strength and pH, odor strength and water depth and odor strength and dissolved oxygen content were proved. No direct proportionality between water temperature and odor strength was found. By multiple linear regression and partial correlation the dependency of the odor on the concentration of dissolved oxygen, to a lesser degree on the water depth (biological processes in the bottom sediments) were found. The effect of pH on odor strength is, according to the results of multiple linear regression and partial correlation, negligible. (See also W74-06530) (Jones-Wisconsin)
W74-06538

SOURCES OF OXYGEN IN ESTUARIES,
M. Owens.
In: Proceedings of Symposium on Mathematical and Hydraulic Modelling of Estuarine Pollution, April 18-19, 1972, Water Pollution Research Laboratory, Stevenage, England, p 25-37. 1 tab, 28 ref.

Descriptors: *Oxygen, *Estuaries, *Advection, Nitrification, Atmosphere, Photosynthesis, Oxygenation, Measurement, Mathematical studies, Flow, Tidal effects, Reaeration, Velocity, Depth, Winds, Wavelengths.
Identifiers: *Oxygen sources, Exchange coefficient.

Sources of oxygen in estuaries are discussed and quantified. During specific periods of investigation, total gain in oxygen in the Thames Estuary from advective sources was about 170 tons/d which was about 18% of that required for complete oxidation of effluents discharged to the estuary. Under certain conditions nitrate and sulphate in the water are reduced by bacterial action and oxygen is directly utilized in oxidizing carbonaceous material, significant in some estuaries. Magnitude of oxygen contribution from the atmosphere is illustrated by considering that for an exchange coefficient of 1 cm/h, 0.24 g oxygen/sq m/d are absorbed for each mg/l deficit. Equations relating to photosynthetic oxygen production and respiration of the algae can be utilized to predict diurnal variations in DO concentration in the water. At certain times of the year freshwater flow, tidal exchange, and reaeration will be the most important sources. Magnitude of the oxygen contribution from the atmosphere is determined amongst other factors) by value of exchange coefficient. Further evaluation, particularly at velocities and depths found in estuaries, is required. Influences of wind speed and wave height on magnitudes of the exchange coefficient need precise defining. (Jones-Wisconsin)
W74-06539

UTILIZATION OF OXYGEN IN ESTUARIES,
Water Pollution Research Lab., Stevenage (England).
M. J. Barrett.
In: Proceedings of Symposium on Mathematical and Hydraulic Modelling of Estuarine Pollution, April 18-19, 1972, Water Pollution Research Laboratory, Stevenage, England, p 39-48. 4 fig, 1 tab, 27 ref.

Descriptors: *Dissolved oxygen, *Estuaries, *Mathematical models, Oxidation, Denitrification, Nitrification, Biochemical oxygen demand, Kinetics.
Identifiers: Thames River(England).

To predict dissolved oxygen distribution in an estuary, the whole course of oxidation up to the time when the remaining unoxidized material escapes through the seaward boundary or is lost by deposition and subsequent dredging must be represented mathematically. Oxidation of carbonaceous and nitrogenous constituents must be distinguished. In the Thames, effluents normally remain within the estuarine system about a month. To utilize BOD test results some means of converting them to 'instantaneous' rates of demand throughout the retention period is necessary. The rate constant increases with increasing temperature. The apparent first odor kinetics commonly found in experiments on oxygen uptake of sewage and other effluents is due to the facts that both a variety of organisms and substrates of differing susceptibilities to degradation are involved, and to the fate of oxygen utilization by respiring bacteria being approximately proportional to the number of organisms present. The course of oxidation of a wide range of wastes could be adequately represented by use of two rate constants. In estuaries nitrogen compounds participate both in oxidation and reduction. Once nitrification begins it continues in water containing low DO concentrations. Nitrate reduction might start under suitable conditions before all traces of DO were absent. (Jones-Wisconsin)
W74-06540

CHANGES IN WATER CHEMISTRY ACCOMPANYING SUMMER FISH KILLS IN SHALLOW EUTROPHIC LAKES OF SOUTHWEST MANITOBA,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
J. Barica.
In: Proceedings of the Symposium on the Lakes of Western Canada, 1973, Edmonton, Ontario, p 228-242. 4 fig, 2 tab, 13 ref.

Descriptors: *Water chemistry, *Lakes, *Fishkill, *Eutrophication, Shallow water, Algae, Dissolved oxygen, Ammonia, Phosphates, Nitrogen, Carbon, Phosphorus, Chlorophyll, Carbon dioxide, Chemical properties, Cyanophyta, Fish farming, Nitrates, Rainbow trout.
Identifiers: *Southwest Manitoba, Aphanizomenon flos-aquae.

Four cases of fishkills following the collapse of heavy Aphanizomenon flos-aquae blooms in shallow eutrophic lakes located in the Erickson area of southwestern Manitoba are described. Emphasis is placed on various chemical parameters in lake water and their changes during the collapse of the bloom and the subsequent fish mortalities. The most dramatic changes in water chemistry take place during the several days prior to the actual fishkill, that is, during the peak of the bloom and during the fishkill itself. Concentration of dissolved oxygen and ammonia undergo the most radical changes. Dissolved oxygen reaches its maximum concentration of 200% saturation or higher right before the fishkill. Concentrations of dissolved oxygen of 20 to 24 mg/l in the surface layers of the lakes are quite common; during this period the Aphanizomenon biomass reaches its maximum. Then, within a few days, a rapid die-off of algae begins and the entire bloom collapses. The

following phase--the actual fishkill--is characterized by a rapid drop of dissolved oxygen from the lake surface down to its bottom, with a simultaneous release of ammonia into the whole profile, without a clear zonation pattern. (Jones-Wisconsin)
W74-06541

OXYGEN IN ESTUARIES: REQUIREMENTS FOR FISHERIES,
Water Pollution Research Lab., Stevenage (England).
J. S. Alabaster.
In: Proceedings of Symposium on Mathematical and Hydraulic Modelling of Estuarine Pollution, April 18-19, 1972, Water Pollution Research Laboratory, Stevenage, England, p 15-23. 1 fig, 3 tab, 23 ref.

Descriptors: *Oxygen, *Estuaries, *Fish populations, *Oxygen sag, Dissolved oxygen, Life cycles, Fecundity, Juvenile growth stage, Larval growth stage, Fish behavior.
Identifiers: River Trent(England).

Sensitivity to low DO concentrations differ between fish species, life stages, and life processes. The DO requirements for fisheries in estuaries must consider this and type of fishery, times and places fish occur, and impact of impairment of each part of the life cycle. Acutely lethal effects would probably be avoided by maintaining DO levels above 3 mg/l though for some species this limit could be lower and for many species lower concentrations could be tolerated for short periods. Sensitivity of salmonid embroyos is greatest at hatching time with high mortalities from sudden exposure to 2-3 mg/l for 6 d. The considerable respiratory and cardiovascular adaptive fish responses to DO changes are not necessarily indicative of impairment of ecologically important functions, and probably should not be used as basis for judgments on DO requirements. Neither reduction in DO to about 5 mg/l nor moderately wide diurnal fluctuations about this level have much effect on growth rate of salmonid alevins. DO reduction to less than 50% saturation can depress juvenile fish food consumption and growth rate. Food resources, swimming performance, behavior, avoidance are all considered. Data given must form basis of DO criteria for fisheries. (Jones-Wisconsin)
W74-06542

CO-OPERATION FOR WATER PROTECTION: EUTROPHICATION CONTROL,
Organization for Economic Co-Operation and Development, Paris (France). Directorate for the Environment.
G. Dorin.
OECD Observer, No 65, August 1973, p 36-39.

Descriptors: *Water pollution control, *Eutrophication, *Pollution abatement, Nutrients, Monitoring, Sewage effluents, Agriculture, Industries, International commissions, Phosphorus, Nitrogen.
Identifiers: OECD.

Methods of control and monitoring of eutrophication are evaluated. Special attention is given to those substances which act as nutrients, particularly those containing phosphorus or nitrogen, and are often produced by biodegradation of more complex materials. Rapid growth of eutrophication suggests that in the fairly near future a large proportion of surface waters may become affected, in which case the socioeconomic and ecological consequences would be extremely serious. In most cases, phosphorus is the most important element of eutrophication development and the simplest to control. The Organization for Economic Cooperation and Development countries concentrate their efforts on four key points of eutrophication control: detergents containing phosphorus, waste water treatment, pollution by agricultural fertilizers and livestock production, and methods of water monitoring. Over a period of twenty years, eutrophication and the phosphorus concentration in water have largely kept in step with the increased use of detergents containing phosphorus in OECD countries. A significant proportion of sewage treatment plants operate inefficiently. A program is needed to educate farmers to use the best fertilization methods. Technically and commercially the modern management of animal wastes calls for considerable effort. In 1972 international experts drew up a common water measurement system especially designed for eutrophication control. (Jones-Wisconsin)
W74-06543

ABSENCE OF OXYGEN-EVOLVING CAPACITY IN DARK-GROWN CHLORELLA: THE PHOTOACTIVATION OF OXYGEN-EVOLVING CENTERS,
Martin Marietta Labs., Baltimore, Md.
G. M. Cheniae, and I. F. Martin.
Photochemistry and Photobiology, Vol 17, No 6, p 441-459, 1973. 7 fig, 3 tab, 36 ref. AT(11-1)3316.

Descriptors: *Plant morphology, *Chlorella, *Photoactivation, *Photosynthetic oxygen, Cytological studies, Photosynthesis, Manganese, Respiration, Plant pigments, Algae.
Identifiers: *Dark grown, Hill activity.

Studies are described of a light-dependent activation of oxygen evolution of green algae cultured in darkness. Chlorella cells were cultured in darkness and examined for pigment composition, capacity to evolve oxygen and capacity to photooxidize artificial electron donors to Photosystem II and I. From evidence obtained, such cells lack oxygen-evolving centers and the Mn pool associated with such centers but possess fully active System II and I trapping centers. Brief illumination (2-3 min) of dark-grown cells resulted in incorporation of Mn into the oxygen-evolving centers and capacity to evolve oxygen. It is concluded from results of these kinetic studies that the photoactivation of oxygen centers in dark grown Chlorella also is a multi-quantum process involving at least two rate limiting steps and a photosensitive state of limited stability. Measurements of oxygen-yield oscillations indicated that throughout the photoactivation process each newly formed oxygen-yielding center was independent of its neighbors. Photoactivation of the Mn-containing oxygen-yielding catalyst is a fundamental process in all photosynthetic oxygen-evolving tissue. Extrapolation of results would indicate that in development of the photosynthetic apparatus formation of oxygen-yielding sites must be preceded by formation of System II quantum-trapping centers. (Jones-Wisconsin)
W74-06544

STUDIES ON THE PHYTOPLANKTON ECOLOGY OF THE TRONDHEIMSFJORD. I. THE CHEMICAL COMPOSITION OF PHYTOPLANKTON POPULATIONS,
Norges Tekniske Hoegskole, Trondheim. Biological Station.
A. Haug, S. Myklestad, and E. Sakshaug.
Experimental Marine Biology and Ecology, Vol 11, No 1, p 15-26, 1973. 1 fig, 3 tab, 15 ref.

Descriptors: *Physiological ecology, *Chemical properties, *Phytoplankton, Proteins, Lipids, Phosphorus, Nitrogen, Dinoflagellates, Diatoms, Cytological studies, Analytical techniques, Carbohydrates.
Identifiers: *Trondheimsfjord(Norway), Chaetoceros affinis, Skeletonema.

Using observations of Chaetoceros affinis as a basis, changes in chemical composition of natural phytoplankton populations, particularly the changes in the amounts of the different carbohydrate fractions were studied in the hope that these changes may provide valuable information about the ecology of the phytoplankton in Trondheimsfjord, Norway. Samples of phytoplankton populations were analyzed for carbohydrate, protein, lipid, and phosphorus. Lipid was less than 10% of the organic dry matter. The N/P ratio was remarkably constant, but the ratio protein/carbohydrate varied between wide limits. For samples consisting mainly of dinoflagellates, the protein/carbohydrate ratio was always low due to a large amount of insoluble polysaccharides. For diatoms the carbohydrates may be divided into three fractions. The amounts of acid-soluble glucan varied from 7.7 to 36.5% of organic dry matter and these changes are the main cause of the variation in the protein/carbohydrate ratio of diatom samples. For diatom samples this ratio is a valuable indicator of the physiological state of the population. The gas-chromatographic investigation of the monosaccharide composition of the soluble carbohydrates also reveals a significant difference between dinoflagellates and diatoms. (Jones-Wisconsin)
W74-06545

THE EFFECTS OF ECOLOGICAL CHANGES ON BUCKEYE LAKE, OHIO, WITH EMPHASIS ON LARGEMOUTH BASS AND AQUATIC VASCULAR PLANTS,
Bureau of Sport Fisheries and Wildlife, Washington, D.C.
J. B. Judd, and S. H. Taub.
Ohio Biological Survey, Biological Notes No 6, 1973. 6 fig, 17 tab, 61 ref, append.

Descriptors: *Ecology, *Reservoirs, *Aquatic plants, *Ohio, *Bass, Systematics, Limnology, Turbidity, Fish behavior, Sport fish, Fish diets, Fish populations, Growth rates, Fish reproduction, Fish parasites.
Identifiers: *Largemouth bass, *Buckeye Lake(Ohio).

Evaluation of the present condition of Buckeye Lake in Ohio involved an analysis of age and growth structure of the largemouth bass population, a qualitative and quantitative survey of the higher aquatic plants, collection of physical and chemical parameters, and determination of the parasitic infections of the largemouth bass. Since its construction in 1826, Buckeye Lake has undergone ecological changes resulting in changes in status of the largemouth bass; it supported fewer but larger bass in 1970 than in the past, however, with a faster growth rate. The bass are not noticeably affected in growth or reproduction by interspecific competition from other fishes; they support a typical parasitic fauna, Proteocephalus ambloplitis, which does not appear to be a limiting factor. The lake's reduced capacity to support the comparatively large number of largemouth bass present in the late 1800's and early 1900's is due to the decrease in extent and number of higher aquatic plant species and removal of stumps, logs, and debris. Since 1930, the lake has become more eutrophic according to limnological measurements. Decrease of aquatic vegetation, bottom clearing with consequent increased wave action, plankton propagation have increased turbidity. (Jones-Wisconsin)
W74-06546

ENDOGENOUS AND PHOTOPERIODIC DIURNAL RHYTHMS OF IN VIVO LIGHT ABSORPTION AND SCATTERING IN THE GREEN ALGA ULVA LACTUCA L.,
Johns Hopkins Univ., Baltimore, Md. McCollum-Pratt Inst.; and Johns Hopkins Univ., Baltimore Md. Dept. of Biology.
S. J. Britz, and H. H. Seliger.
Biological Bulletin, Vol 144, No 1, p 12-18, 1973. 2 fig, 11 ref.

Descriptors: *Plant physiology, *Biorthyms, *Light, Chlorophyta, Photoactivation, Absorption, Photosynthesis, Wavelengths, Algae, Maryland.
Identifiers: Light scattering, Patuxent River(Maryland).

It had been observed that in the in vivo visible light absorption spectra of Ulva lactuca, the absorbance varied considerably over time at all wavelengths in a seemingly rhythmic pattern. Free floating specimens of Ulva lactuca were collected along the shore near the mouth of the Patuxent River, Maryland and cultured in the laboratory. At all wavelengths relative optical density values varied rhythmically with periods of 24 hours. The presence of these rhythms of light absorption and scattering in artificial nutrient medium under constant photoperiod was demonstrated with in vivo spectroscopy. The absorbance during photophase at 682 nm, the chlorophyll-a in vivo absorption maximum, was typically two to three times that during scotophase. Prephased endogenous rhythms (in continued darkness) were observed for a time period equal to three photoperiods. The absorbance rhythm did not correlate with changes in extractable chlorophyll-a or -b concentration. No changes in linear dichroism were observed, indicating the rhythm of light absorption could not be explained on the basis of orientation of individual absorber molecules. In vivo light microscopy did not reveal differences in chloroplast orientation. (Jones-Wisconsin)
W74-06547

THE INFLUENCE OF ENVIRONMENTAL FACTORS ON THE DISTRIBUTION OF FRESHWATER ALGAE: AN EXPERIMENTAL STUDY. III. EFFECTS OF TEMPERATURE, VITAMIN REQUIREMENTS AND INORGANIC NITROGEN COMPOUNDS ON GROWTH,
Michigan State Univ., East Lansing. Dept. of Botany.
B. Moss.
Journal of Ecology, Vol 61, No 1, p 179-192, 1973. 6 fig, 3 tab, 48 ref.

Descriptors: *Algae, *Temperature, *Vitamins, *Growth rates, Nitrogen compounds, Inorganic compounds, Distribution, Phosphorus, Ammonia, Nitrates, Chlorophyta.
Identifiers: Eutrophic algae, Oligotrophic algae.

Algal growth was determined at several temperatures under otherwise standard conditions, since temperature optima for growth varies markedly with species, in order to investigate whether oligotrophic species in general might have intrinsically lower growth rates than eutrophic algae. Effect of vitamin availability and ability to use nitrate by the eutrophic and oligotrophic flora was studied. Experiments to determine growth rate were carried out in constant temperature water baths fitted with heaters and refrigeration units. Species tested were: oligotrophic group--Micrasterias americana, Pleurotaenium trabecula, Cosmarium, Gonatozygon monotaenium, Roya anglica, and Desmidium swartzii; eutrophic group--Pandorina morum, Cosmarium botrytis, Closterium acerosum, Volvox aureus, Eudorina californica, Haematococcus droebakensis, Mesotaenium kramstai, Scenedesmus quadricuada, and Pediastrum duplex. The maximum growth rates of oligotrophic species tended to be smaller than those of eutrophic species. Temperature optima for growth under the conditions used did not differ between the two groups. Possible adaptive advantages of low growth rates in infertile waters are discussed in relation to theoretical generalization on the maturity of ecosystems. Some members of both groups required vitamin B-12 for growth, and most species tested could use either nitrate or ammonium as a nitrogen source. (Jones-Wisconsin)
W74-06549

EPIPHYTIC MICROPHYTES IN A POND POLLUTED WITH BEET SUGAR FACTORY WASTES,
Polish Academy of Sciences, Krakow. Zaklad Biologii Wod.
W. Huk.
Acta Hydrobiologica, Vol 15, No 1, p 89-95, 1973. 1 fig, 1 tab, 8 ref.

Descriptors: *Periphyton, *Microorganisms, *Sewage lagoons, *Algae, Industrial wastes, Anaerobic conditions, Systematics, Cyanophyta, Euglenophyta, Chrysophyta, Chlorophyta, Protozoa, Biochemical oxygen demand, Self-purification, Organic matter, Sugar beets.
Identifiers: *Sugar factory wastes, Bacteriophyta, Epiphytes.

Observations of epiphyte development were conducted on a specially prepared synthetic medium in a pond filled with undiluted beet sugar factory wastes. The medium consisted of bunches of narrow cellophane strips 15 cm long and 1 mm wide hung at 30 cm depth in two points in the pond. The collected material showed 62 systemic units, including Bacteriophyta, Cyanophyta, Euglenophyta, Chrysophyta, Chlorophyta, and Protozoa, of which only 22 units had been previously recorded. During the first two months after the beet sugar factory wastes had been released into the pond, water in the pond was navy blue and smelled putrid and contained poorly developed periphyton covering only part of the strips. When the color changed, the periphyton composition was much more varied; then great decrease of BOD-5 and the absence of dissolved oxygen indicated the existence of very intensive reductive-oxygenating processes. During the course of six months, full mineralization of the wastes released into the pond took place, with various organism communities participating. Individual states of self-purification of the wastes were clearly reflected in the composition of the periphyton species as well as in their abundance. (Jones-Wisconsin)
W74-06551

PROTOZOANS IN PONDS FILLED WITH SUGAR FACTORY WASTES,
Polish Academy of Sciences, Krakow. Zaklad Biologii Wod.
E. Grabacka.
Acta Hydrobiologica, Vol 15, No 1, p 97-111, 1973. 2 fig, 3 tab, 11 ref.

Descriptors: *Protozoa, *Sewage lagoons, *Industrial wastes, Bottom sediments, Fish farming, Self-purification, Benthos, Systematics, Dissolved oxygen, Anaerobic conditions, Organic matter, Bacteria.
Identifiers: *Sugar factory wastes, Golysz Experimental Farms(Poland), Metazoa, Ciliata, Heliozoa, Rhizopoda, Metopidae, Oxytrichidae.

Purification of sugar factory wastes is difficult because great quantities of sewage with high organic matter are produced in a short period. Purification was attempted by utilizing the wastes in fish ponds, where they are gradually mineralized, enriching the water with new nutrient compounds. Succession of protozoans in bottom sediments during the self-purification process was studied and the changes effected in the bottom microfauna by introduction of different waste concentrations from the sugar production process investigated, specifically the Ciliata group, of which many species are fairly sensitive indices of the degree of water pollution and hence reflect the course of self-purification. Self-purification was distinctly reflected in the development of Ciliata on the bottom, successively manifested in three ecologically different Ciliata associations. Strong pollution at the beginning of the experiment resulted in unfavorable conditions for protozoans. Enrichment of the pond with new mineral constituents favorably influenced increase in number of Ciliata. Ciliata numbers in ponds filled with undiluted of weakly diluted wastes were many times higher than in normally utilized ponds. No influence of wastes on the bottom microfauna of protozoans in the second year was found. (Jones-Wisconsin)
W74-06552

MACROBENTHOS OF PONDS WITH SUGAR FACTORY WASTES,
Polish Academy of Science, Krakow. Zaklad Biologii Wod.
J. Zieba.
Acta Hydrobiologica, Vol 15, No 1, p 113-129, 1973. 5 fig, 1 tab, 25 ref.

Descriptors: *Benthic fauna, *Ponds, *Industrial wastes, *Sewage lagoons, Diptera, Larvae, Biochemical oxygen demand, Fish farming, Benthos, Phytoplankton, Fish food organisms, Anaerobic conditions, Carp, Eutrophication, Biomass, Oligochaetes.
Identifiers: *Sugar factory wastes, Chironomidae, Glyptotendipes polytomus, Ciliata, Golysz Experimental Farms(Poland).

In purification of sugar factory wastes in fish ponds, biological productivity gradually increases as expressed by intensive development of bottom fauna. Metabolism of the dominant species of this fauna was considered for understanding of their ecological dependencies and consequently to a more satisfactory utilization of the wastes treated in the ponds. Results of a preliminary two-year investigation of macrobenthos are presented. Seasonal fluctuations in numbers and biomass of the macrobenthos fauna were related to trophic conditions dependent on different concentrations of sugar factory wastes. In ponds with undiluted and greatly diluted wastes, development of benthic fauna--mainly of Chironomidae larvae--occurred in a specific pattern. With no waste dilution a new generation of the fauna was more than two months behind as compared with the pond with diluted wastes. Conclusions are that presence of large amounts of macrobenthos in the first vegetation period after the inflow of wastes can provide considerable food reserves for larger stocks of reared carp. Wastes should not be too concentrated; otherwise the development of macrobenthos is inhibited and fish stocking is possible only in the second half of the summer. (Jones-Wisconsin)
W74-06553

REPORT OF THE EXPERT GROUP ON DETERGENTS.
Organization for Economic Co-Operation and Development, Paris (France). Directorate for the Environment.
Report 89769, 1973. 40 p, 1 fig, 3 tab, 2 append.

Descriptors: *Detergents, *Eutrophication, *Legislation, *Phosphates, Social aspects, Formulation, Social impact, Hazards, Laundering, Sewage treatment, Costs, Sodium compounds, Heavy metals, Economics.
Identifiers: *OECD, Sodium triphosphate, Ethylenediaminetetraacetic acid, Polycarboxylic acids, Hydroxycarboxylic acids, Polymers, Soaps, Sodium carbonate, Sodium silicate, Sodium nitrilotriacetate, NTA, EDTA.

Steps already taken by various OECD countries to control detergents affecting eutrophication are reported. Information was collected on detergent consumption and its trends, both in composition and quantity. Potential consequences, including economic, of proposed substitutes and their constituents are assessed. Basic considerations are presented concerning present national policies regarding the formulation of detergents with special reference to phosphate builders and to possible substitute materials in connection with existing or proposed legislation (national, federal, regional) and of voluntary agreements regarding the constituents of detergents which may affect eutrophication. Requirements of detergent performance are discussed and qualifications of substitutes for detergent phosphates including NTA, EDTA, polycarboxylic acids (citrates), hydroxycarboxylic acids, polymers, soap and soap-phosphate combinations, and sodium carbonate and sodium silicates with their prerequisite requirements for compatibility with the current types of textiles.

Cost associated with alternative policies are given. Appropriate enforcement policies should be promulgated to particular regional conditions. Research is in progress on NTA removability in water and sewage treatment processes, the carrying of heavy metals as soluble complex ions through sewage treatment processes into surface and ground waters, and on health effects. (Jones-Wisconsin)
W74-06554

A STUDY OF HAZARDOUS WASTE MATERIALS, HAZARDOUS EFFECTS AND DISPOSAL METHODS. VOLUME I.
Booz-Allen Applied Research, Inc., Bethesda, Md.
Available from the National Technical Information Service as PB-221 465. National Environmental Research Center, Cincinnati, Ohio, Final Report EPA-670/2-73-14, July 1973. 389 p, 8 fig, 81 tab, 873 ref. 68-03-0032.

Descriptors: *Hazards, *Industrial wastes, *Waste disposal, Water pollution, Costs, Information retrieval, Bibliographies, Solid wastes, Industries, Mining, Waste treatment, Radioactive wastes, Toxicity, Waste dumps, Food processing industry, Textiles, Pulp and paper industry, Chemical wastes, Oil industry, Metals, Waste identification, Soil contamination, Air pollution, Environmental effects, Chemical warfare, Explosives, Thermal powerplants, Waste water treatment, Injection wells, Control, Tannery wastes.
Identifiers: *Hazardous materials, Waste streams.

Background information is presented by providing a list of hazardous materials which should be subject to special disposal techniques, documentation of harmful effects now known and provisions for mechanisms for revising these harmful effects, develop a rating system for delineating the degree of hazard, and provide an inventory of current disposal practices and evaluation of these practices. Hazardous waste materials are defined as materials or combination of materials which require special management techniques because of their acute or chronic effects on biological health and the environment. An extensive literature search was conducted which included both manual and computer screening of pertinent literature sources. The industrial groups are identified with detailed information on the composition of industrial waste streams. The more pressing problem of hazardous wastes occurs as a result of production and use processes. Compounds found hazardous are tabulated into a rating system. A survey and inventory of treatment and disposal methods are presented. Major findings and conclusions are grouped under definition of hazardous wastes and identification of hazardous effects, selection and rating of hazardous materials, quantification and distribution, waste treatment processes, and national disposal systems. Recommendations and a bibliography are included. (See also W74-06556 and W74-06557) (Jones-Wisconsin)
W74-06555

A STUDY OF HAZARDOUS WASTE MATERIALS, HAZARDOUS EFFECTS AND DISPOSAL METHODS. VOLUME II.
Booz-Allen Applied Research, Inc., Bethesda, Md.
Available from the National Technical Information Service as PB-221 466. National Environmental Research Center, Cincinnati, Ohio, Final Report EPA-670/2-73-15, July 1973. 525 p, 20 fig, 89 tab, 61 ref. 68-03-0032.

Descriptors: *Hazards, *Industrial wastes, *Waste disposal, Mining, Coals, Bituminous materials, Food processing industry, Pulp and paper industry, Chemical wastes, Plastics, Resins, Elastomers, Soaps, Detergents, Paints, Explosives, Fertilizers, Pesticides, Textiles, Synthetic rubber.
Identifiers: Metals, Drugs, Varnishes, Lacquers, Enamels, Perfumes, Cosmetics.

A compilation of wastes generated by the food processing industry, textile mill products, paper and allied products; chemicals and allied products (including industrial organic chemicals and industrial inorganic chemicals); plastic materials and synthetic resins, synthetic rubber, synthetic and other manmade fibers; drugs, soap, detergents, cleansers, perfumes, cosmetics and other toilet preparations; paints, varnishes, lacquers, enamels, and allied products; agricultural chemicals, including chemical fertilizers and pesticides; and commercial and military explosives including liquid and solid rocket propellants, is given. Industry description, production statistics, economic statistics, waste characteristics, waste disposal and waste treatment processes and practices are described, including disposal hazards. (See also W74-06555) (Auen-Wisconsin)
W74-06556

A STUDY OF HAZARDOUS WASTE MATERIALS, HAZARDOUS EFFECTS AND DISPOSAL METHODS. VOLUME III.
Booz-Allen Applied Research, Inc., Bethesda, Md.
Available from the National Technical Information Service as PB-221 467. National Environmental Research Center, Cincinnati, Ohio, Final Report EPA-670-2-73-16, July 1973. 444 p, 15 fig, 85 tab, 70 ref. 68-03-0032.

Descriptors: *Hazards, *Industrial wastes, *Waste disposal, Statistics, Oil industry, Radioactive wastes, Industries, Economics, Tannery wastes, Air pollution, Water pollution, Nuclear powerplants, Powerplants, Solid wastes, Thermal pollution.
Identifiers: Leather industry, Asbestos industry, Department of Defense, Fabricated metals industry, Hospitals, Medical services, Steel industry, Nonferrous metals industry, Metals finishing, Nuclear powered ships.

A compilation of hazardous wastes generated by the following industries is given: The petroleum and coal products industry; leather tanning and finishing; abrasives, asbestos and miscellaneous nonmetallic mineral products; blast furnaces, steel works, and rolling and finishing mills; primary smelting and refining of nonferrous metals; coating, engraving and allied services of fabricated metals; nuclear power production; hospitals; and conventional power utilities. Included are listings of hazardous materials, their rating and supporting data. Industry description, economic statistics, production processes, waste materials, waste disposal processes and practices for each industry, as well as hazardous effects of wastes and impact of wastes on water quality are presented. Usage of coal, petroleum, natural gas, uranium and geothermal power by utilities and associated environmental pollution are detailed. Disposal of radioactive wastes for Naval nuclear-powered ships and their support facilities and a summation of their environmental monitoring is given. A comprehensive listing of hazardous materials and compounds found hazardous by a rating system is included. (See also W74-06555) (Auen-Wisconsin)
W74-06557

FRESHWATER BIOLOGY AND POLLUTION ECOLOGY: TRAINING MANUAL.
Environmental Protection Agency, Cincinnati, Ohio. Office of Water Program Operations.
For primary bibliographic entry see Field 5A.
W74-06558

MODELING THE EUTROPHICATION PROCESS.
Utah Water Research Lab., Logan.
Proceedings of a workshop, September 5-7, 1973, Logan, Utah, Water Research Laboratory, Utah State Univ. November 1973. 228 p, 118 fig, 34 tab, 313 ref.

Descriptors: *Mathematical studies, *Eutrophication, *Lakes, *Model studies, Algae, Phosphorus, Nutrients, Biota, Thermocline, Ecosystems, Biological communities, Carbon, nutrients, Carbon, Oxygen, Nitrogen, Plankton, Phytoplankton, Water management(Applied), Diversion, Forecasting, Dynamics, Minnesota, Ohio, Wisconsin, Washington, Cyanophyta, Sediments, Cost benefit analysis, Welfare(Economics), Water pollution control, Lake Erie.
Identifiers: *Lake restoration, Lake Sammamish(Wash.), Lake Washington(Wash.), Shagawa Lake(Minn.), Lake Wingra(Wis.), Twin Lakes Watershed(Ohio), Lake Mendota(Wis.), Lake George(N.Y.).

Papers presented at the workshop include the following subjects: (1) Long-term lake recovery related to available phosphorus. (2) Modeling algal growth dynamics in Shagawa Lake, Minnesota, with comments concerning projected restoration of the lake. (3) Simulation of urban runoff, nutrient loading, and biotic response of a shallow eutrophic lake. (4) Some aspects of phosphorus dynamics of the Twin Lakes Watershed. (5) The role of thermocline migration in regulating algal blooms. (6) Need for an ecosystem perspective in eutrophication modeling. (7) Multi-nutrient dynamic models of algal growth and species competition in eutrophic lakes. (8) Rates of carbon, oxygen, nitrogen, and phosphorus cycling through microbial populations in stratified lakes. (9) Capabilities and limitations of a nutrient-plankton model. (10) Phytoplankton population changes and nutrient fluctuations in a simple aquatic ecosystem model. (11) Aquatic modeling in the Eastern Deciduous Forest Biome, U.S.-International Biological Program. (12) A physical model for simulation of aquatic ecosystems. (13) Activity analysis and the management of resources: model for control of eutrophication. (14) Component description and analysis of environmental systems: Oxygen utilization in aquatic microcosms. (15) Predicting the effects of nutrient diversion on lake recovery. A synopsis of the workshop and discussions are included. (See W74-06561 thru W74-06576) (Auen-Wisconsin)
W74-06560

SYNOPSIS OF WORKSHOP ON MODELING OF THE EUTROPHICATION PROCESS.
California Univ., Berkeley. Sanitary Engineering Research Lab.
P. H. McGauhey.
In: Proceedings of a workshop on Modeling the Eutrophication Process, September 5-7, 1973, Utah, Water Research Laboratory, Utah State University, November 1973, p 1-4.

Descriptors: *Eutrophication, *Mathematical models, *Analytical techniques, Methodology, Design, Technology.
Identifiers: *Lake reclamation, State-of-the-art.

The workshop revealed that the present state-of-the-art is far too primitive to produce either the universal model or to evaluate correctly the input which should go into it. The inability to construct or to formulate a universal model leads to the next best approach: that is to make specific models which may be used to protect specific lakes; and then try to expand these models to universalize them. The question is raised as to why any individual model is not further used. Items stressed by several participants are that: vertical mixing is important; models should include the effects of sediments in supplying nutrients; relative recovery rate of a lake may be a key to where management should be given priority; it is conceptually feasible to link hydrologic and lake response in a simulation model, or to the relative physical system to the response of biota systems (not vice-versa); models which link land and water are needed; land use in many cases determines the nutrient input; temperature is a more important factor than realized; feedback of nutrients during growing seasc

is not included in models which complicates the problem of interpreting the relationship of early fast growing organisms followed by slower growing organisms. (See also W74-06560) (Auen-Wisconsin)
W74-06561

LONG-TERM LAKE RECOVERY RELATED TO AVAILABLE PHOSPHORUS,
Washington Univ., Seattle. Dept. of Civil Engineering.
E. B. Welch, C. A. Rock, and J. D. Krull.
In: Proceedings of a Workshop on Modeling the Eutrophication Process, September 5-7, 1973, Logan, Utah, Water Research Laboratory, Utah State University, November 1973, p 5-13. 7 fig, 15 ref. NSF O-B-36810X, EPA R-800512.

Descriptors: *Mathematical models, *Lakes, *Reclamation, *Phosphorus, Washington, Sediments, Water quality control, Phytoplankton, Biomass, Eutrophication, Iron, Hypolimnion, Anaerobic conditions.
Identifiers: *Lake recovery, Lake Washington(Wash.), Lake Sammamish(Wash.).

Lake Washington's recovery is compared with Lake Sammamish, leading to some new hypotheses about internal mechanisms affecting the diversion response-phosphorus income relationship. In five years after diversion of one-third of its phosphorus input, Lake Sammamish showed no significant response while Lake Washington responded promptly to phosphorus decrease. The probable explanation is that the phosphorus income change to Sammamish has occurred on the asymptote portion of a response curve that allows for much less lake response to a given increase in phosphorus income than observed in Lake Washington. The internal mechanism that probably controls the phosphorus content available is large concentrations of iron released from sediments into an anaerobic hypolimnion, which complexes and subsequently resediments phosphorus before it is available to phytoplankton. Strong control of water column concentrations of total phosphorus by large exchanges of phosphorus with sediments was supported by a gross model predicting phosphorus response to income change. If sediment release rate was held constant and sedimentation rate was allowed to vary with phosphorus concentration then only a slight reduction in concentration was predicted and which would have occurred rapidly. (See also W74-06560) (Jones-Wisconsin)
W74-06562

MODELING ALGAL GROWTH DYNAMICS IN SHAGAWA LAKE, MINNESOTA, WITH COMMENTS CONCERNING PROJECTED RESTORATION OF THE LAKE,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
D. P. Larsen, H. T. Mercier, and K. W. Malueg.
In: Proceedings of a workshop on Modeling the Eutrophication Process, September 5-7, 1973, Logan, Utah, Water Research Laboratory, Utah State University, November 1973, p 15-31. 10 fig, 2 tab, 20 ref.

Descriptors: *Mathematical models, *Eutrophication, *Plant growth, *Dynamics, Lakes, Minnesota, Reclamation, Phosphorus, Water quality control, Cycling nutrients, Nitrogen, Solar radiation, Sediments.
Identifiers: *Shagawa Lake(Minn.), Lake restoration.

The dominant source of phosphorus in Shagawa Lake has been from wastewater discharge. A model is presented which describes algal dynamics within the lake and suggests that current models simulating lake recovery may be inappropriate for the Shagawa Lake system. The hydraulic, phosphorus, and nitrogen budgets are given. The model simulates the observed spring algal bloom and demonstrates sensitivity to the magnitude of a hypothesized loss coefficient in both timing and magnitude of the algal bloom. It does not simulate the large late summer bloom of algae observed in the lake unless sediment nutrient supply and nitrogen fixation are included. It simulates the general cycle of available nitrogen and available phosphorus concentration, however. If the algal demand for available nitrogen can be met and if the rate of growth is regulated by the rate of supply of available phosphorus, the model will simulate the low levels of both available nitrogen and available phosphorus observed during the summer months. The role of the sediments in providing critical nutrients to overlying waters has been demonstrated and it is likely that the sediments will extend the recovery of the lake beyond the projected time span. (See also W74-06560) (Jones-Wisconsin)
W74-06563

SIMULATION OF URBAN RUNOFF, NUTRIENT LOADING, AND BIOTIC RESPONSE OF A SHALLOW EUTROPHIC LAKE,
Wisconsin Univ., Madison. Inst. for Environmental Studies
D. D. Huff, J. F. Koonce, W. R. Ivarson, P. R. Weiler, and E. H. DeHmann.
In: Proceedings of a workshop on Modeling the Eutrophication Process, September 5-7, 1973, Logan, Utah, Water Research Laboratory, Utah State University, November 1973, p 33-35. 25 fig, 3 tab, 15 ref. NSF AG-199, 40-193-69.

Descriptors: *Model studies, *Urban runoff, *Nutrients, *Ecosystems, Biological properties, Shallow water, Eutrophication, Lakes, Watersheds(Basins), Runoff, Phosphorus, Nitrogen, Productivity, Biomass, Phytoplankton.
Identifiers: *Lake Wingra(Wis.).

Research and modeling results are synthesized to simulate the behavior of the linked terrestrial and aquatic components of the Lake Wingra, Wisconsin basin ecosystem. Runoff to the lake was simulated, groundwater flows estimated, records made of lake discharge and lake stage, lake evaporation, and nutrient sources simulated. This modeling effort entails the coupling of detailed mechanistic models of the hydrology of a lake's drainage basin, prediction of nutrient loading, and biotic response. Although the model is simplified for a shallow lake, system specific regressions were utilized in the simulations sparingly, and only where mechanistic models have yet to be developed. The model represents a significant synthesis of the understanding of ecosystem functioning. The use of models as hypotheses of ecosystem behavior, therefore yields a tool for studies of management alternatives for aquatic systems. As such a tool, a model helps fill the gap between scientific insight and emprical type analyses. Simulation models may nevertheless allow for more rigorous testing of empirical models or management recommendations. This modeling effort indicates the feasibility of using detailed simulation models of lakes and their drainage basins. (See also W74-06560) (Jones-Wisconsin)
W74-06564

SOME ASPECTS OF PHOSPHORUS DYNAMICS OF THE TWIN LAKES WATERSHED,
Kent State Univ., Ohio. Center for Urban Regionalism.
G. D. Cooke, T. N. Bhargava, M. R. McComas, M. C. Wilson, and R. T. Heath.
In: Proceedings of a workshop on Modeling the Eutrophication Process, September 5-7, 1973, Logan, Utah, Water Research Laboratory, Utah State University, November 1973, p 57-72. 8 fig, 10 tab, 20 ref. EPA 16010-HCS (R-801936).

Descriptors: *Demonstration watersheds, *Phosphorus, *Model studies, *Cycling nutrients, *Eutrophication, Ohio, Nutrient removal, Septic tanks, Shallow water, Ecosystems, Depth.
Identifiers: *Twin Lakes(Ohio), Nutrient diversion, Lake restoration, Small watersheds.

The small experimental Twin Lakes Watershed in Ohio is currently undergoing nutrient diversion (septic tank drainage) and presents a sampling design which facilitates the compartmentalization of the terrestrial and aquatic portions of this ecosystem. The most important phosphorus source was surface inflows to the lakes. The study considered the effects of nutrient diversion on hydrologic, geochemical, and limnological features of the watershed and the lakes, and examined methods of phosphorus inactivation as a step to recliming the lakes. The theory of ecosystem development provides the holistic framework needed to understand the relationship between activities of the terrestrial portion of a watershed and the response of aquatic communities to changes in these activities. Water and phosphorus inflows and outflows of the two lakes were measured, along with many other geological and limnological aspects. The assumptions normally applied to predict the time of lake recovery seem unjustified for the Twin Lakes due to their shallow depth and small size. Because the calendar year for calculations may not represent an interval of limnological time, a new time interval is being explored--the limnological year--based on the duration of an ecological event which may greatly facilitate statistical and mathematical analyses. (See also W74-06560) (Jones-Wisconsin)
W74-06565

THE ROLE OF THERMOCLINE MIGRATION IN REGULATING ALGAL BLOOMS,
Wisconsin Univ., Madison. Water Chemistry Program; and Texas A and M Univ., College Station. Dept. of Civil Engineering.
R. E. Stauffer, and G. F. Lee.
In: Proceedings of a workshop on Modeling the Eutrophication Process, September 5-7, 1973, Logan, Utah, Water Research Laboratory, Utah State University, November 1973, p 73-82. 6 fig, 1 tab, 15 ref. EPA 16010-EHR, TG5P2-WP-184-04.

Descriptors: *Thermocline, *Cycling nutrients, *Spatial distribution, *Eutrophication, Wisconsin, Phosphorus, Cyanophyta, Water quality, Nitrogen, Chlorophyll, Thermal stratification, Temperature, Epilimnion, Mathematical models, Nutrients.
Identifiers: *Lake Mendota(Wis.).

It is hypothesized that surges of algae biomass are dependent on refluxing of nutrients by periodic depression of the thermocline by meteorologic inputs. Field investigations of possible significance of this mechanism as a factor in controlling blue-green algal blooms in Lake Mendota, Wisconsin are reported. Meteorologic data were provided by the U.S. Weather Bureau. Sampling was accomplished by vertical profiling and chlorophyll sampling every meter down past the thermocline. The model predicts transport of nitrogen and phosphorus based on measurements of initial and final stages of density partitioned water column. This is an example of a lake definitely not in a steady nutrient transport state during stratified periods; instead, it depends on a stochastic process for recycling its own nutrient pool to maintain high chlorophyll levels. This type of periodic nutrient enrichment may be important in temperate lakes where metalimnetic reservies of nitrogen and phosphorus accumulate during stratified periods and where the mechanism for recycling of nutrients must be considered in estimating intra-lake nutrient transfers and in analysis of interactions among morphometric characteristics of lakes and time sequence of nutrient additions from external sources as they relate to biological productivity. (See also W74-06560) (Jones-Wisconsin)
W74-06566

NEED FOR AN ECOSYSTEM PERSPECTIVE IN EUTROPHICATION MODELING,

Georgia Univ., Athens. Dept. of Zoology; and Georgia Univ., Athens. Inst. of Ecology.
B. C. Patten.

In: Proceedings of a workshop on Modeling the Eutrophication Process, September 5-7, 1973, Logan, Utah, Water Research Laboratory, Utah State University, November 1973, p 83-87. 1 fig, 9 ref.

Descriptors: *Mathematical studies, *Ecosystems, *Eutrophication, *Mathematical models, Control, Trophic level, Abatement, Dynamics, Watersheds(Basins).
Identifiers: *Lake restoration.

Modeling the eutrophication process seems mainly to be concerned with the primary production subsystem of lake ecosystems. The exogenous drives are basically nutrient loadings and photosynthetic energy inputs, and the internal processes include physiological parameters of algal nutrition, limnological parameters of water mass and entrained nutrient dynamics. The appropriate minimal conceptual unit for modeling eutrophication is the whole ecosystem as ecosystem components are all mutually dependent. Consequently, control points for attacking eutrophication exist everywhere in the ecosystem, not just in the nutrient and producer parameters. Theoretically, remote control may be more important in ecosystems than direct control. That is, parameters far removed from a state variable in the interconnection network may be more significant in controlling that state than other, more closely associated parameters. In applications, the reciprocal principle in combination with the knowledge that ecosystems are completely controllable can form the basis for broader avenues of attack on environmental problems. The distinct possibility exists that small (inexpensive), well chosen and correctly timed (both determined from sensitivity analysis or optimal control theory) manipulations of ecosystem parameters, remote from the nutrient-primary production subsystem, may be able to produce dramatic improvements in water quality for the amount of control effort expended. (See also W74-06560) (Jones-Wisconsin)
W74-06567

MULTI-NUTRIENT DYNAMIC MODELS OF ALGAL GROWTH AND SPECIES COMPETITION IN EUTROPHIC LAKES,

Notre Dame Univ., Ind. Dept. of Civil Engineering; Notre Dame Univ., Ind. Dept. of Chemical Engineering; Illinois Univ., Chicago. Dept. of Biological Sciences; and TenEch Environmental Consultants, South Bend, Ind.
V. J. Bierman, Jr., F. H. Verhoff, T. L. Poulson, and M. W. Tenney.

In: Proceedings of a workshop on Modeling the Eutrophication Process, September 5-7, 1973, Logan, Utah, Water Research Laboratory, Utah State University, November 1973, p 89-109. 10 fig, 88 ref. EPA R-801245.

Descriptors: *Plant growth, *Nutrients, *Mathematical models, *Limiting factors, Eutrophication, Absorption, Competition, Biological communities, Phosphorus, Nitrogen, Cycling nutrients, Nuisance algae.
Identifiers: *Lake restoration, *Algal growth, Cell synthesis.

Kinetic equations describing algal growth in eutrophic lakes' surface waters are considered. A two-step growth model, involving separate nutrient transport and cell synthesis mechanisms, was developed and applied to one- and two-species systems where phosphorus was the primary nutrient regulating growth and to a two-specie system where phosphorus and nitrogen were important regulators. Temperature effects, cell sinking, cell decomposition, nutrient recycle, and predation were included. For the case of phosphorus-dependent growth of a single algal species, the proposed model predicts a lag between phosphorus removal from solution and subsequent algal growth. Because of luxury phosphorus uptake, 85% of the algal crop developed after 50% of the phosphorus had been removed. It is concluded that detailed knowledge of the complex metabolic processes that occur inside microorganisms is not necessary in order to develop a realistic, analytical model of algal growth. Results of the two-species system in which phosphorus is the regulating nutrient, show that species differences in phosphorus uptake efficiencies and in minimum phosphorus requirements are sufficient causes to explain the frequently observed correlation between nuisance blooms of blue-green algae and low nutrient concentrations. A higher degree of internal stability can be obtained in a two-species system as opposes to a single-species system. (See also W74-06560) (Jones-Wisconsin)
W74-06568

RATES OF CARBON, OXYGEN, NITROGEN, AND PHOSPHORUS CYCLING THROUGH MICROBIAL POPULATIONS IN STRATIFIED LAKES,

Notre Dame Univ., Ind. Dept. of Chemical Engineering; and Notre Dame Univ., Ind. Dept. of Civil Engineering.
C. F. Cordeiro, W. F. Echelberger, Jr., and F. H. Verhoff.

In: Proceedings of a workshop on Modeling the Eutrophication Process, September 5-7, 1973, Logan, Utah, Water Research Laboratory, Utah State University, November 1973, p 111-120. 4 fig, 4 tab, 22 ref.

Descriptors: *Eutrophication, *Mathematical models, *Cycling nutrients, Carbon, Oxygen, Nitrogen, Phosphorus, Microorganisms, Population, Lakes, Stratification, Nutrients, Kinetics, Chemical properties, Dynamics, Bacteria, Bicarbonates, Phosphates, Ammonia, Nitrates.
Identifiers: *Lake restoration, Microbial cell growth, Stoichiometry.

Cycling rates of carbon, oxygen, nitrogen, and phosphorus through the various components of a lake system were investigated with a mathematical model to determine the major nutrient sources and the system components which use most of each element as a guide to which species may be most affected by changes in the system and enable a qualitative prediction of the results of corrective actions. The kinetics of cell growth were developed from a mechanism which postulates that this growth is accomplished by the transport of metabolites from the exterior of the cell to the interior, and the chemical conversion of these chemicals into cellular photoplasm. The elemental composition of the microbial population was determined from an average composition and used as a basis for deriving the various stoichiometric relationships used in the model. The lake was simulated as consisting of two layers, each with its set of biological and chemical components. The symbiotic activity of the algae and bacteria as regards to oxygen and bicarbonate production and utilization is clearly evident in the model. It is also possible to study the sources and sinks of the other elements. The settling and silting rate can also be determined from the model. (See also W74-06560) (Auen-Wisconsin)
W74-06569

CAPABILITIES AND LIMITATIONS OF NUTRIENT-PLANKTON MODEL,

Washington State Univ., Pullman. Dept. of Zoology and Washington State Univ., Pullman. Dept. of Computer Science.
R. A. Parker.

In: Proceedings of a workshop on Modeling the Eutrophication Process, September 5-7, 1973, Logan, Utah, Water Research Laboratory, Utah State University, November 1973, p 121-130. 6 fig, 3 tab, 14 ref.

Descriptors: *Nutrients, *Plankton, *Mathematical models, *Eutrophication, Ammonia, Plant growth, Mortality, Copepods, Crustaceans, Temperature, Photosynthesis, Phosphates, Nitrogen, Nitrates, Phytoplankton, Chlorophyll, Seasonal, Light intensity.
Identifiers: *Kootenay Lake(British Columbia), Lake restoration.

A detailed evaluation of the course of eutrophication suggests a strategy of model formulation which focuses on nutrient-plankton relationships. Since ammonium may be used preferentially as a nitrogen source by certain phytoplankters, this study evaluates the performance of a coupled system of nutrient and plankton differential equations which incorporated this assumption in contrast to one without preference. The growth and mortality functions adopted for the algal groups, and for the two zooplankton groups (cladocerans and copepods) are tabulated. Horizontal transport is recognized for each variable, and vertical diffusivity has been included for the nutrients. Only the upper 'mixed' layer was modeled, limited to 10 m so that virtually all photosynthetic activity was included. Photosynthetic rate, nutrient uptake, and cell nutrient content may or may not all exhibit Monod dependence on external nutrient concentration. Simulation results for phytoplankton, phosphate, nitrate, ammonium, copepods, and cladocerans are presented for a three-year period. It seems apparent that the model does not depend heavily on modifications in the Monod nitrate-ammonium growth functions, nor on the half-saturation constant for phosphate. The performance of this model is under the over-riding influence of a structure inherently dependent on temperature and light intensity. (See also W74-06560) (Jones-Wisconsin)
W74-06570

PHYTOPLANKTON POPULATION CHANGES AND NUTRIENT FLUCTUATIONS IN A SIMPLE AQUATIC ECOSYSTEM MODEL,

Federal Water Quality Administration, Athens, Ga. National Pollutants Fate Research Program.
R. R. Lassiter, and D. K. Kearns.

In: Proceedings of a workshop on Modeling the Eutrophication Process, September 5-7, 1973, Logan, Utah, Water Research Laboratory, Utah State University, November 1973, p 131-138. 4 fig, 11 ref.

Descriptors: *Mathematical models, *Phytoplankton, *Biota, *Nutrients, *Physicochemical properties, Ecosystems, Light, Temperature, Eutrophication, Phosphorus, Succession, Biomass, Seasonal, Dynamics, Hydrogen ion concentration.

This oversimplified model consists of equations describing a physicochemical system and associated biota. Physical aspects of the system consist of light, temperature, and an atmosphere containing 0.033% carbon dioxide. Chemical aspects consist of a set of dissolved inorganic and organic chemicals. It is assumed that the organic chemicals do not participate directly in the chemical equilibria. The biotic system consists of six phytoplankton species and heterotrophic microorganisms. The model contains explicit equations for the phytoplankton, but the heterotrophic microorganisms are included only implicity. Algal growth rates are temperature dependent. Among results obtained thus far are those which point to timing of significant ecological events (such as phosphorus reaching critically low concentrations) as important in phytoplankton competition. In some cases pH may prove to be a good indication of the time of occurrence of such events. It is also postulated that fast growing phytoplankton may dominate the early growing season, while slower growing forms capable of using lower nutrient concentrations may dominate a later season growth when their ability to utilize nutrients equals or exceeds the rate of bacterial remineralization. (See also W74-06560) (Jones-Wisconsin)
W74-06571

AQUATIC MODELING IN THE EASTERN DECIDUOUS FOREST BIOME, U.S.-INTERNATIONAL BIOLOGICAL PROGRAM,
Rennsselaer Polytechnic Inst., Troy, N. Y.
J. A. Bloomfield, R. A. Park, D. Scavia, and C. S. Zahoreak.
In: Proceedings of a workshop on Modeling the Eutrophication Process, September 5-7, 1973, Logan, Utah, Water Research Laboratory, Utah State University, November 1973, p 139-158. 7 fig, 8 tab, 32 ref. AG-199,40-193-69.

Descriptors: *Ecosystems, *Computer programs, *Eutrophication, Methodology, Hydrology, Biota, Nutrients, Biomes, Mathematical models, New York, Wisconsin.
Identifiers: *Eastern Deciduous Forest Biome, Lake George(N.Y.), Lake Wingra(Wis), Biome model CLEAN, WNGRA2 model, PL/1 FORTRAN, DYNAMO, UNIVAC 1108, IBM 370/165, Model Components, SIMPLE model.

To predict the consequences of perturbations of aquatic ecosystems, Lake George, New York and Lake Wingra, Wisconsin were the bases of mechanistic aquatic models capable of forecasting nutrient enrichment effects, thermal pollution, siltation and other by-products of man's activities; in addition the models present a degree of ecologic insights gained through the large-scale integrated studies of the International Biological Program. Q-mode cluster analysis and ordination of data helped to confirm that Lake George sampling stations were representative of differing degrees of eutrophication. R-mode cluster analysis and data ordination from both Lake George and Lake Wingra are helping in the definition of functional groups. CLEAN is programmed in modular form so that one can execute a specific submodel, such as for net phytoplankton, or link any meaningful combination of submodels as required. WNGRA2 is a site-specific model of mixed levels of resolution. SIMPLE is an eighth-order nonlinear compartmental model structured primarily to examine effects of excessive phosphate loadings and was designed specifically to simulate Lake George conditions but, with only slight modifications can be applied to any lake. The state variables represent larger ecologic groupings than in CLEAN, the time step is weekly, and the model considers only the most significant transfers. (See also W74-06560) (Auen-Wisconsin)
W74-06572

A PHYSICAL MODEL FOR SIMULATION OF AQUATIC ECOSYSTEMS,
Federal Water Quality Administration, Athens, Ga. National Pollutants Fate Research Program.
J. W. Falco, and W. M. Sanders, III.
In: Proceedings of a workshop on Modeling the Eutrophication Process, September 5-7, 1973, Logan, Utah, Water Research Laboratory, Utah State University, November 1973, p 159-169. 13 fig, 3 tab, 6 ref.

Descriptors: *Eutrophication, *Model studies, *Prototypes, Turbulence, Streamflow, Dispersion, Reaeration, Channels, Light quality.
Identifiers: *Aquatic Process Simulator.

The Aquatic Ecosystem Simulator was designed as a process physical model, as opposed to a geometric or hydrodynamic model, which would simulate biological and chemical responses of natural flowing streams to a wide range of environmental perturbations. In addition to providing information on microbial growth kinetics, the simulator will provide the capability for introducing significant material gradients along the length of a water channel and thus provide a facility to study the role of transport phenomena in environmental water quality problems. A third feature is the variable light source which simulates solar radiation, not only in terms of total intensity but also in terms of spectral distribution for the study of photosynthetic processes. The reason for the delays between the development of partially controlled streams and studies with microcosms and development of scaled physical models is largely one of cost; this facility cost approximately $1 million. In addition to the physical calibrations, microbial growth experiments with bacterial and mixed bacterial and algal populations will be performed to measure growth rates of these organisms as function of turbulent mixing rates, water temperature, nutrient concentration, and other pertinent environmental parameters. (See also W74-06560) (Jones-Wisconsin)
W74-06573

ACTIVITY ANALYSIS AND THE MANAGEMENT OF RESOURCES: A MODEL FOR CONTROL OF EUTROPHICATION,
Utah Water Research Lab., Logan.
D. B. Porcella, A. B. Bishop, and W. J. Grenney.
In: Proceedings of a workshop on Modeling the Eutrophication Process, September 5-7, 1973, Logan, Utah, Water Research Laboratory, Utah State University, November 1973, p 171-186. 10 fig, 3 tab, 14 ref. EPA 68-01-0728.

Descriptors: *Cost-benefit analysis, *Model studies, *Management, *Eutrophication, *Phosphorus, Welfare(Economics), Costs, Control, Decision making, Lake Erie, Analysis, Water quality control.
Identifiers: *Phosphorus management, Phosphorus loading, Cost-effectiveness, Case study.

This study aimed at achieving a relatively complete understanding of phosphorus inputs as a management tool for phosphorus control. The system in which phosphorus is utilized is described, possible alternatives for controlling phosphorus input to surface waters determined and the least-cost strategy for controlling that phosphorus input ascertained. The model can be applied to any region or river basin using easily obtainable data. With Lake Erie as an example, changes in phosphorus input due to various management tactics resulted in changes in relative eutrophication. Treatment costs associated with management strategies were related to effectiveness, and use of cost-effectiveness analysis for selecting the most comprehensive set of management factors is deomonstrated. Conclusions are that use of activity analysis to control the effects of a particular resource, in this case, phosphorus, is a reasonable approach. Management of a resource rather than treatment alone should be instituted when real costs of management controls are less than treatment costs saved or avoided. In Lake Erie use of management controls can result in significant treatment cost savings. A combination of management controls and treatment processes can result in lowering eutrophication levels to about the mesotrophic range, at least, with respect to phosphorus loadings. (See also W74-06560) (Jones-Wisconsin)
W74-06574

COMPONENT DESCRIPTION AND ANALYSIS OF ENVIRONMENTAL SYSTEMS: OXYGEN UTILIZATION IN AQUATIC MICROCOSMS,
Georgia Univ., Athens; and Utah Water Research Lab., Logan.
J. Hill, IV, and D. B. Porcella.
In: Proceedings of a workshop on Modeling the Eutrophication Process, September 5-7, 1973, Logan, Utah, Water Research Laboratory, Utah State University, November 1973, p 187-203. 8 fig, 5 tab, 27 ref.

Descriptors: *Design, *Model studies, *Analysis, *Methodology, *Energy transfer, Simulation analysis, Hydrologic systems, Systems analysis, Eutrophication, Mud-water interfaces, Mathematical models, Computers, Equations.
Identifiers: *Component analysis, *Component description, System transfer function, System properties.

The technique of component description and systems analysis is applied to an environment system, specifically to aquatic microcosms serving as analogues for the mud-water environment of eutrophic lakes. Component description of environmental systems is a detailed method of arriving at a system model which includes a great deal of information concerning processes of energy transfer and transformation. If component values are not available or accessible for measurement, the component analysis is tedious and expensive. However, the component values resulting from a component analysis are applicable to the same component in a similar system; therefore, some component analyses need only be done once. Modeling of environmental systems for impact studies, development planning, or similar purposes with specific applications to a specific area is probably best done using compartmental techniques. Modeling environmental systems to understand processes, general application of controls, and man-made perturbations is probably best done using component techniques. The analysis demonstrated illustrates the analytical process and attempts to point out some of the pitfalls as well as advantages in the application of the technique. (See also W74-06560) (Jones-Wisconsin)
W74-06575

PREDICTING THE EFFECTS OF NUTRIENT DIVERSION ON LAKE RECOVERY,
Battelle Pacific Northwest Lab., Richland, Wash.
M. W. Lorenzen.
In: Proceedings of a workshop on Modeling the Eutrophication Process, September 5-7, 1973, Logan, Utah, Water Research Laboratory, Utah State University, November 1973, p 205-210. 1 tab, 2 fig, 5 ref.

Descriptors: *Mathematical models, *Forecasting, *Nutrients, *Diversion, Lakes, Reclamation, Eutrophication, Sediments, Methodology.
Identifiers: Lake restoration, Nutrient diversion, Nutrient concentrations.

Model derivations are summarized showing how different assumptions about nutrient exchange processes can result in varying predictions concerning lake recovery. Model I is that in which net loss of nutrient to the sediment is considered proportional to the average concentration of that nutrient in the water. Model II considers both loss to sediments and return from sediments as independent processes and assumes that nutrient concentration in the sediment does not change appreciably over time. Model III considers coupled equations describing transfer into and out of sediments. All three models are idealized and simplified representations of complex precesses. Models II and III not only represent improvement over existing models but show important variables. Because data available for comparing these models are limited, hypothetical conditions were used for example calculations summarizing various parameters for four lakes. These values were used to calculate nutrient concentrations as a function of time illustrating that each model can predict very different results. Any model should first be checked to insure that it predicts accurately prediversion lake conditions before it is used to evaluate the effects of nutrient diversion. The seemingly disparate results are due to initial conditions which are not at steady state with loading rates. (See also W74-06560) (Jones-Wisconsin)
W74-06576

THE IMPACT OF SLIMES-DAM FORMATION ON WATER QUALITY AND POLLUTION,
Department of Water Affairs, Pretoria (South Africa).
For primary bibliographic entry see Field 5B.
W74-06604

AN ECOLOGICAL ACCOUNT OF THE PAST AND FUTURE OF SOUTH AFRICAN RIVERS,
National Inst. for Water Research, Congella (South Africa). Regional Lab.
F. M. Chutter.
Limnological Society of South Africa Newsletter No. 21, p 22-34, November 1973. 48 ref.

Descriptors: *Ecology, Rivers, *Water quality, *Biota, Aquatic life, Water storage, Soil erosion, Land management, Reservoir operation, Water pollution control, Water pollution effects.
Identifiers: *South Africa.

Changes brought about in South African rivers by human activities in the past, and their known effects on the biota are described. Probable future changes in rivers are described in relation to population growth, agricultural practice and water consumption. Rivers will be increasingly affected by impoundments and diffuse sources of chemical contaminants. While the biological consequences of many types of change may be predicted, little is known about the effects of impoundments and their management on rivers downstream of impoundments in South Africa. (DWA)
W74-06606

UTILIZATION OF PHOSPHORUS BY PHYTOPLANKTON IN PHOSPHORUS-RICH ENVIRONMENTS,
Georgia Inst. of Tech., Atlanta. School of Biology.
J. R. Strange.
Available from the National Technical Information Service as PB-231 304, $3.25 in paper copy, $1.45 in microfiche. Georgia Environmental Resources Center, Atlanta, ERC-1373, January 1974, 34 p, 23 fig, 2 tab, 11 ref, 3 append. OWRR A-035-GA(1). 14-31-0001-3810.

Descriptors: *Phosphorus, *Phytoplankton, *Eutrophication, *Algae, Waste assimilative capacity, Absorption, *Georgia.
Identifiers: *Lake Sidney Lanier(Geo), Phosphorus uptake, Chlorococcum, Fragillaria, Nostoc.

A study was made of the eutrophic Flat Creek embayment of Lake Sidney Lanier near Gainesville, Georgia, to determine to what degree phosphorus in luxury concentration could be utilized by various species of phytoplankton. Three prominant species of algae, Chlorococcum, Fragillaria and Nostoc, were grown under experimental conditions to determine their response to luxury amounts of phosphorus. Unialgal cultures were established in modified Winegradsky columns with a modified Chu's No. 10 medium. Phosphate levels of 0.15 ppm resulted in rapid growth, and the cultures reached maximum biomass levels after two or more weeks. Luxury amounts of P32 were added to a 100 ml sample from the enriched culture, increasing by more than 34-fold the concentration of phosphorus. Uptake of P32 varied from less than 20% for Nostoc to greater than 80% of the P32 added for Chlorococcum. However, if Nostoc was previously deprived of phosphorus, its subsequent uptake ability increased markedly. For the species studied, P32 uptake was directly proportional to the surface-per-volume ratio, similar to results found in marine benthic algae. These results show that phytoplanton can uptake large amounts of phosphorus entering a lake through municipal or industrial waste discharges, but further research is needed to ascertain whether removal of phosphorus by this means retards eutrophication or whether the phosphorus continues up the food chain.
W74-06611

UTILIZATION OF ERTS-1 DATA TO MONITOR AND CLASSIFY EUTROPHICATION OF INLAND LAKES,
Bendix Corp., Ann Arbor, Mich.
For primary bibliographic entry see Field 5A.
W74-06698

ERTS-1 OBSERVES ALGAL BLOOM IN LAKE ERIE AND UTAH LAKE,
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 5A.
W74-06699

STUDIES ON THE PHOTOSYNTHETIC PIGMENTS AND THEIR DECOMPOSITION IN THE SEDIMENT OF LAKE BALATON AND LAKE BELSO,
Magyar Tudomanyos Adademia, Tihany. Biological Research Inst.
J. Olah.
Ann Inst Biol (Tihany) Hung Acad Sci. 39. p 115-121, 1972. Illus.
Identifiers: Benthos, *Chlorophyll, Decomposition, *Hungary(Lake Balaton), Lakes, *Photosynthetic pigments, Primary production, *Hungary(Lake Belso), *Lake sediments, Anaerobic conditions.

In the examination period, the chlorophyll-a content of the mud surface in Lake Balaton (Hungary) was 29-71 mg/m2. The Moss and Tietjen ratios as well as the absorption spectra and the pheo-pigment content computed by using the equation of Lorenzen showed that a large proportion of the pigment was in an active condition. These results suggest that the contribution of the microphytobenthos to the primary production of the lake is considerable. The chlorophyll-a content of the superficial layer of the mud in the highly eutrophic Lake Belso was 66 mg/m2, with a highest proportion of pheo-pigments. In the upper 12 cm layer of mud the pigments were of homogeneous distribution. The pheo-pigments are suggested to originate from the rich phytoplankton, and their destruction is retarded by the semi-anaerobic condition of the water sediment interface.--Copyright 1973, Biological Abstracts, Inc.
W74-06741

ORGANIC PHOSPHORUS COMPOUNDS OF A NORTHERN MICHIGAN BOG, BOG-LAKE SYSTEM,
Michigan Univ., Ann Arbor. School of Natural Resources.
J. P. Koenings, and F. F. Hooper.
In: Nutrient Cycling and Productivity of Dystrophic Lake-Bog Systems (Part A). December 1972, p 3-22. 6 fig, 2 tab, 32 ref. ORA 016440, AEC AT(11-1)-1771.

Descriptors: *Phosphorus compounds, *Dystrophy, *Bogs, *Lakes, Trophic level, Tracers, Cycling nutrients, Analytical techniques, Organic acids, *Michigan.
Identifiers: *North Gate Lake(Mich.), Polyphosphates.

Certain Michigan bog lakes do not follow the high productivity pattern concomitant with high phosphorus content common in enriched eutrophic lakes. This study describes the chemical nature and distribution of the organic phosphorus compounds in North Gate Bog, bog-lake system and presents data from a P-32 labeling experiment which bears upon the dynamics and cycling of these compounds and upon the paradoxical relationship between nutrient level and productivity. Optical density in the ultraviolet at 260 nm in conjunction with ion exchange chromatography separation of the inorganic and organic acids containing phosphorus was used for determination of the hydrolysis products of the ribonucleic acids as well as the related free mono-, di-, and triphosphorylated nucleotides as part of dissolved organic phosphorus. Compounds produced in the bog mat appear to be hydrolysis products of ribonucleic acids as well as free mono-, di-, and triphosphate nucleotides. While inorganic phosphorus of the epilimnion and the mat waters appears to be chiefly orthophosphate, the hypolimnion contains an inorganic pool consisting of both ortho- and polyphosphate phosphorus. Lack of polyphosphates in the hypolimnion dicates that these compounds arise from in situ a tolysis of algae or bacteria rather than fr materials produced in the euphotic zone (See al W73-14185) (Auen-Wisconsin)
W74-06742

PRELIMINARY REPORT OF THE ROLE SPHAGNUM IN THE CYCLING PHOSPHORUS IN A BOG-LAKE SYSTEM,
Michigan Univ., Ann Arbor. School of Natu Resources
F. F. Hooper.
In: Nutrient Cycling and Productivity Dystrophic Lake-Bog Systems (Part A) Decemb 1972, p 23-48. 8 fig, 2 tab, 7 ref. ORA 016440, AE AT(11-1)-1771.

Descriptors: *Cycling nutrients, *Phosphoru *Mosses, Bogs, Lakes, Tracers, Phosphorus co pounds, Organic compounds, Weather, Dy trophy, *Michigan.
Identifiers: *Bog mats, North Gate Lake(Mich.)

The North Gate Bog (Michigan) mat was i vestigated to determine the phosphorus retu flow from the bog mat to the lake, the rates exchange between the water and mat, and define the chemical characteristics of t phosphorus compounds involved. The stab phosphorus of the mat interstitial water was me sured and a section of the bog mat labeled. T marginal circulation scheme offers a pathw whereby both autochthonous seston and lochthonous debris can penetrate through t strong thermal barrier present in the lake duri spring and summer. First, P-32 was appli directly to the Sphagnum surface producing leachate consisting entirely of soluble unreacti phosphorus which was flushed into the lake wh rains created a hydrological gradient of flo within the mat; this leachate not only penetrat the surface water but also entered the hypoli nion. A second label, which was injected direct into the interstitial water of the mat, produced leachate which was an entirely particulate unrea tive phosphorus; this was also flushed into the la and persisted in the surface water with little or loss or transformation in excess of three week Both of the label fractions penetrated to the low parts of the hypolimnion. (See also W73-1418 (Auen-Wisconsin)
W74-06743

IONIC STATE AND COORDINATION OF IRO IN BOG LAKES,
Michigan Univ., Ann Arbor. School of Natur Resources.
J. P. Koenings.
In: Nutrient Cycling and Productivity Dystrophic Lake-Bog Systems (Part A). Decemb 1972, p 51-71. 5 fig, 6 tab, 27 ref. ORA 06144 AEC AT(11-1)-1771.

Descriptors: *Iron compounds, *Bogs, *Lake *Solubility, Distribution, Oxidation reductio potential, Hydrogen ion concentrations, Analyt cal techniques, *Michigan.
Identifiers: Ionic ferrous iron, Ferric iron, Nort Gate Lake(Mich.).

Separation and characterization of iron com pounds present in the epilimnion and in th hypolimnion of acid bog North Gate Lake and als an assessment of the effects of reduced organi compounds on the forms of iron are described. I a dilute, low pH solution, as in a bog, Fe(I becomes or remains ionic because of the wea ability of Fe(II) to form complexes. The anaerobi hypolimnion and the low dissolved oxygen con centration in the epilimnion, combine with a hig amount of reducing substances, both organic an inorganic, and the low pH to provide an enviro ment in which Fe(II) is preferred. The presence o ionic Fe(II) without complexation as the predom nant form of iron in the deoxygenated waters o

the bog is confirmed. Results can be explained in terms of loose iron III-colored organic associations that allow iron to react as ionic ferric iron, probably due to a loose charge-to-charge interaction between un-ionized or weakly ionized organic acids, and Fe(III) produced by the oxidation of Fe(II) diffusing upward from the hypolmnion. pH controls the relative roles of iron and organic matter in oxygenated water. (See also W73-14185) (Auen-Wisconsin)
W74-06744

EFFECTS OF OIL DISPERSANTS AND OIL EMULSIONS ON MARINE ANIMALS,
Kristinebergs Zoologiska Station, Fiskebackskil (Sweden).
M. Swedmark, A. Granmo, and S. Kollberg.
Water Research, Vol 7, No 11, p 1649-1672, November 1973. 12 fig, 8 tab, 40 ref.

Descriptors: *Oil pollution, *Toxicity, *Bioassay, Fish, Mussels, Crabs, Water temperature, Salinity, Lethal limit, Sea water, Water pollution effects, Marine animals, Fjords, Respiration, Animal physiology, Fish behavior, Movement, Surfactants.
Identifiers: *Oil dispersants, *Oil emulsions, *Crude oil, Cod(Fish), Flounders, Bivalves, Cockles, Scallops, Prawns, Continuous flow technique, Macroinvertebrates, Fuel oil, Diesel oil.

The toxicities to marine animals of nine oil dispersants, three oil emulsions with Corexit and of a dispersion of Oman crude oil, were studied in continuous flow aquarium systems at 96 hr exposures followed by a recovery period in clean seawater. New types of dispersants were found to be less toxic than older types and oil emulsions more toxic than dispersants alone or crude oil alone. Fishes and bivalves were found most sensitive. Crustaceans were the most resistant to dispersants but very susceptible to oil emulsions. The tolerance of different species was found to be related to their mode of life, more active species being more susceptible. Delayed mortality of bivalves increased their susceptibility if the recovery period was included. Effects on locomotory behavior of fishes and crustaceans, breathing rate of fish, valve-closure of bivalves and byssal thread formation of common mussels have been demonstrated for both dispersants and oil emulsions. The general sequence of such effects was: increased activity; successively impaired activity; immobilization; and death. Recovery is good for fish and crustaceans but poor for bivalves due to the delayed effects. Ecological consequences of dispersants and oil pollution in the marine environment are discussed. (Mortland-Battelle)
W74-06745

SURVIVAL IN MATURATION PONDS OF COLIFORM BACTERIA WITH TRANSFERABLE DRUG RESISTANCE,
National Inst. for Water Research, Pretoria (South Africa).
W. O. K. Grabow, and I. G. Middendorff.
Water Research, Vol 7, No 11, p 1589-1597, November 1973. 6 tab, 41 ref.

Descriptors: *Water pollution effects, Resistance, Sewage treatment, *E. coli, *Sewage lagoons, Separation techniques, Pathogenic bacteria, Population, Antibiotics(Pesticides), Bactericides.
Identifiers: *Drugs, *Survival, *Salmonella typhi, Ampicillin, Chloramphenicol, Kanamycin, Streptomycin, Tetracycline, Bacterial physiology, South Africia.

The use of antimicrobial drugs which produces bacterial resistance that is mediated by R factors and is transferrable to other species raises questions regarding the survival of these bacteria in maturation ponds. Consequently studies were undertaken to investigate the behavior of drug-resistant coliform bacteria in a series of sewage maturation ponds in South Africa. Samples were collected from three ponds, the coliforms isolated, and E. coli I identified. The nalidixic acid-resistant strains E. coli E25 and Salmonella typhi N were used as recipients. Groups of 20 resistant coliforms selected at random from every sample were tested for transferable resistance. The average reduction through the ponds of coliforms resistant to ampicillin, Chloramphenicol, kanamycin, streptomycin or tetracycline was 6.83 percent lower than that of drug-sensitive bacteria. This difference was mainly due to coliforms with transferable resistance (R(plus) coliforms) which increased from 0.86 percent to 2.45 percent through the ponds. The spectrum of transferable resistance of coliforms in the effluent did not differ notably from that of coliforms in the influent. The averageincidence of Escherichia coli I among R(plus) coliforms decreased from 66.08 percent to 62.09 percent. This indicates that low-level transfer of R factors may occur in ponds. Possible mechanisms and the epidemiological significance of the increased survival of R(plus) coliforms in maturation ponds are discussed. (Little-Battelle)
W74-06748

CULTURE STUDIES OF ENTEROMORPHA LINZA (L.) J.AG. AND ULVARIA OXYSPERMA (KUTZING) BLIDING (CHLOROPHYCEAE, ULVALES) FROM CENTRAL AMERICA,
North Carolina Univ., Wilmington. Dept. of Biology.
D. F. Kapraun, and E. H. Flynn.
Phycologia, Vol 12, Nos 3/4, p 145-152, December 1973. 26 fig, 32 ref.

Descriptors: *Cultures, *Chlorophyta, *Marine algae, *Cytological studies, Plant morphology, Marine plants, Chromosomes, Benthic flora.
Identifiers: Central America, *Enteromorpha linza, *Ulvaria oxysperma, Culture media, Sample preservation, Sample preparation, *Columbia, *Costa Rica.

Enteromorpha linza and Ulvaria oxysperma from Columbia and Costa Rica, respectively, were studied by observations of material collected from nature and laboratory culture experiments. Cultures were maintained in enriched seawater media in an open-room incubator illuminated with 1500 lux incident light at 23C with 12-hr light and a 12-hr dark cycle. The algae were stained for chromosomes using a modified technique described by Kapraun (1970). Plant material was fixed in an 12KI-formalin solution during the middle of the dark cycle, washed in distilled water after 12 hr, and placed in an iron-alum mordant. Fronds were soaked in the mordant 2-5 min, rinsed thoroughly in distilled water and stained in acetocarmine for observation. Results of these investigations were compared with the literature from Japanese and European studies. Both E. linza and U. oxysperma were shown to be haplobiontic, reproducing exclusively by bi- and quadriflagellate zoospores. Results of cytological investigations are discussed: N equals 10 was indicated for E. linza, while no determination was possible for Ulvaria. (Holoman-Battelle)
W74-06749

TEMPERATURE CONTROL OF REPRODUCTION AND PRODUCTIVITY IN A SUBARCTIC CORALLINE ALGA,
National Museum of Natural History, Washington, D. C.
W. H. Adey.
Phycologia, Vol 12, Nos 3/4, p 111-118, December 1973. 12 fig, 8 ref.

Descriptors: *Water temperature, *Primary productivity, Reproduction, *Bioassay, *Light intensity, *Limiting factors, Growth rates, Ice cover, Marine algae, Atlantic Ocean, Oxygen, Seasonal, Rhodophyta, *Pacific Ocean, Physiological ecology.
Identifiers: *Clathromorphum circumscriptum.

Based on detailed quantitative distributional data for the North Atlantic and qualitative data for the North Pacific, a hypothesis of winter temperature control of reproduction and distribution is formulated for the crustose coralline alga Clathromorphum circumscriptum. The hypothesis, that winter temperatures below 2-3C are required for reproduction, was tested by growing plants for extended periods under various light and temperature conditions. Regimes from constant light cycle (12-12) and intensity (1200 lux) at a temperature of 12-13C, to reduction of both light and temperature over a 5 month interval to 6-18 hr light-dark periods, 130 lux and 0C, were employed in a manner approximately simulating the natural pattern in the shallow sublittoral of the Maine coast. Although conceptacle production was initiated in those tanks where the light cycle was reduced from 12 to 6 hr per day, mature conceptacles with bispores developed only in the tanks where the temperature was reduced. The most prolific plants were those subject to reduction of light cycle and intensity. In tanks having neither temperature nor light cycle reduction, only a very small percentage of primordial conceptacles were initiated and none of these developed to maturity. The productivity of Clathromorphum circumscriptum, based on oxygen exchange measured with a precision polarographic electrode, was examined at light intensities ranging from 0-4000 lux and temperatures ranging from 0-20C. The compensation point was reduced markedly with temperature, reaching levels of only 35 lux near 0C. This indicates a high level of efficiency in net productivity at very low temperatures, and suggests that under arctic conditions holoautotrophic plants probably can survive even where ice cover and winter darkness significantly reduce total light received. (Little-Battelle)
W74-06751

INFLUENCE OF IODINE ON GROWTH AND DEVELOPMENT OF THE BROWN ALGA ECTOCARPUS SILICULOSUS IN AXENIC CULTURES,
Scripps Institution of Oceanography, La Jolla, Calif.
M. L. Woolery, and R. A. Lewin.
Phycologia, Vol 12, Nos 3/4, p 131-138, December 1973. 4 fig, 13 ref.

Descriptors: *Marine algae, *Plant growth, *Iodine, *Essential nutrients, Deficient elements, *Phaeophyta, Bioassay, Plant physiology, Kelps, Marine plants, Cultures, Nutrient requirements, Laboratory tests, Germination, Plant pigments, Chlorophyll, Colorimetry.
Identifiers: *Ectocarpus siliculosus, Axenic cultures, Survival, Culture media, Carotenoids.

A quantitative evaluation was made of the iodine requirement of the brown alga Ectocarpus siliculosus using solely the female clone. Cultures were grown in (1) artificial seawater medium, of the same composition and prepared by the same method as was the starvation medium; (2) artificial seawater medium prepared similarly, but with sodium chloride which had not been pre-treated to remove iodine and bromine; (3) natural seawater; and (4) seawater similarly depleted of iodine and bromine. In a preliminary experiment prepared in quadruplicate, iodine and bromine were added, independently and together, and after 2, 4, 6, and 8 wk. growth in the first set of tubes was assayed colorimetrically for mixed chlorophylls and carotenoids. Another experiment was carried out to determine the effects of iodine concentrations lower than that in seawater. After 2, 3, and 4 wk. the algae were examined microscopically for the abundance of reproductive organs and zoospores and assayed colorimetrically. Nutrient-supplemented cultures were then incubated for an additional 6 wk, and reassayed for restoration of pigmentation. Filaments of E. siliculosus survived for at least 12 wk in iodine-deficient media; however iodine is an essential nutrient for growth. Iodine is not replaceable by bromine at any of the concen-

trations tested. At least 0.0015 microgram at iodine/l is required for any appreciable vegetative growth, while 0.025 microgram at/l is needed for the normal formation and maturation of plurilocular sporangia. (Natural seawater contains about 0.4 microgram at iodine/l). In 12-wk cultures, 0.2 microgram at iodine/l promotes maximum growth, equivalent to 4 g dry weight per litre of medium. Concentrations up to one hundred times as high are tolerated without evident inhibitory effects. (Holoman-Battelle)
W74-06752

YAMADAPHYCUS, A NEW GENUS OF THE DELESSERIACEAE (RHODOPHYTA),
Hokkaido Univ., Sapporo (Japan).
For primary bibliographic entry see Field 5A.
W74-06753

CYANOPHAGES - VIRUSES ATTACKING BLUE-GREEN ALGAE,
Hadassah Medical School, Jerusalem (Israel).
E. Padan, and M. Shilo.
Bacteriological Reviews, Vol 37, No 3, p 343-370, September 1973. 12 fig, 6 tab, 164 ref.

Descriptors: *Cyanophyta, *Viruses, *Reviews, *Bibliographies, Physicochemical properties, Proteins, Growth stages, Metabolism, Photosynthesis, Genetics, Cytological studies, Distribution patterns, Hosts, Plant morphology, Ecology, Plant viruses.
Identifiers: *Cyanophages, Nucleic acids, Phages, DNA, Adenosine triphosphate.

Characteristics, genetics, and growth cycles of cyanophages are reviewed, the interaction of their development with metabolism of the cyanophycean host is discussed, and ecological effects are considered. An extensive bibliography is included. (Mortland-Battelle)
W74-06754

HORIZONTAL PHYTOPLANKTON STUDIES IN LAKE BALATON BASED ON SCOOPED SAMPLES AND FILTRATES TAKEN IN 1967,
Magyar Tudomanyos Akademia, Tihany. Biological Research Inst.
G. Tamas.
Ann Inst Biol (Tihany) Hung Acad Sci. 39. p 151-188, 1972. Illus.
Identifiers: *Chlorophyta, *Chrysophyta, Cyanophyta, Euglenophyta, Filtrates, Lakes, Mycophyta, *Phytoplankton, Pyrrophyta, Seasonal, *Hungary(Lake Balaton), Sampling, Distribution.

In the period between April and Nov., 1967, 495 scooped samples and 117 net-filtrates from 15 sampling sites of 5 transversed sections were examined. Identified were 147 spp., 11 varieties and 2 forms belonged to 6 phyla according to the following distribution: Cyanophyta 18, Euglenophyta 11, Pyrrophyta,5, Chrysophyta 65, Chlorophyta 60, Mycophyta 1. The number of individuals and species (709,700/1) was the biggest in the Aug. collections from the Bay of Keszthely. The smallest number of species (44) and individuals (79,900) was registered in the Nov. collections of Balatonalmadi-Balatonvilagos and Sagpuszta-Balatonszemes, respectively. Chrysophytes had the highest values for both species and individual numbers as well as percentage in the summer samples taken in the Bay of Kaszthely. During 1967 the distribution of the phytoplankton in Lake Balaton (Hungary) was uniform both horizontally and seasonally.--Copyright 1973, Biological Abstracts, Inc.
W74-06756

AN EXAMINATION OF THREE STRAINS OF THE BLUE-GREEN ALGAL GENUS, FREMYELLA,
East Tennessee State Univ., Johnson City. Dept. of Biology.
J. T. Wyatt, T. C. Martin, and J. W. Jackson.
Phycologia, Vol 12, Nos 3/4, p 153-161, December 1973. 7 fig, 4 tab, 20 ref.

Descriptors: *Growth stages, *Cultures, *Metabolism, Behavior, *Plant morphology, *Cyanophyta, Systematics, Isolation, Sampling, Growth rates.
Identifiers: *Fremyella.

Placed in the family Scytonemataceae by some authorities and by others in the Microchaeteaceae, the blue-green algal genus Fremyella often exhibits seemingly paradoxical behavioral patterns. Its growth characteristics and its metabolic rates indicate the genus to be ecologically competitive. On the other hand, its infrequent occurrence in most experimental algal collections suggests just the opposite. Three strains of Fremyella produced widely different data which suggested that the genus probably occupies terrestrial, subaquatic, and aquatic systems. However, the results did not truly explain the rarity of the genus. (Little-Battelle)
W74-06759

THE GENUS NEOCHLORIS STARR (CHLOROPHYCEAE, CHLOROCOCCALES),
Slippery Rock State Coll., Pa. Dept. of Biology.
For primary bibliographic entry see Field 5A.
W74-06760

LEAD INHIBITION OF HORMOTILA BLENNISTA (CHLOROPHYCEAE, CHLOROCOCCALES),
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Botany.
T. J. Monahan.
Phycologia, Vol 12, Nos 3/4, p 247, December 1973. 1 tab, 8 ref. Grant No 07-2177.

Descriptors: *Lead, *Inhibition, *Plant growth, *Bioassay, Deficient elements, Heavy metals, *Soil algae, Chlorophyta, Pollutants, Cultures, Environmental effects, Light, Phosphates, Potassium, Nutrients.
Identifiers: Pollutant effects, Survival, *Hormotila blennista.

Hormotila blennista, a unicellular green soil alga, was cultured in modified Bristol's solution deficient in the potassium phosphate salts to which had been added the trace element mix of Watt and Fogg (1966) and known concentrations of lead chloride. Autoclave sterilization, axenic cultures, and sterile techniques were routinely used. After autoclaving, culture media ranged between pH 6.4 and 6.6. Cultures were grown in 50 ml of medium and incubated at 22 plus or minus 1.0C under continuous fluorescent illumination supplying 3000 to 4000 lux light intensity. Dark experiments were performed by placing cultures in sealed cardboard boxes in the growth chamber. Cells were harvested during the declining growth phase and counts made to determine the effect of lead on growth. When contrasted to control cultures, significant inhibition was noted in the light at all lead concentrations tested from 50-500 ppb (P less than 0.001) and in the dark at 50 ppb (P less than 0.01), and 100, 250, and 500 ppb (P less than 0.0001). It was concluded that the effects of lead among the algae may be particularly accentuated under stressful conditions of essential nutrient deficiency, such as phosphate and potassium as exemplified by H. blennista. (Holoman-Battelle)
W74-06761

GROWTH OF STREPTOCOCCUS CREMORIS AND STREPTOCOCCUS LACTIS IN A CHEMOSTAT. PRODUCTION OF CELLS AND SURVIVAL OF BACTERIA DURING FROZEN STORAGE,
National Research Council of Canada, Ottawa (Ontario). Div. of Biological Sciences.
I. J. McDonald, B. Reiter, and P. L. Rogers.
Canadian Journal of Microbiology, Vol 19, No 10, p 1285-1295, October 1973. 12 fig, 1 tab, 24 ref.

Descriptors: *Streptococcus, *Growth rates, *Cytological studies, *Cold resistance, Nutrients, Hydrogen ion concentration, Freezing, Cultures, Temperature, Limiting factors.
Identifiers: *Sample preservation, Survival, *Culture media, Viable count, Chemostat, Sample preparation.

Streptococcus cremoris HP and Streptococcus lactis 829 were grown in chemostats in tryptone yeast extract broth and in supplemented 2 percent skim milk medium. In both media lactose was the limiting nutrient. Cultures were grown at various dilution rates in media poised at constant pH and temperature and also at constant dilution rates in media controlled at different pH levels and temperatures. The effects of the various conditions of growth of production of bacteria, viable counts, and acid-producing activities of cells and on the ability of bacteria to survive subsequent frozen storage were determined. None of the conditions of growth tested had very pronounced effects on the ability of cells to survive or on the inability of cells to retain acid-producing activity after being frozen at -70C and stored at -40C. (Mortland-Battelle)
W74-06762

OXIDATION OF N-ALKANES BY CLADOSPORIUM RESINAE,
Dayton Univ., Ohio. Dept. of Biology.
J. D. Walker, and J. J. Cooney
Canadian Journal of Microbiology, Vol 19, No 10, p 1325-1330, October 1973. 3 fig, 3 tab, 29 ref.

Descriptors: *Cultures, *Microbial degradation, *Oxidation, Growth rates, Organic compounds, Organic acids, Oxygen demand, Metabolism, Alcohols.
Identifiers: Substrate utilization, *Biooxidation, *Cladosporium resinae, Dodecane, Hexadecane, Hexane, Hexanol, Hexanal, Dodecanal, Hexadecanal, Aldehydes, Cycloheximide, *Alkanes.

Cells of two hydrocarbon-using strains of Cladosporium resinae grown on glucose oxidize hydrocarbons without a lag when transferred to dodecane, hexadecane, or their primary alcohols, aldehydes, or acids. Cycloheximide does not limit oxygen uptake when cells are transferred from glucose to dodecane or hexadecane. Isocitrate lyase levels are not higher in alkane-grown cells than in glucose- or glutamic acid-grown cells. Glucose-grown cells have higher Q sub O2 values than hydrocarbon-grown cells when placed on dodecane or hexadecane. Thus, n-alkane-oxidizing enzymes are constitutive in C. resinae. Cells oxidize dodecanal and hexadecanal though they do not grow on them. Whole cells and cell-free preparations oxidize dodecane, hexadecane, and their primary alcohols and aldehydes, indicating that the oxygenated compounds may be intermediates in alkane oxidation. Hexane, which supports little growth, inhibits oxygen uptake of whole cells below the endogenous level, as do hexanol and hexanal, although cell-free preparations oxidize all three six-carbon compounds. Hexane inhibits oxygen uptake on hexadecane. Therefore, hexane does not appear to be transported into cells and may interfere with membrane function. (Little-Battelle)
W74-06763

MERCURY AS A HYDROSPHERIC POLLUTANT II. BIOLOGICAL HALF-TIME OF METHYL MERCURY IN FOUR MEDITERRANEAN SPECIES: A FISH, A CRAB, AND TWO MOLLUSCS,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco).
J. K. Miettinen, M. Heyraud, and S. Keckes.
Paper presented at FAO Technical Conference on Marine Pollution and its Effects on Living

Resources and Fishing, No FIR:MP/70/E-9, November 5, 1970. 8 p, 2 fig, 1 tab, 30 ref.

Descriptors: *Mercury, *Bioassay, Marine fish, *Molluscs, *Crabs, *Metabolism, *Radioisotopes, Pollutants, Metals, Environmental effects, Aquatic animals, Analytical techniques, Organic compounds, Testing, Laboratory tests, Sampling.
Identifiers: Serranus scriba, Carcinus maenuas, Tapes decussatus, Mytilus gallo provincialis.

Fish (Serranus scriba), decapod crabs (Carcinus maenuas), and two types of bivalve molluscs (Tapes decussatus and Mytilus gallo provincialis) were taken from the Ligurian Sea in order to ascertain whether their excretion of methyl mercury follows similar rates and routes as in parallel species from brackish and fresh waters. A mercury radioisotope was administered to the animals as methylmercury nitrate and initial loss and slow loss were measured by whole body counting with scintillation counters. The counting error was estimated to remain below plus or minus 2%. All the comparative analyses point to a similar pattern of excretion rates in fresh water, brackish and marine organisms. Generally a large fraction of the administered compound has a slow loss rate. The biological half-time depends on the method of methyl mercury's entry into the organism, being longer after intramuscular injection than after peroral administration. (Jerome-Vanderbilt)
W74-06767

INTERACTION OF TEMPERATURE AND COPPER IONS AS ORIENTING STIMULI IN THE LOCOMOTOR BEHAVIOR OF THE GOLDFISH (CARASSIUS AURATUS),
Texas A and M Univ., College Station. Dept. of Biology.
H. Kleerekoper, J. B. Waxman, and J. Matis.
Journal of the Fisheries Research Board of Canada, Vol 30, No 6, p 725-728, 1973. 3 fig, 1 tab, 3 ref. EPA Project 18050 DWQ.

Descriptors: *Temperature, *Copper, *Fish behavior, Heat, Light, Swimming, Heavy metals, Time, Movement, Laboratory tests, Water pollution effects, Fish attractants.
Identifiers: *Sub-lethal effects, *Goldfish.

Movements of single goldfish (Carassius auratus) were monitored in a free choice situation comprising zones of laboratory water or copper-containing water (0.01 ppm as CuCl2) each at two temperatures, 21.1 plus or minus 0.1 and 21.5 plus or minus 0.1C. The interaction between the copper ion proper and the gradient of copper concentration creates stimulus conditions that cannot be accounted for by the concentration of copper ions alone. This experiment was performed to ascertain whether a similar interaction occurs between copper and temperature in their combined effect on the orientation of locomotion in the goldfish. The experiments were carried out in an acrylic tank kept under constant light. The tank was divided into 16 parts leaving an open area in the center. The data representing the number of photoelectric gates triggered by the fish and the time of entry or departure were punched on paper tape and transposed to magnetic tape for computer processing. Fish entered the copper zone at 21.1C significantly less frequently and spent less time there per entry as compared to the copper-free zone ('avoidance behavior'). The copper zone at 21.5C became significantly 'attractive' to the fish in terms of both frequency of entry and time spent. The effects of copper ion and of the temperature were based on an analysis of variance. The presence of the copper ions in the absence of heat brings about a significant decrease in both percentage of entries and time spent per entry. Temperature rises in the presence of copper produced an increase in both the percentage of the entries into the compartment and the time spent per entry. (Tirfie-Vanderbilt)
W74-06769

ENVIRONMENTAL MERCURY CONTAMINATION.
For primary bibliographic entry see Field 5B.
W74-06770

MERCURY IN FISH IN THE GREAT LAKES,
Michigan Dept. of Natural Resources, Lansing. Fish Div.
For primary bibliographic entry see Field 5B.
W74-06774

SURVEY OF MERCURY CONCENTRATIONS IN FISHES OF LAKES ST. CLAIR, ERIE, AND HURON,
Bureau of Commercial Fisheries, Ann Arbor, Mich. Technological Lab.
For primary bibliographic entry see Field 5B.
W74-06775

MERCURY IN WILD ANIMALS, LAKE ST. CLAIR, 1970,
Bureau of Sport Fisheries and Wildlife, Laurel, Md. Patuxent Wildlife Research Center.
For primary bibliographic entry see Field 5B.
W74-06776

MERCURY LEVELS IN A SAMPLE OF MICHIGAN RESIDENTS,
Michigan Dept. of Public Health, Lansing.
For primary bibliographic entry see Field 5B.
W74-06782

MERCURY IN HUMANS IN THE GREAT LAKES REGION,
Ontario Dept. of Health, Toronto. Environmental Health Services Branch.
For primary bibliographic entry see Field 5B.
W74-06783

THE OCCURRENCE OF MERCURY IN THE ENVIRONMENT AND MAN, DISCUSSION PAPER,
Michigan Dept. of Natural Resources, Lansing.
For primary bibliographic entry see Field 5B.
W74-06784

THE ROLE OF FOOD CHAINS IN ENVIRONMENTAL MERCURY CONTAMINATION,
Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
For primary bibliographic entry see Field 5B.
W74-06795

MERCURY AND FOOD CHAINS,
Institute for Water and Air Pollution Research, Stockholm (Sweden).
For primary bibliographic entry see Field 5B.
W74-06796

RESEARCH NEEDS: STUDY OF THE ENVIRONMENTAL DYNAMICS OF MERCURY,
Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
For primary bibliographic entry see Field 5B.
W74-06798

ENVIRONMENTAL DYNAMICS OF MERCURY: DISCUSSION PAPER,
Rochester Univ. N. Y.
For primary bibliographic entry see Field 5B.
W74-06799

DOSE-RESPONSE RELATIONSHIP ASSOCIATED WITH KNOWN MERCURY ABSORPTION AT LOW DOSE LEVELS OF INORGANIC MERCURY,
Michigan Univ., Ann Arbor. School of Publich Health.
R. G. Smith.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 207-222, 1972, 5 tab, 4 fig, 17 ref.

Descriptors: *Mercury, Air pollution, *Public health, *Industrial plants, *Air pollution effects, Pollutants, Heavy metals, Environmental effects, Human pathology, Toxicity, Testing, Sampling, Data collection, Evaluation.
Identifiers: *Industrial hygiene.

Approximately 75 to 85% of mercury inhaled is absorbed and this is the primary source of mercury entering the body. Mercury is oxidized in the blood with major accumulations occurring in the brain with possible effects on the central nervour system. No clinical evidence of mercurialism was found among workers exposed to less than 100 micrograms of mercury per cubic meter of air. Mercury studies performed in large chlorine plants to determine dose-response relationships are reported. Environmental mercury in all the plants sampled was measured and information about 567 employees was collected. Age distribution, length of employment and cigarette smoking habits of the employees were compared with mercury levels to develop time-weighted averages for exposure. The employees examined were in good health and in no way distinguishable from the control population in comprehensive tests. There was a somewhat higher incidence of a number of neuropsychiatric symptoms, based on subjective responses. (See also W74-06770) (Jerome-Vanderbilt)
W74-06800

SURFACE ELECTROMYOGRAPHY IN CHRONIC INORGANIC MERCURY INTOXICATION,
Michigan Univ., Ann Arbor. Dept. of Industrial Engineering.
D. B. Chaffin, and B. D. Dinman.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 222-229, 1972.

Descriptors: *Mercury, *Air pollution, *Human pathology, *Toxicity, Pollutants, Heavy metals, Air pollution effects, Public health, Laboratory tests, Measurement, Evaluation, Analytical techniques.
Identifiers: *Electromyography, *Occupational health, Industrial hygiene.

In August 1970 a survey by the Institute of Environmental and Industrial Health of a tungsten-carbide alloy recovery facility indicated high airborne concentrations of mercury which would present a probable health hazard. The four employees of this shop were subjected to medical examination, including an electromyographic evaluation of their muscle action potential. This system presents a graphical and numerical plot of the amplitude of the different complex muscle action components which are reported as a histogram and compared to developed power spectra norms. The production worker and the owner of the firm showed signs and symptoms of chronic mercurialism, including loss of appetite and weight, impaired sleep, nightmares, ease of fatigue and personality changes. The spectral analysis of the electromyograms revealed signal abnormalities in both patients. Application of this method to a population with less chronic exposure needs further investigation. Factors such as drugs and medications, concomitant pathological states, physical fitness, and recent physical work affect the electromyographic record. (See also W74-06770) (Jerome-Vanderbilt)
W74-06801

BIOTRANSFORMATION OF ORGANO-MERCURIALS IN MAMMALS,
Rochester Univ., N.Y. Dept. of Radiation Biology; and Rochester Univ., N. Y. Dept. of Biophysics.
T. W. Clarkson.

In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 229-238, 1972. 3 tab, 1 fig, 23 ref.

Descriptors: *Mercury, *Human pathology, *Metabolism, Pollutants, Human diseases, Toxicity, Organic compounds, Inorganic compounds, Laboratory tests, Chemical reactions, Evaluation, Investigations, Measurements, Public health, Heavy metals.
Identifiers: *Biotransformation, *Organomercurials, Methylation, Diuretics.

Two major pathways of biotransformation of organo-mercurials are discussed: (1) a cleavage of the mercury bond resulting in the release of inorganic mercury; (2) a chemical change in the organic moiety resulting in a modified organo-mercuric compound which further reacts and leads to the eventual release of inorganic mercury. It is known that inorganic mercury is accumulated by kidney tissue, thus relative rates of biotransformation may be obtained by comparing the fraction of inorganic mercury in kidneys after single doses of different organo-mercurial compounds. The possibility that the release of inorganic mercury from organo-mercurial compounds accounts for the toxicity of those compounds is discussed. The distribution of mercury was examined and it was found that inorganic mercury is accumulated and stored in the cortical tissue of the kidneys. Since mercurial diuretics are excreted much more rapidly than inorganic mercury, biotransformation of these compounds to inorganic mercury will result in increased retention of mercury in the body. The phenyl and methoxyethyl mercurials appear to be excreted at approximately the same rate as inorganic mercury. (See also W74-06770) (Jerome-Vanderbilt)
W74-06802

THE BINDING OF INORGANIC AND ORGANIC MERCURY COMPOUNDS (HG 203) TO CONSTITUENTS OF NORMAL HUMAN BLOOD,
Creighton Univ., Omaha, Nebr.
H. A. Guirgis, W. K. Stewart, and W. Taylor.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 239-246, 1972. 3 fig, 5 tab, 4 ref.

Descriptors: *Mercury, *Radiochemical analysis, *Metabolism, *Human pathology, *Proteins, Dialysis, Pollutants, Heavy metals, Inorganic compounds, Organic compounds, Analytical techniques, Separation techniques, Biochemistry, Electrophoresis, Public health.
Identifiers: *Organomercurials, *Human blood, Clinical studies.

The relative uptake of 203 Hg-labelled mercuric chloride (Hg Cl2), phenylmercuric acetate (PMA) and methylmercuric nitrate (MMN) by normal human blood, was studied in vitro. The uptake of HgC12, PMA, and MMN by erythrocytes and plasma varied from one compound to another. Binding of mercury compounds to the serum proteins was confirmed, using both dialysis and gel-filtration techniques. Electrophoretic separation of the mercuric compound and serum mixture was utilized to identify the protein fraction which binds each of the mercuric compounds in vitro. In vivo inhibition of glutathione reductase, phosphoglucose isomerase, glucose-6-phosphate dehydrogenase and caeruloplasmin were affected by mercuric chloride, phenylmercuric acetate and mersalyl. (See also W74-06770) (Jerome-Vanderbilt)
W74-06803

BIOLOGICAL REACTIONS AND PATHOLOGICAL CHANGES IN HUMAN BEINGS AND ANIMALS CAUSED BY ORGANIC MERCURY CONTAMINATION,
Kumamoto Univ. (Japan). Medical School.
T. Takeuchi.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 247-289, 1972. 15 fig, 11 tab, 76 ref.

Descriptors: *Mercury, *Human pathology, *Animal pathology, *Public health, Pollutants, Toxicity, Environmental effects, Absorption, Organic compounds, Inorganic compounds, Water pollution, Diseases, Biology, Water pollution sources, Investigations.
Identifiers: *Methylation, *Japan(Minamata disease).

A summary is presented of mercury pollution in water, its effects on the human and animal populations and the absorption of mercury by different organs. The major sources of methylmercury in water are discharges from acetaldehyde manufacturing plants, use of mercuric agricultural products, and the formation of methylmercury chloride. The effects of mercury poisoning were studied in the areas of Niigata and Minamata Bay after hazardous concentrations were found in water there. The three major pathological symptoms of the disease are cerebellar ataxia, constriction of visual fields and dysarthria. In fetal cases of the disease disturbances of mental and motoric development result. In animals, notably cats, unsteady and slow movement, atoxic gait and paroxysmal convulsions were the main symptoms. Postmortem liver, kidney and brain tissue from humans who suffered from acute and sub-acute cases of Minamata disease had high mercury content. The various effects of methylmercury and alkyl mercury on tissue cells were tested and reported. (See also W74-06770) (Jerome-Vanderbilt)
W74-06804

THE DOSE-RESPONSE RELATIONSHIP RESULTING FROM EXPOSURE TO ALKYL MERCURY COMPOUNDS,
Michigan Univ., Ann Arbor. School of Public Health.
B. D. Dinman, and L. H. Hecker.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 290-301, 1972. 4 tab, 20 ref.

Descriptors: *Mercury, *Diets, *Toxicity, *Metabolism, *Human pathology, Pollutants, Inorganic compounds, Organic compounds, Public health, Foods, Investigation, Poisons, Lethal limits, Heavy metals.
Identifiers: Blood, Hair.

A review of the human dose-response relationship resulting from exposure to alkylmercury compounds is presented on the basis of available literature. The normal range of mercury loading in populations which live in uncontaminated areas and have diets which do not include contaminated fish is presented. This level is considered to be 10 micrograms or less per day. The mercury levels in blood were compared to those in hair. The normal mercury level in blood is considered to be between 0.5 micrograms and 1.0 microgram per 100 ml of whole blood. The blood mercury levels of 8 patients with obvious symptoms of mercury intoxication were between 290 and 440 micrograms per 100 ml of blood. The whole blood mercury concentration in a case of fatal mercury poisoning was estimated to 400 micrograms per 100 ml blood. It appears that alkylmercury levels of up to 100 micrograms per 100 ml blood are not clearly associated with readily detectable deleterious effects. The problems associated with the detection of minimal alkyl mercury intoxication are discussed and recommendations are made. (See also W74-06770) (Jerome-Vanderbilt)
W74-06805

THE RELATIONSHIP BETWEEN MERCURY CONCENTRATION IN HAIR AND THE ONSET OF MINAMATA DISEASE,
Kumamoto Univ. (Japan). School of Preventive Medicine.
T. Takeuchi.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 302-304, 1972. 2 fig, 2 ref.

Descriptors: *Mercury, *Human pathology, *Laboratory tests, Pollutants, Toxicity, Biochemistry, Metabolism, Poisons, Water pollution, Environmental effects, Diseases, Analytical techniques, Chemical analysis, Lethal limit, Pathology.
Identifiers: *Minamata disease, Hair, *Japan(Niigata).

A close relationship between mercury concentrations in human hair and mercury poisoning was discovered during investigations of mercury contamination in Niigata. Results from those investigations are presented. Mercury intoxication was evident in individuals whose hair contained from 52 to 570 ppm mercury. Some of the individuals who had high mercury concentrations in their hair were not affected by mercury intoxication. In Minamata, some clinical signs of mercury poisoning were observed in individuals with only 10 - 20 ppm mercury in their hair. Some factors indicate a greater inherent sensitivity of the fetus than of children or adults to organic mercury loadings. (See also W74-06770) (Jerome-Vanderbilt)
W74-06806

ORGANIC MERCURY POISONING IN ALAMOGORDO, NEW MEXICO,
New York State Dept. of Health, Albany.
A. Hinman.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 304-305, 1972. 1 tab.

Descriptors: *Mercury, *Human pathology, *Poisons, *Seed treatment, Pollutants, Toxicity, Biochemistry, Metabolism, Food, Diets, Food chains, Diseases, Public health, Treatment, Analysis, Pathology, *New Mexico.
Identifiers: *Methylation, Poisoning.

In a case of mercury poisoning in Alamogordo, New Mexico three children were affected after eating contaminated meat. Their father, a farmer, had obtained seed grain which had been treated with methylmercury dicyandiamide to feed his stock. A hog which had eaten the grain was butchered and eaten by the family. The hog's meat contained 27.5 ppm of mercury. The three children were treated with British anti-lewisite (BAL) to increase urinary mercury excretion and also with n-acetyl-d, l,-penicillamine but no clinical improvement was noted. After about three to four months, gradual improvement was observed but all three patients remained severely impaired. (See also W74-06770) (Jerome-Vanderbilt)
W74-06807

SURVIVAL AND REPRODUCTION OF RING-NECKED PHEASANTS CONSUMING TWO MERCURIAL FUNGICIDES,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
W. J. Adams, and H. H. Prince.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 306-317, 1972. 8 fig, 1 tab, 14 ref.

Descriptors: *Mercury, *Mortality, *Reproduction, *Birds, *Food chains, *Seed treatment, Pollutants, Toxicity, Growth rates, Organic compounds, Inorganic compounds, Analysis, Laboratory tests, Animal pathology.
Identifiers: Methylmercury, Poisoning, Pheasants.

The effects of two mercurial fungicides used in seed treatment, methylmercuric dicyaniamide and phenylmercuric acetate, on the survival and reproduction of pheasants were investigated. Two groups of birds were fed food treated with different concentrations of the two compounds, daily

nd at three day intervals respectively. Eggs were collected, stored and incubated and chicks were weighed, banded, and placed in brooder houses. All birds fed untreated food survived. One of the 11 hens fed phenylmercury died during the 74 day test period. Ten of the hens fed methylmercury died, and it appeared that a cumulative consumption level of about 24.7 mg of methylmercury was fatal with signs of mercury poisoning occurring between 13 to 17 mg. Egg production of hens fed methylmercury declined, beginning in the second week. Although no decline was observed for hens fed phenylmercury, both compounds had an adverse effect on hatchability. The amount of embryonic mortality during the first 14 days of development was 70%, 62%, and 48% for methylmercury, phenylmercury, and control groups respectively. Consumption of more than 4 mg of methylmercury would seriously decrease hatchability. Consumption of 16 mg of methylmercury or more would result in cessation of egg production in pheasant hens. (See also W74-06770) (Jerome-Vanderbilt)
W74-06808

DOSE-RESPONSE RELATIONSHIPS AFTER EXPOSURE OF SWINE TO ORGANO-MERCURIAL COMPOUNDS,
Saskatchewan Univ., Saskatoon. Western Coll. of Veterinary Medicine.
L. Tryphonas.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 318-319, 1972.

Descriptors: *Hogs, *Mercury, *Poisoning, *Toxicity, *Laboratory tests, Pollutants, Organic compounds, Inorganic compounds, Environmental effects, Human pathology, Analysis, Chemical analysis, Diseases, Public health, Lethal limit, Biochemistry, Measurement.
Identifiers: *Organomercurials.

The effects of methyl mercuric dicyandiamide (MMD), ethyl mercuric chloride (EMC) and phenyl mercuric chloride (PMC) on swine were investigated, to find the levels at which mercury poisoning became evident. The daily dosages ranged from 0.19 to 4.56 mg of mercury per kg. MMD produced clinical disease at about 0.76 mg Hg/kg/day, EMC produced disease at about 0.38 mg Hg/kg/day and PMC caused predominantly kidney damage with signs of disease only above 2.28 mg Hg/kg/day. The alkyl mercury compounds affect the brain, causing decrease in cerebrum volume and cytolysis of neurons. The effect of alkyl mercury compounds on the kidneys is not severe. This study confirms a relatively high toxicity to swine of alkyl mercury compounds as compared to aryl mercury compounds. The accumulation of mercury compounds in certain organs of swine become a hazard to public health. (See also W74-06770) (Jerome-Vanderbilt)
W74-06809

DETECTION AND APPRAISAL OF SUBCLINICAL INTOXICATIONS,
Duke Univ. Medical Center, Durham, N.C.
L. J. Goldwater.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 319-325, 1972. 2 fig, 4 tab, 10 ref.

Descriptors: *Mercury, *Human pathology, *Toxicity, *Biochemistry, Pollutants, Inorganic compounds, Organic compounds, Poisons, Analysis, Proteins, Analytical techniques, Public health, Enzymes, Heavy metals, Pathology, Pollutant identification, Path of pollutants.
Identifiers: *Subclinical effects, Clinical studies.

The inadequacies of some of the present methods of determining subclinical levels of mercury intoxication are reviewed and areas of research which may yield more exact evaluations are suggested. Methods such as testing the blood and urine mercury levels prove inadequate because there is no critical level of mercury regularly associated with them. Often, by the time significantly increased levels are observed, biological damage has already occurred. The low grade absorption of some mercury compounds may result in a slight increase in excretion of protein but detection methods are complex and do not lend themselves to simple tests. Some biochemical tests which are based on the affinity of mercury for sulfhydryl-containing enzymes have been investigated and show promise. Coproporphyrins, delta-aminolevulinic acid, lactose dehydrogenase, serum phosphoglucose isomerase and serum gluthathione reductase are some of the substances which have been studied. It is suggested that mercury, like several other heavy metals, may be beneficial to the biological processes at very low levels, but toxic in higher concentrations. Further investigation of low levels of mercury and its enzymatic functions is necessary in order to understand subclinical intoxication. (See also W74-06770) (Jerome-Vanderbilt)
W74-06810

APPROACHES TO THE DETECTION OF SUBCLINICAL MERCURY INTOXICATIONS: EXPERIENCE IN MINAMATA, JAPAN,
Kumamoto Univ. (Japan). Medical School.
T. Takeuchi.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 325-328, 1972. 1 fig, 3 ref.

Descriptors: *Mercury, *Organic compounds, *Human pathology, *Toxicity, *Subclinical effects, Pollutants, Inorganic compounds, Poisons, Environmental effects, Analytical techniques, Water pollution, Testing procedures, Diseases, Public health, Pathology, Mortality, Industrial wastes.
Identifiers: *Japan, Subclinical effects, Minamata disease, Methylmercury, Clinical tests.

Pathological findings indicated three types of Minamata disease. The first was a complete type of Hunter-Russell's syndrome; the second was incomplete with only one of the basic symptoms exhibited; and the third was a latent type which showed none of the clinical symptoms. This evidence indicated that there were problems with differential diagnosis which resulted from incomplete or masked symptoms. The pathological changes which occurred were the disappearance of granular cells in the cerebellum under the Purkinje layer and a decrease in the nerve cells of both calcarine regions. These stages were found even in patients who exhibited no clinical symptoms. Sural nerve biopsy has been proposed as most useful for diagnosis with mercury determination, because this nerve tends to be most easily disturbed in sensory peripheral nerves. Visual microscopic examination reveals a relative increase of smaller fiber, below 3 microns, and a decrease of normal size fibers, with collagen proliferation. The correlation between Minamata disease and mercury concentrations in hair indicates that this may be a useful diagnostic tool. (See also W74-06770) (Jerome-Vanderbilt)
W74-06811

EPIDEMIOLOGICAL APPROACHES TO THE STUDY OF SUBCLINICAL EFFECTS OF MERCURY INTOXICATION,
Michigan Univ., Ann Arbor. School of Public Health.
For primary bibliographic entry see Field 5B.
W74-06813

BIOLOGICAL EFFECTS OF MERCURY COMPOUNDS, DISCUSSION PAPER,
Rochester Univ., N. Y.
T. W. Clarkson, B. D. Dinman, J. C. Gage, L. J. Goldwater, and H. Guirgis.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 341-345, 1972. 4 ref.

Descriptors: *Mercury, Reviews, *Toxicity, *Distribution, *Absorption, *Human pathology, Pollutants, Inorganic compounds, Organic compounds, Analytical techniques, Poisons, Diseases, Testing procedures, Biochemistry, Diets, Food chains, Heavy metals, Water pollution.
Identifiers: *Methylation, Subclinical effects, Accumulation, Minamata disease.

Although early studies of the toxicity of inorganic and organic mercury and mercury vapor supplied much valuable information, there are many problems remaining in measuring objectively the effects of the substances at a threshold level. Differences in the absorption and distribution of ionic mercury and metallic mercury vapor are discussed. The possibility of inorganic mercury undergoing methylation in man is unlikely. The stabilities of different organo-mercury compounds in vivo vary, as do their toxicities. The inhibition of the oxygen-carrying capacities of hemoglobin resulting from some forms of mercury intoxication may stimulate hemoglobin production. Fetal and infant mercury intoxication is discussed, based on information from Minamata and Niigata studies. The most important difference between inorganic and methylmercury poisoning is the irreversibility of the neurological symptoms which accompany methylmercury poisoning. Analysis of hair may be a good system for monitoring mercury levels in humans. Although detection of subclinical intoxications by methylmercury is difficult, new methods must be developed because of the irreversible nature of the disease. (See also W74-06770) (Jerome-Vanderbilt)
W74-06814

THE EXREM III COMPUTER CODE FOR ESTIMATING EXTERNAL RADIATION DOSES TO POPULATIONS FROM ENVIRONMENTAL RELEASES,
Oak Ridge National Lab., Tenn. Radiation Shielding Information Center.
For primary bibliographic entry see Field 5B.
W74-06818

AQUATIC VEGETATION OF THE OTTOWA RIVER NEAR CHALK RIVER NUCLEAR LABORATORIES (CRNL),
Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs.
S. R. Gentner.
Available from NTIS, Springfield, Va., as Rept. No. AECL-4511. $4.00 in paper copy, $1.45 in microfiche.

Descriptors: *Survey, *Aquatic plants, Rivers, Vegetation, Data collections, *Nuclear powerplants, Effluents, Water pollution, Ecology, Radioecology, *Radioactivity effects, Research and development, *Food chains, Public health, *Canada.
Identifiers: *Ottawa River(Canada).

In the summer of 1972 a preliminary survey of the aquatic vegetation in the Ottawa River near the Chalk River Nuclear Laboratories from the Pump House downstream to Pte. au Bapteme on the Ontario side was undertaken. Maps showing the distribution of the vegetation along the shoreline and in the water were drawn up, and a checklist of all the vascular plants found was compiled. A complete survey of the aquatic vegetation may be viewed as the first step towards studying the changing patterns of aquatic vegetation due to activities at CRNL, as a means of identifying local plants for experimental use, as a means of learning the primary producers in the aquatic food chains of the river, and as the basis for future radioecological studies. (Houser-ORNL)
W74-06819

ENVIRONMENTAL SCIENCES DIVISION ANNUAL PROGRESS REPORT FOR PERIOD ENDING SEPTEMBER 30, 1973,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W74-06826

ENERGETICS OF DAPHNIA AMBIGUA,
Kansas Water Resources Research Inst., Manhattan.
K. B. Armitage.
Available from the National Technical Information Service as PB-231 356, $3.25 in paper copy, $1.45 in microfiche. Contribution No. 129, December 1973. 27 p, 7 tab, 16 ref. OWRR A-043-KAN(1). 14-31-0001-3516.

Descriptors: *Daphnia, *Seston, *Nitrogen, *Growth rates, *Kansas, Population, Chlorophyll, Akalinity, Photosynthesis, Zooplankton, Aquatic animals, Phosphates, Ponds, Growth stages, Temperature.
Identifiers: *Oxygen consumption, *Filtering rate(Daphnia), Orthophophates, Nitrate nitrogen.

The population cycle of the zooplankten D. ambigua was followed in a one hectare pond at the University of Kansas. D. parvula and D. pulex also occur in the same pond. D. ambigua predominates during the colder season from November through early June when water temperatures are below 20 degrees C. The population peak of D. ambigua in May is followed by that of D. pulex and then D. parvula. Growth of D. ambigua was measured under field and laboratory conditions. Both the time of egg development to hatching and of first instar to adult were slower at lower environmental temperatures. At the same temperature developmental times were shorter in the laboratory. The maximum size was smaller at each higher temperature over a temperature range of 6.5 to 26.6 degrees C. Clutch size decreased markedly at temperatures above 15 degrees C. Metabolic rates were consistent with rates measured under laboratory regimes of temperature acclimation. The filtering rate was higher at higher temperatures; large animals had higher filtering rates than small animals at low temperatures but had lower filtering rates than small animals at high temperatures. D. ambigua filtered particles of 2 to 5.04 microns in diameter. Gross photosynthetic rate, seston concentration, and chlorophyll a concentration were determined as measures of food available to the daphnid populations. Orthophosphate generally was high; nitrogen in the form of ammonia exceeded nitrate nitrogen; total alkalinity was low in summer and fall and high in winter and spring. These results will be used to calculate an energy budget for the D. ambigua population.
W74-06831

DISTRIBUTION OF AUTOTROPHIC NITRIFYING BACTERIA IN A POLLUTED STREAM,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Environmental Science.
M. S. Finstein, and V. A. Matulewich.
Available from the National Technical Information Service as PB-231 357, $3.75 in paper copy, $1.45 in microfiche. Water Resources Research Institute, New Brunswick, New Jersey, February, 1974. 61 p, 2 fig, 28 tab, 41 ref. OWRR A-030-N.J.(2). 14-01-00013230.

Descriptors: *Nitrification, Water pollution effects, *Microbial degradation, Environmental effects, Nitrates, Microorganisms, Path of pollutants, *Oxygen demand, *New Jersey.
Identifiers: Nitrosomonas, Nitrobacter, *Nitrogenous oxygen demand, *Nitrifying bacteria, *Passaic River(N.J.), Environmental surfaces, Microbial ecology.

The nitrogenous oxygen demand exerted by sewage and secondarily treated effluent may seriously lower the water quality of receiving streams. Comprehensive stream management requires the ability to predict where this component of the oxygen demand will be exerted, and at what rate. Efforts to include nitrification in stream models are unlikely to be highly successful without some understanding of the ecology of the responsible organisms. The present investigation was undertaken to provide such information. The distribution of nitrifying bacteria in bulk waters, on surfaces, and in muds at 11 Passaic River sites was studied using most-probable-number procedures. In mud samples taken from the mud-water interface, nitrifiers were from 21 to 140,000 (average 515) times more abundant (volumetrically) than in the overlying waters. Nitrifiers were found throughout a 21 cm profile of mud, the highest densities occurring in the topmost levels. Large numbers of these bacteria were associated with aquatic plants, algae, and slimes on rocks. There was no correlation between nitrifier density and river flow. Ammonium-oxidizers outnumbered nitrite-oxidizers in all but one of the 112 samples examined by a factor from 1.7 to 5310 (average 20.9). These data suggest that high river velocities may bring into suspension substantial numbers of nitrifiers. The relative scarcity of nitrifying bacteria in bulk waters and their abundance at surfaces is suggestive that surfaces may be the more important site of nitrification in rivers. (Whipple-Rutgers)
W74-06834

BASIC RESEARCH IN THE AQUATIC ENVIRONMENT: EFFECTS OF EUTROPHICATION ON PHYTOPLANKTON POPULATIONS AND SELECTED SPECIES OF AQUATIC VASCULAR PLANTS,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
H. F. Mulligan.
Available from the National Technical Information Service as PB-231 358, $3.25 in paper copy, $1.45 in microfiche. Completion Report, December 1973. 43 p, 3 fig, 7 tab, 21 ref. OWRR B-011-NY(1). 14-01-0001-1533.

Descriptors: *Aquatic weed control, *Eutrophication, *Nutrient removal, *Pollution abatement, *Water pollution control, *Water pollution effects, Aquatic weeds, Aquatic productivity, Nitrogen, Phosphorus, *Phytoplankton, Pollutants, Ponds, Soil-water plant relationships, Water Chemistry.
Identifiers: Experimental ponds, Phytoplankton-aquatic weed interactions, Fertilizer pollution.

Planktonic algae and benthic plants are in direct competition. An increase in one component usually is accompanied by a decline in the population of the other. Continuous fertilization with N and P above the level of .05 mg N/l and .005 mg P/l leads to a dominance in the summer phytoplankton population. A cessation and enrichment causes the plant population to return to natural levels. The concentrations of P-PO4 remain high and it appears that nitrogen is the more limiting of the two elements under natural conditions. Prolonging the cover of the ice has the same consequence as adding additional nitrogen to the water. Elodea canadensis and Potamogeton crispus are favored by high nutrient levels whereas Chara sp., Myriophyllum spicatum var. exalbescens and Ceratophyllum demersum are eliminated. Although aquatic environments can recover rapidly from enrichment and re-establish near normal vegetation conditions, they are liable to be easily disturbed by unusual natural occurrences such as prolonged ice cover due to exceptionally cold winters.
W74-06835

THE RUNOFF OF WATER AND NUTRIENTS FROM WATERSHEDS TRIBUTARY TO CAYUGA LAKE, NEW YORK,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 5B.
W74-06848

WATER AND NUTRIENT BUDGETS FOR CAYUGA LAKE, NEW YORK,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center
For primary bibliographic entry see Field 5B
W74-06849

ENVIRONMENTAL ASPECTS OF PLUTONIUM AND OTHER ELEMENTS, A SELECTED ANNOTATED BIBLIOGRAPHY.
Oak Ridge National Lab., Tenn
Aval NTIS, Springfield, Va., as Rept No EIS-74-21 (Suppl. 2); $7.60 per copy, $1.45 microfiche Report No. ORNL-EIS-74-21 (Supp. 2), February 1914. 282 p, 438 ref, 1 append, 7 indexes

Descriptors: *Monitoring, *Environment, *Plutonium, *Ecology, *Ecosystems, *Bibliographies, Bioassay, Biological communities, Chemical properties, Physical properties, Radiation, Radioecology, Radioactive waste disposal, Nuclear explosions, Water pollution, Soil contamination.
Identifiers: *Nevada Test Ste.

This third published bibliography of 438 references from the computer information file built to provide support to its sponsor, the Nevada Applied Ecology Group of the AEC Nevada Operations Office, emphasizes the early (before 1962) unclassified and declassified literature that concerns plutonium, uranium, and the Nevada Test Site (NTS). Included are environmental aspects of the nuclear devices tested at the NTIS, supporting investigations that provide background information on the Test Site, such as basic studies of the flora, fauna, and geology of that area, and basic biological and medical studies on the effects of plutonium and uranium, particularly as they relate to health considerations for man. Every reference provides an abstract. Abstracts are findings-oriented. Additional numerical data are included in a special field or referred to in the comment field. Indexes are given for author, subject category, keywords, geographic location, permuted title, taxons, and publication description. (Houser-ORNL)
W74-06857

THE CHALLENGE OF MILITARY NUCLEAR CONSTRUCTION,
Army War Coll., Pa. Carlisle Barracks, Pa.
For primary bibliographic entry see Field 8H.
W74-06859

BEHAVIOR OF RADIOIODINE IN THE ENVIRONMENT AND IN MAN,
Comitato Nazionale per l'Energia Nucleare, Ispra (Italy). Division Protezione Sanitaria e Controlli.
For primary bibliographic entry see Field 5B.
W74-06862

THE EFFECTS OF WASTE DISPOSAL IN THE NEW YORK BIGHT. SECTION 3: ZOOPLANKTON STUDIES.
National Marine Fisheries Service, Highlands, N.J. Sandy Hook Sports Fisheries Marine Lab.
Available from the National Technical Information Service as AD-739 533, $1.45 in microfiche. Final Report, February 1972. 115 p, 157 fig, 12 tab, 500 ref.

Descriptors: *Waste disposal, *Water pollution effects, *Zooplankton, *Copepods, *Acids, *Chemical wastes, Crustaceans, Heavy metals, Drifting(Aquatic), Sewage sludge, Bioindicators, Larvae, Biochemical oxygen demand, Dissolved oxygen, Industrial wastes, Systematics, Ecological distribution, Seasonal, Annelids, Mollusks, Marine animals, Animal pathology.
Identifiers: *New York Bight, Finfish, Bivalves, Oithona spp, Paracalanus spp, Pseudocalanus minutus, Centropages spp, Temora spp, Tortanus discaudatus, Acartia clausii, Acartia tonsa, Acar-

tia longiremis, Eurytemora, Labidocera aestiva, Calanus finmarchicus, Carycaeus spp, Oncea spp, Candacia armata, Metridea lucens, Clytemestra, Centropages typicus, Centropages hematus, Temora stylifera, Temora longicornis, Paracalanus parvus.

A comparative zooplankton study was undertaken as part of a multi-disciplinary study of the effects of offshore waste disposal on the waters of the New York Bight. The emphasis has been placed on copepods because they occur in this area the year round and are usually the principal constituent of zooplankton. Samples were collected by net towing (0.5m diameter, No. 8 mesh) at surface, mid-, and bottom depths at 15 stations and preserved in 4 percent buffered formaldehyde. Laboratory counts were made by diluting the samples to a known volume, mixing until a uniform suspension occurred, and then removing 1 ml subsamples until at least 300 copepods were tallied and identified. Settled and displacement volumes were measured; organisms greater than 15 mm in diameter were not included in the displacement volume. In conjunction with the zooplankton samples, total iron, nitrate and three kinds of phosphates were measured to trace movements of sewage sludge and industrial acid wastes. Of the samples collected (January 1969 - April 1970), the average number of copepods per cubic meter ranged from 700 to 41,000 and was within the range reported in other middle Atlantic Coastal waters. Statistical analyses of the samples showed a vertical distribution pattern for the organisms. The displacement volumes of sewage, trace amounts to 9.3 ml/cu, apparently had no short term effects on the number of organisms found; however, most were likely to be killed in acid water of concentrations 1 : 1000 or greater. (Long-Battelle)
W74-06866

THE EFFECTS OF WASTE DISPOSAL IN THE NEW YORK BIGHT. SECTION 5: CHEMICAL STUDIES.
National Marine Fisheries Service, Highlands, N.J. Sandy Hook Sports Fisheries Marine Lab.
Available from the National Technical Information Service as AD-739 535, $1.45 in microfiche. Final Report, February 1972. 185 p, 271 fig, 18 tab, 500 ref.

Descriptors: *Waste disposal, *Zooplankton, *Trace elements, *Water pollution effects, Dissolved oxygen, Salinity, Temperature, Turbidity, Hydrogen ion concentration, Pesticides, Sediments, Oxidation-reduction potential, Nutrients, Water analysis, Primary productivity, Selenium, Zinc, Silver, Rubidium, Cobalt, Sea water, Benthos, Microbiology, Crustaceans, Fish, Water pollution sources, Drifting(Aquatic), Sedimentation, Sewage sludge, Water pollution, Nitrates, Phosphorus, Iron, Measurements, Sampling, Spectrophotometery, On-site tests, Flow, Oil, Phosphates, Copper, Lead, Chromium, Mercury, Chlorophyll, Organic compounds.
Identifiers: Petrochemicals, Biological samples, Environmental samples, Sample preservation, Sample preparation, Dredge spoils, Chlorophyll a, Finfish, *New York Bight, Orthophosphates, Organic phosphorus, Flounder, Muscle, Liver, Scophthalmus aquosus, Pseudopleuronectes americanus, Pseudopleuronectes, Paralichthys oblongus, Paralichthys dentatus, Urophycis, Hormarus americanus, Spisula solidissima, Cyprina, Cancer.

Samples of water, sediments, and organisms were collected from the New York Bight and analyzed to determine the distribution and fate of sewage sludge, dredging spoils, and acid wastes disposed. Samples were collected during 27 cruises from the surface, mod-depth, and bottom in areas with depths of 23 to 27 meters. Water samples were collected with a Van Dorn sampler and divided into subsamples for analysis of iron, chlorophyll a, phosphate, nitrate and DO. Subsamples were stabilized where necessary. Temperature, salinity, turbidity, and pH were also measured. Sediment samples were collected with plastic Phleger coring tubes from the upper 5 cm of a Smith-McIntyre grab, stored in plastic bags, and frozen for later analysis of petrochemicals, copper, lead, chromium, mercury, pesticide metabolites, and determination of redox potential. Populations of benthic organisms and zooplankton were also determined. The methods employed for the analyses are described. From the data, it was concluded that: (1) Acid wastes tend to remain in a distinct pattern after disposal, (2) Sewage sludge results in turbid, phosphorus-rich water containing particulate matter, (3) There was no demonstrable increase in primary productivity as a result of nutrification, (4) Bacteriological activity in sludge depletes the overlying waters of oxygen to levels insufficient to support life, (5) Dredging spoils on bottom sediments contain enough petroleum to harm bottom-dwelling organisms, and (6) The heavy metals, Cu, Pb, Cr, and Hg, originating in sewage and dredging spoils, were found in water, sediments, and animal tissues at toxic levels. (Long-Battelle)
W74-06867

THE EFFECTS OF WASTE DISPOSAL IN THE NEW YORK BIGHT. SECTIONS 7, 8, AND 9.
National Marine Fisheries Service, Highlands, N. J. Sandy Hook Sports Fisheries Marine Lab.
Available from the National Technical Information Service, Sect. 7 as AD-739 537, Sect. 8 as AD-739 538, and Sect. 9 as AD-739 531, $1.45 in microfiche, each. Final Report, February 1972. 128 p, 1 fig, 1 tab, 530 ref.

Descriptors: *Pathology, *Benthos, *Waste disposal, *Water pollution effects, *Bibliographies, Water pollution sources, Benthic fauna, Benthic flora, Zooplankton, Plankton, Aquatic animals, Aquatic life, Microbiology, Crustaceans, Marine fish, Marine animals, Wildlife, Heavy metals, Waste water disposal, Water pollution, Pollutant identification, Distribution patterns.
Identifiers: *New York Bight, Finfish, Characterization, Petrochemicals, Drift organisms.

These are the last three sections of the final report, describing results of studies conducted to obtain data to assess the effects of waste disposal on the marine environment of the New York Bight: Section No. 7, Conclusions; Section No. 8, Literature Cited; Section No. 9, Bibliography. (Long-Battelle)
W74-06868

BIOLOGICAL RESPONSE TO DETERGENT AND NONDETERGENT PHOSPHORUS IN SEWAGE - PART II,
Utah Water Research Lab., Logan.
D. B. Porcella, P. A. Cowan, and E. J. Middlebrooks.
Water and Sewage Works, Vol 120, No 12, p 36-46, December 1973. 3 fig, 7 tab, 11 ref.

Descriptors: *Phosphorus, *Bioassay, *Sewage effluents, *Plant growth, *Toxicity, Biomass, Measurement, Waste dilution, Nutrients, Water pollution effects, Sewage, Sewage treatment, *Growth rates, Suspended solids, Cyanophyta, Chlorophyta, Optical properties, Trace elements, Laboratory tests, Detergents.
Identifiers: *Selenastrum capricornutum, *Anabaena flos-aquae, Dilution, Particulate carbon, Optical density.

The responses are presented of Anabaena flos-aquae and Selenastrum capricornutum to detergent and nondetergent phosphorus. Maximum growth and mean growth rate are discussed with maximum growth being based upon the first and last biomass measurements during the growth cycle (18 or 21 days). Mean growth rate represents growth over a 7-day period. Correlation between particulate carbon (PC), optical density (OD) and suspended solids (SS) was performed to establish the relations between the individual parameters. Dilution studies were made to detect toxicity, indicated by unusual growth as a function of dilution. Deionized and reservoir water were used to dilute effluents from secondary and tertiary sewage treatment. The results indicate the following conclusions: (1) no differences exist between baseline and test samples; (2) response was greater in secondary than tertiary effluents; and (3) iron and trace elements appeared to stimulate slightly greater growth. Samples of various wash products were added to a solution of two percent test secondary effluent in reservoir water. The results showed no significant difference in maximum growth. It can be concluded that the addition of the wash products to treated sewage did not affect the bioassay response. (Holoman-Battelle)
W74-06873

STREAM POLLUTION AND A SIMPLIFIED DIVERSITY INDEX,
Oberlin Coll., Ohio.
For primary bibliographic entry see Field 5A.
W74-06876

EFFECTS OF SOLID WASTE DISPOSAL ON GROUND WATER QUALITY,
For primary bibliographic entry see Field 5B.
W74-06949

PHYTOPLANKTON SUCCESSIONS AND LAKE DYNAMICS IN LAS VEGAS BAY, LAKE MEAD, NEVADA,
Nevada Univ., Reno.
E. R. Koenig, R. W. Tew, and J. E. Deacon.
J Ariz Acad Sci. Vol 7, No 3, p 109-112, 1972.
Identifiers: Bays, Currents, Density, Effluents, Industrial wastes, Lakes, *Nevada(Lake Mead), *Phytoplankton, Seasons, *Sewage effluents, Successions.

Phytoplankton successions, applications of the general growth equation and physical measurements were employed to investigate events occurring at the interface between industrial and sewage effluent contained in Las Vegas Wash and waters of Lake Mead, Nevada. The data indicate that the entering waters tend to form a density current interrupted at intervals by dynamic effects generated in the lake. The dynamic relationships described here for the spring months suggest that a much more thorough understanding of physical, chemical and biological interactions is necessary to permit solution of the numerous problems of Las Vegas Bay.--Copyright 1973, Biological Abstracts, Inc.
W74-07001

EFFECT OF SODIUM-POTASSIUM CHLORIDE MINERAL WATER FROM THE SPLAIS SPRING (DRUSKININKAI HEALTH RESORT) ON THE PSEUDOCHOLINESTERASE ACTIVITY OF BLOOD SERUM AND PROTEIN-SYNTHESIZING FUNCTION OF THE LIVER IN EXPERIMENTAL ACUTE TOXIC HEPATITIS, (IN RUSSIAN),
K. A. Ambrashka.
Vopr Kurortol Fizioter Lech Fiz Kul't. Vol 37, No 2, p 154-160, 1972. Illus.
Identifiers: Acute toxicity, Blood serum, Chlorides, Cholin, *Health resorts, *Hepatitis, Liver, *Minerals, Potassium, Protein, Rats, Sodium, Springs, Water pollution effects, *USSR(Spalis spring), Salts.

The ingestion of water (containing NaCl, KCl and some SO_4^{2-} and Mg^{2+}) from the Spalis spring (USSR) shows therapeutic effects for acute toxic hepatitis in white rats. This is expressed by a more complete recovery of the impaired liver, and trend towards normalization of the pseudocholinesterase activity of the blood serum and the main indices of the protein-synthesizing func-

tion of the liver.--Copyright 1973, Biological Abstracts, Inc.
W74-07005

QUALITATIVE REQUIREMENTS OF YOUNG EELS ANGUILLA JAPONICA FOR WATER-SOLUBLE VITAMINS AND THEIR DEFICIENCY SYMPTOMS,
Freshwater Fisheries Research Lab., Tokyo (Japan).
S. Arai, T. Nose, and Y. Hashimoto.
Bull Freshwater Fish Res Lab. Vol 22, No 1, p 69-83, 1972. Illus.
Identifiers: Anguilla-japonica, *Deficiency symptoms, *Eels, Qualitative requirements, *Vitamins(Water soluble).

Using a purified test diet developed for eels, qualitative requirements of eels for water-soluble vitamins were investigated. Eels require 11 vitamins, thiamine, riboflavin, pyridoxine, pantothenic acid, folic acid, biotin, choline, nicotinic acid, inositol, vitamin B12 and ascorbic acid for normal growth, but not p-aminobenzoic acid. The deficiency syndromes are described.--Copyright 1973, Biological Abstracts, Inc.
W74-07006

RADIOECOLOGICAL RESEARCHES IN FRESHWATER AND TERRESTRIAL ENVIRONMENT, (IN ITALIAN),
For primary bibliographic entry see Field 5B.
W74-07009

SYSTEMS ANALYSIS IN THE MARION LAKE IBP PROJECT,
British Columbia Univ., Vancouver.
C. J. Walters, and I. E. Efford.
Oecologia (Berl). Vol 11, No 1, p 33-44, 1972.
Identifiers: Biological studies, *Canada(Marion Lake-B.C.), Consumer, Density, Growth, Lakes, *Primary production, Season, *Systems analysis, IBP projects, Model studies, *Simulation analysis.

Modeling work in the Marion Lake Project (British Columbia, Canada) has led to a number of simulation models that trace the fate of primary production through consumer components of the lake ecosystem. Two of these models illustrate extremes in realism and generality: a simple compartment-flow system, and a detailed population model that represents density and individual growth of 24 major animal species. Both models are adequate to describe normal seasonal changes in the variables that they represent, but the simple model may give better predictions about response of the system to disturbance. Modeling efforts would have been much more successful if they had been initiated at the start of the project rather than after much field data were already collected.--Copyright 1973, Biological Abstracts, Inc.
W74-07010

DISTRIBUTION AND SEASONAL VARIATIONS OF THE PLANKTON IN 'RIVIERE DE MORLAIX,' (IN FRENCH),
G. Le Fevre-Lehoerff.
C R Hebd Seances Acad Sci Ser D Sci Nat. Vol 275, No 15, p 1681-1684, 1972. Illus.
Identifiers: Appendicularia, Brachyura, Chaetognatha, Cladocera, Copepoda, *Distribution, *France(Riviere de Morlaix), Mysidacea, *Plankton, Polychaeta, *Seasonal, Teleost, *Estuary, Tidal estuaries.

The 'Riviere de Morlaix,' a tidal estuary, is on the northern coast of Brittany (France). Monthly collected samples obtained during neap low tide at 9 points made it possible to determine the major zooplanktonic groups represented in the estuary, the homogeneity or heterogeneity of distribution of the main species, and the amplitude of their seasonal variations. The most representative groups involve the holoplanktonic Crustacea, Copepoda (Acartiidae, Centropagidae), Cladocera, Mysidacea, as well as the Appendicularia and the Chaetognatha. As for the meroplankton, it is represented by larvae of Polychaeta and Brachyura, and eggs and larva of Teleostei. A description is given of the zones, nature of the bottom, temperature, salinity, and trophic relations.--Copyright, 1973, Biological Abstracts, Inc
W74-07012

CORRELATION BETWEEN CO2 AND O2 CONCENTRATIONS IN LAKE ERIE, USA,
State Univ. Coll., Fredonia, N.Y.
K. G. Wood, and J. Verduin.
Arch Hydrobiol. Vol 71, No 1, p 1-16. 1972. Illus.
Identifiers: *Anaerobic conditions, *Carbon dioxide, Lakes, *Oxygen, Respiration, *Lake Erie, Hypolimnion.

Oxygen (O2) concentration was correlated with total carbon dioxide (CO2) concentration, both variables reported as the micro moles/l difference from air equilibrium. CO2 deficits were not associated with corresponding O2 supersaturation, but O2 deficits were associated with corresponding O2 excess, mole for mole. However the hypolimnion of the central basin of Lake Erie showed as much as 30% greater CO2 excess than O2 deficit during late Aug. when dissolved O2 values approached zero. These values suggest a significant anaerobic respiration contribution. New equations are provided for studies of carbonate equilibria. The differential titration method for estimation of biological productivity is discussed.--Copyright 1973, Biological Abstracts, Inc.
W74-07025

BALANTIDIASIS OUTBREAK IN TRUK,
P. D. Walzer, F. N. Judson, K. B. Murphy, G. R. Healy, and D. K. English.
Am J Trop Med Hyg. Vol 22, No 1, p 33-41. 1973. Illus.
Identifiers: *Balantidiasis, *Caroline Islands(Truk), *Epidemics(Human), Islands, Typhoons, *Animal wastes(Pigs), Water pollution effects.

In May and June 1971, an epidemic of balantidiasis involving 110 persons occurred on Truk, Caroline Islands following a devastating typhoon on 1 May. The disease was mild, self-limited, and lacked distinguishing clinical features. The outbreak was multifocal in origin, occurred in all age groups and with equal sex distribution, and terminated spontaneously by early July. The people of Truk live on close association with pigs, and the epidemic probably resulted from widespread contamination by pig feces of ground and surface water supplies, which the people were forced to use after their catchment systems were destroyed by the typhoon.--Copyright 1973, Biological Abstracts, Inc.
W74-07031

GROWTH COMPARISONS OF OYSTERS, MUSSELS AND SCALLOPS CULTIVATED ON ALGAE GROWTH WITH ARTIFICIAL MEDIUM AND TREATED SEWAGE EFFLUENT,
Woods Hole Oceanographic Institution, Mass. Dept. of Biology.
K. R. Tenore, and W. M. Dunstan.
Chesapeake Sci. Vol 14, No 1, p 64-66. 1973.
Identifiers: Aequipecten-irradians, *Algae, Crassostrea-virginica, Effluent, Medium, Mortality, *Mussels, Mytilus-edulis, *Oysters, *Scallops, *Sewage, Shell growth, Dry-meat weight, *Growth comparisons.

Shell growth, dry-meat weight, and mortality of the American oyster (Crassostrea virginica), the blue mussel (Mytilus edulis) and the bay scallop (Aequipecten irradians) cultured for 3 mo. on algae grown on artificail medium and in secondary-treated sewage effluent exhibited no significant differences.--Copyright 1973, Biological Abstracts, Inc.
W74-07035

AN EPIDEMIOLOGICAL STUDY ON CLONORCHIASIS IN KYOTO CITY, (IN JAPANESE),
Kyoto Prefectural Univ. of Medicine (Japan). Dept. of Medical Zoology.
M. Nagahana, K. Matsuno, M. Iwaki, K. Oda, and A. Yamaguchi.
Jap J Parasitol. Vol 21, No 3, p 143-149. 1972. English summary.
Identifiers: *Clonorchiasis, Clonorchis-Sinensis, Dogs, *Epidemiology, Fish, Human diseases, *Japan(Kyoto City), Parafossarulus-Manchouricus, Rats, Waterways, *Cities, Water pollution effects.

Two waterways flow through Kyoto prefecture from Lake Biwa in Shiga prefecture. 1 of the epidemic areas of clonorchiasis in Japan. One is the River Uji, and the other is the Kyoto drainage canal flowing through Kyoto City. The present study was conducted from 1968-1969. The construction work of this canal was finished in 1912 before Muto found and determined the first intermediate host, Parafossarulus manchouricus at the lake side of Biwa in 1918. Although Kawamura and Hirase had already described the finding of the snail in this canal before 1919 (Muto, 1918), there was no systematic survey of clonorchiasis in and/or around this canal. Even today, this canal is utilized for electrification and water service for Kyoto citizens. This canal also is utilized for fishing during all seasons and for swimming in summer. In a survey along the whole canal (about 24 km), the snail was found at 6 stations. An examination on the metaceriae of C. sinensis in fishes caught in the canal where the snail was found, showed many fishes positive for the metacercariae. In the case of P. parva, 13 of 18 fishes (72.2%) were positive for the metacercariae of C. sinensis. Examinations for C. sinensis in final hosts (dogs and house rats) were performed at an area near the canal. Two of 38 dogs (5.3%) were positive for C. sinensis eggs, and 4 of 30 house rats (13.3%) were infected with adult worms of C. sinensis. Kyoto city includes an epidemic areas of clonorchiasis although not on a large scale.--Copyright 1973, Biological Abstracts, Inc.
W74-07050

5D. Waste Treatment Processes

INTERMITTENT SAND FILTRATION TO UPGRADE EXISTING WASTEWATER TREATMENT FACILITIES,
Utah Center for Water Resources Research, Logan.
G. R. Marshall, and E. J. Middlebrooks.
Available from the National Technical Information Service as PB-231 205; $7.25 in paper copy, $1.45 in microfiche. Utah Water Research Publication PRJEW115-2. February 1974. 80 p, 26 fig, 34 tab, 40 ref. OWRR A-015-UTAH(1). 14-01-0001-3845.

Descriptors: *Filtration, *Waste water treatment, *Oxidation lagoons, *Tertiary treatment, Water quality standards, Algae, Pilot plant, Temperature, Treatment facilities, Effluents.
Identifiers: Intermittent sand filters, Slow sand filters, *Algae removal, Effluent polishing, *Sand filters.

Laboratory and field scale intermittent sand filtration of wastewater lagoon effluents was found to be a promising and economically feasible means of upgrading wastewater effluents to meet more stringent water quality standards of today. While the process was found to be very efficient at oxidizing applied nitrogen compounds, it was also found to be inefficient at removing applied phosphorus compounds. The process was found to

be capable of removing appreciable amounts of applied algae, still some algae were found to pass the entire filter depth. When operating under applied BOD concentrations typical in a properly operated secondary biological treatment plant effluent, the process was found to consistently meet present Utah Class 'C' water quality standards for BOD (equal to or less than 5 mg/1). Very high total coliform removal efficiency was exhibited by the process of intermittent sand filtration. The number of consecutive days of operation before cleaning was required was found to be related to the hydraulic loading rate and the filter influent suspended solids concentration. It was estimated that an effluent polishing intermittent sand filter process can be constructed and operated at a cost ranging from $15 to $47 per million gallons of filtrate.
W74-06506

UTILIZATION OF TRICKLING FILTERS FOR DUAL TREATMENT OF DRY AND WET WEATHER FLOWS,
Killam (Elson T.) Associates, Inc., Milburn, N. J.
P. Homack, K. Zippler, and E. Herkert.
Copy Available from GPO Sup Doc as EP1.23:670/2-73-071, $1.50; microfiche from NTIS as PB-231 251, $1.45. Environmental Protection Agency, Technology Series, Report EPA-670/2-73-071, September 1973. 118 p, 28 fig, 39 tab. EPA Project 11020 FAN.

Descriptors: *Trickling filters, *Filtration, *Waste water treatment, Rocks, Infiltration, Control, Treatment, Dual purpose, Dry seasons, Wet seasons, *New Jersey, *Sewage treatment.
Identifiers: *Dual treatment, New Providence(NJ).

A trickling filter sewage treatment plant was designed and constructed in the Borough of New Providence, New Jersey to alleviate local sewage treatment plant hydraulic overloading and resultant loss of treatment efficiency caused by excessive infiltration. The Plant utilizes two high rate trickling filters, one with rock media, the other with plastic media, operating in parallel to treat wet weather flow. During dry weather periods the plant is operated in series with a controlled flow to maintain an active biological slime on the filters. The plant also consists of a primary clarifier-leveling reservoir, secondary clarifier and chlorine contact tank. No sludge handling facilities are provided. A study of plant efficiency for one year indicated that during dry weather controlled flow operation, the BOD and suspended solids removal efficiency varied from 85 to 90 per cent. When operated during wet weather, the BOD and suspended solids removal efficiency varied from 56 to 74 percent. The plastic media trickling filter was found to remove more BOD per unit volume than the rock media trickling filter, under both dry and wet weather flow conditions. This investigation has shown that it is both technically feasible and economical to design, construct and operate a treatment plant to process both the controlled dry weather and the higher flows encountered during periods of excessive infiltration using a combination of series-parallel high rate trickling filters. (EPA)
W74-06508

PHYSICAL-CHEMICAL TREATMENT OF RAW MUNICIPAL WASTEWATER,
District of Columbia Dept. of Environmental Services, Washington.
D. F. Bishop, T. P. O'Farrell, A. F. Cassel, and A. P. Pinto.
Copy Available from GPO Sup Doc as EP1.23:670/2-73-070, $1.05; microfiche from NTIS as PB-231 250, $1.45. Environmental Protection Agency, Technology Series Report EPA-670/2-73-070, September 1973. 60 p, 13 fig, 16 tab, 30 ref. EPA Project 11010 EYM. 14-12-818.

Descriptors: *Waste water treatment, Anaerobic conditions, *Filtration, *Adsorption, *Ion exchange, *District of Columbia, Biochemical oxygen demand, Calcium carbonate, Chemical oxygen demand, Colloids, Ammonia organic loading, *Flocculation, Phosphorus, Nitrogen, Lime, Sedimentation.
Identifiers: *Physical-chemical treatment, Lime clarification, *Municipal wastewater, Carbon adsorption, Breakpoint chlorination, Recarbonation.

Physical-chemical treatment of raw wastewater consisted of two-stage lime clarification with intermediate recarbonation, filtration, pH control, ion exchange or breakpoint chlorination, and adsorption. Lime treatment with approximately 300 mg/l of CaO increased the wastewater pH to 11.5 and removed 96% of the phosphorus and 80% of the organics. In the second stage, recarbonation with 120 mg/l of CO2 and mineral addition of 5 mg/l of Fe+++ reduced the pH to 10.0 and precipitaed excess Ca++ as CaCO3. Dual media filtration decreased effluent suspended solids and total phosphorus to less than 5 mg/l and 0.15 mg/l as P, respectively. Addition of 10 mg/l chlorine to the filter influent controlled biological growth within the filter and produced filter runs of greater than 50 hours. With extensive operator surveillance, the clinoptilolite exchange media reduced the NH3 to less than 1 mg/l as NH+4-N. Breakpoint chlorination oxidized the NH3 to N2, leaving a residual NH3-N concentration of less than 0.4 mg/l. The 20 mg/l of soluble BOD entering the granular carbon columns prodiced anaerobic biological growth on the carbon, which contributed to heavy H2S production and high carbon losses during backwash. Breakpoint chlorination ahead of carbon adsorption minimized biological activity. The complete physical-chemical system, with ion exchange, removed 98% of the phosphorus, 95% of the organics (COD) and 78% of the total nitrogen. With breakpoint chlorination, the complete system removed 98% of the phosphorus, 94% of the organics (COD) and 86% of the total nitrogen. (Kisenbauer-EPA)
W74-06509

TECHNICAL AND ECONOMIC EVALUATION OF COOLING SYSTEM BLOWDOWN CONTROL TECHNIQUES,
Wapora, Inc., Washington, D.C.
D. B. Boies, J. E. Levin, and D. Baratz.
Copy available from GPO Sup Doc as EP1.23:660/2-73-026, $1.20; microfiche from NTIS as PB-231 258, $1.45. Environmental Protection Agency, Technology Series Report EPA-660/2-73-026, November 1973. 73 p, 13 fig, 11 tab. PE B12036, ROAP 16ACQ Task 11. 68-03-0233.

Descriptors: *Cooling towers, Cooling water, *Control systems, *Waste water treatment, Automatic control, Instrumentation, Management, Water pollution treatment, Treatment facilities, Recycling.
Identifiers: *Cooling system blowdown.

Methods are described which are either currently applied or commercially available to reduce the pollution impact of blowdown from large cooling systems (recirculating rates greater than 500 cfs). Treatment equipment descriptions, capabilities and compatibilities are discussed. Where appropriate, broad ranges of both capital costs and operating expenses are provided. The described methods include (a) the application and design of closed-cycle cooling systems, (b) makeup water treatment, (c) recirculating water treatment, (d) mechanical treatment, and (e) blowdown treatment and/or disposal. (EPA)
W74-06510

PACKINGHOUSE WASTE TREATMENT.
Stockton Dept. of Public Works, Calif.
Available from the National Technical Information Service as PB-231 976; $15.25 in paper copy, $1.45 in microfiche. Environmental Protection Agency Report, (April 1970). 238 p, 34 fig, 45 tab. EPA Project 11060 DRT.

Descriptors: *Aeration, *Activated sludge, *Food processing industry, *Waste water treatment, Biological treatment, Corrosion control, Sampling, Sewage, Sewers.
Identifiers: *Meat packing wastewater, U-Tube aeration, *In-Sewer treatment, Sewer gases, Pretreatment.

The feasibility to demonstrate pretreatment of packinghouse wastewaters was investigated in the laboratory. The pretreatment consisted of a Kehr activated sludge process in conjunction with in-sewer treatment. Laboratory tests were designed to study the oxygen uptake, contact time, potential foaming and scum problems, flow characteristics, odors, BOD removal efficiency, clarification, and return of activated sludge of high suspended solids mixed liquor reactors using packinghouse wastes. Sampling and analysis of the sewer flow and gases generated, along with work on in-sewer treatment and corrosion protection evaluated as part of the pretreatment process. Main water quality control plant description and operations were given along with the results of an extensive sewage sampling program. An economic analysis was made of the different pretreatment processes and of central treatment. Pretreatment of the waste was shown to be economically desirable. (Scaief-EPA)
W74-06511

AN APPRAISAL OF NEUTRALIZATION PROCESSES TO TREAT COAL MINE DRAINAGE,
Pennsylvania State Univ., University Park. Coll. of Earth and Mineral Sciences.
H. L. Lovell.
Copy available from GPO Sup Doc as EP1.23:670/2-73-093, $3.50; microfiche from NTIS as PB-231 249, $1.45. Environmental Protection Agency, Technology Series Report EPA-670/2-73-093, November 1973. 347 p, 65 fig, 66 tab, 100 ref. Partly sponsored by Pennsylvania Dept. of Environmental Resources. EPA Project 14010 EFN.

Descriptors: *Coal mine acids, *Neutralization, *Waste water treatment, Operation and maintenance, *Sludge, Treatment facilities, *Separation techniques, Bacteria, Dewatering, Disposal, Capital costs, Operating costs, *Oxidation, Water quality, *Pennsylvania.
Identifiers: Treatment processes, Autotrophic bacteria, Alkaline reagents, Hollywood(Penn).

Four different quality drainages were treated and detailed results tabulated. Appropriate unit operations, from water collection to sludge disposal were considered for eight different reagents (calcium/magnesium carbonate, oxide and hydroxide; caustic soda and soda ash). Necessary process variations were possible with a versatile 500,000 gpd facility. Limestone has the least cost per neutralization equivalent and may be used with drainage containing up to 500 mg/l iron II. The resulting sludge is dense, rapid settling and dewaterable. Lime can treat any drainage efficiently but may result in excess consumption. Lime-produced sludges are voluminous and difficult to handle. Unitized sludge recycle process, using lime, forms a dense, dewaterable sludge. Iron II oxidation was accomplished by air in alkaline systems or with autotrophic bacteria in acid system. Thickeners are preferred to settling lagoons to separate sludge in larger plants. Dewatered sludge requires least disposal volume. Drying basin dewatering is pragmatic, but filtration or centrifugation are effective, but more costly. Settled sludge may be discarded directly to abandoned deep or surface mines; while dewatered sludge may be placed in landfill areas. (EPA)
W74-06512

TREATMENT OF DOMESTIC WASTEWATER AND NSSC PULP AND PAPER MILL WASTES,
Harriman Utility Board, Tenn.
P. J. Farrell, L. R. Heble, and A. G. Steuhser.
Copy available from GPO Sup Doc as EP1.23:660/2-73-010 $1.40; microfiche from NTIS as PB-231 267, $1.45. Environmental Protection Agency, Technology Series Report EPA-660/2-73-010, December 1973. 104 p, 32 fig, 21 tab, 7 ref. EPA Project 12130 DBF.

Descriptors: *Domestic wastes, *Waste water treatment, Sulfites, *Pulp wastes, *Aeration, Disinfection, *Filtration, Color, Organic wastes, Solid wastes, Biochemical oxygen demand.
Identifiers: *Joint treatment, Organics removal, Color removal, Primary clarification, Extended aeration, Final clarification, Biofiltration.

The Harriman Utility Board and the Mead Corporation made a study of the joint treatment of primary clarified domestic waste and neutral sulfite semichemical (NSSC) pulp and paper mill wastes. A pilot plant was constructed and operated from April, 1971 through March, 1972. The most effective treatment scheme consisted of a biofilter (used as a roughing filter) and an extended aeration. Color reduction was accomplished by massive lime and chlorine additions due to the color's dependency on pH. Disinfection was optimum when ammonia was mixed with the combined wastes prior to chlorination. The biofilter's BOD removal efficiency ranged from 3 to 45 percent. Extended aeration's BOD removal efficiency ranged from 24 to 98 percent. (EPA)
W74-06513

RECOVERY OF FATTY MATERIALS FROM EDIBLE OIL REFINERY EFFLUENTS,
Swift and Co., Oak Brook, Ill. Research and Development Center.
W. C. Seng.
Copy available from GPO Sup Doc as EP1.23:660/2-73-015, $1.60; microfiche from NTIS as PB-231 268, $1.45. Environmental Protection Agency, Technology Series Report EPA-660/2-73-015, December 1973. 148 p, 27 fig, 27 tab, 4 ref. EPA Project 12060 DQV.

Descriptors: Treatment facilities, *Industrial wastes, *Waste water treatment, *Oil wastes, Polymers, *Flocculation, *Centrifugation, Market value, *Byproducts, Cathodic protection, Water pollution sources, Coagulation, Rectifiers, Biological oxygen demand, Suspended solids, Anodes, Anions, Cathodes, Cations, Water pollution, Turbidity, Zeta potential, Flotation, *Operating costs, Laboratory tests, Instrumentation, Corrosion control, *Illinois.
Identifiers: *Fatty wastes, Electro-coagulation, pH control, Hexane solubles, Edible fats, Edible oils, Bradley(Ill).

New full scale equipment was added to existing standard waste treatment equipment at the Swift and Company Edible Oil Refinery at Bradley, Illinois. Synthetic acrylamide polymer flocculants with alum, and impressed current, were evaluated for removal of fatty materials from the plant waste water. An in-plant waste water survey was made. A DeLaval PX-213 bowl opening, disc stack centrifuge was successfully tested to concentrate the removed fatty material after caustic and sulfuric acid treatment. The 7000 pounds daily of recovered oil (98% ether soluble), worth 4-1/4 to 4-5/8 cents per pound, could offset 60% of the total waste treatment direct operating costs. (EPA)
W74-06514

A DESIGN AND ECONOMIC EVALUATION OF CATALYTIC OXIDATION OF PHENOLS IN WASTEWATER,
Delaware Univ., Newark.
H. H. Ficke.
Available from the National Technical Information Service as PB-231 220; $7.75 in paper copy, $1.45 in microfiche. Delaware Water Resources Center, Newark Research Report, May 1973. 76 p, 5 fig, 5 tab, 31 ref, 5 append. OWRR A-14-DEL (4).

Descriptors: *Waste water treatment, *Phenols, *Oxidation, Catalysts, Chemical reactions, Design, Evaluation, *Cost analysis.
Identifiers: *Catalytic oxidation.

Catalytic oxidation is a possible process for treating wastewater effluents containing phenol from catalytic cracking units and coal tar plants. Experimental data were collected to determine intrinsic rate constants for phenol oxidation to CO2 and water. These constants were used in the design and optimization of a proposed process. Total cost for 99% reduction of phenol from 1000 gallons of wastewater (700 ppm) from the catalytic cracker was $0.35. Total cost per 1000 gallons (4000 ppm) from coal tar was $0.60. (Knapp-USGS)
W74-06516

DEMONSTRATION OF A NON-AQUEOUS SEWAGE DISPOSAL SYSTEM,
Black Hills Conservancy Sub-District, Rapid City, S.Dak.
F. L. Matthew, and E. E. Nesheim.
Copy available from GPO Sup Doc as EP1.23:670/2-73-088, $1.60; microfiche from NTIS as PB-231 338, $1.45. Environmental Protection Agency, Technology Series Report EPA-670/2-73-088, December 1973. 131 p, 7 fig, 20 tab, 2 ref. EPA Project 15010 PBK.

Descriptors: *Waste water treatment, *Water reuse, Water pollution control, Operating costs, *Recreation facilities, *Sewage treatment, *South Dakota.
Identifiers: *Chemical treatment, Recirculating systems, Watercraft wastes, *Mount Rushmore(So. Dak).

A prototype non-aqueous wastewater treatment system utilizing recirculated mineral oil as a collection and transport media was installed and operated at the Mount Rushmore National Memorial, Rapid City, South Dakota. The project was conducted to demonstrate the feasibility and effectiveness of the non-aqueous system for application at recreational and similarly remote areas. The non-aqueous system was evaluated for six months during the 1972 visitation season. During this period, data were collected to determine system usage rate and user waste loading and for the evaluation of the physical, biological, and chemical content of the flush oil as a function of system usage. System operation and reliability were also demonstrated during the test period. The demonstration showed that the non-aqueous treatment system is effective in the collection, transport, and disposal of human waste. Odors in the oil flush media and from the treatment system presented an aesthetic problem which makes the use of this system undesirable for recreational areas such as Rushmore. System redesign to prevent organic accumulations and the routine use of an oxidizer-bactericide to eliminate odor-producing bacterial activity is required before this concept can be suitable for high-use visible recreational areas. Water conservation is achieved when recirculated mineral oil is used to collect and transport human wastes. The waste volume is reduced by 98 percent in comparison with conventional water carriage systems. (EPA)
W74-06519

COLIFORM BACTERIA GROWTH AND CONTROL IN AERATED STABILIZATION BASINS,
Crown Zellerbach Corp., Camas, Wash. Environmental Services Div.
S. H. Watkins.
Copy available from GPO Sup Doc as EP1.23:660/2-73-028 for $2.75; microfiche from NTIS as PB-231 259 for $1.45. Environmental Protection Agency, Technology Series EPA-660/2-73-028, December 1973. 280 p, 47 fig, 75 tab, 15 ref. EPA Project 12040 GQD.

Descriptors: *Tertiary treatment, *Waste water treatment, *Coliforms, *Pulp wastes, *Disinfection, *Toxicity, *Chlorination, Bioassay, Chemical analysis, Microorganisms, Biochemical oxygen demand, Sulfite liquors, Salmonids, *Oregon, Water quality standards.
Identifiers: Ammonia base, Chloramines, Prosthecate bacteria, Sanitary survey, South Santiam River(Ore), Lebanon(Ore).

Secondary effluent from an ammonia base sulfite mill in Lebanon, Oregon, increased concentrations of coliforms (total coliform bacteria) in receiving waters to more than 1000 per 100 ml, the State standard. Factors responsible for high coliform populations were determined and a disinfection method was developed for reducing their numbers in secondary effluent. Chlorination was often ineffective. However, by injecting NaOH into the chlorinator's water supply, adequate coliform kill was achieved with approximately 5.7 ppm chlorine and 3.3 ppm NaOH. Continuous chlorination affected a reduction in coliforms in receiving waters to acceptable levels and the chlorinated effluent had a low degree of toxicity to salmonid fingerlings. (EPA)
W74-06520

COLOR REMOVAL FROM KRAFT MILL EFFLUENTS BY ULTRAFILTRATION,
Champion International Corp., Hamilton, Ohio
H. A. Fremont, D. C. Tate, and R. L. Goldsmith.
Copy available from GPO Sup Doc as EP1.23:660/2-73-019, $2.40; microfiche from NTIS as PB $1.45. Environmental Protection Agency, Technology Series Report EPA-660/2-73-019, December 1973. 240 p, 58 fig, 35 tab. EPA Project S 800-261.

Descriptors: Pulp and Paper industry, Effluents, *Waste water treatment, Pilot plants, Cost analysis, *Pulp wastes, *Filtration, Membrane processes, Organic wastes, Reverse osmosis, Color, Operation and maintenance, Incineration, *Water reuse, *North Carolina, Recycling.
Identifiers: *Ultrafiltration Process, Waste water recycle, *Color removal, Organic removal, Bleach caustic extraction effluent, Kraft Decker effluent, Canton(N.C.).

The purpose was to examine ultrafiltration as a means of reducing color in kraft mill effluents more efficiently and/or more economically than the presently available method. The program included the six month operation of a 10,000 gpd pilot plant at the Champion Papers' Canton, North Carolina, pulp and paper mill. The major experimental effort dealt with treatment of pine bleaching caustic extraction filtrate with lesser emphasis on unbleached pine and hardwood pulp washing Decker effluents. Four experimental aspects of the process were evaluated: feed pretreatment, ultrafiltration, concentrate disposal and water reuse potential. The process color removal efficiency was satisfactory. For all influent studied typical results were 90% color removal with 98.5-99% water recovery. The total operating costs, including amortization and exclusive of credits for a one million gallon per day treatment plant are estimated to be $0.58/tons bleached pulp for pine caustic extraction filtrate influent and $0.33/ton total pulp for Decker effluents as influent. (EPA)
W74-06521

INVESTIGATION OF TREATING ELECTROPLATERS CYANIDE WASTE BY ELECTRODIALYSIS,
RAI Research Corp., Long Island City, N.Y.
S. B. Tuwiner.
Copy available from GPO Sup Doc as EP1.23/2:73-287, $0.90; microfiche from NTIS as PB-231263 $1.45. Environmental Protection Agen-

cy Technology Series Report EPA-R2-73-287, December 1973. 48 p, 2 fig, 2 tab, 21 ref. EPA Project 12010 DFS.

Descriptors: Effluents, Industrial wastes, Membrane processes, *Dialysis, Separation techniques, Liquid wastes, *Electro-osmosis, Ion transport, *Waste water treatment.
Identifiers: *Cyanide, *Electroplating, *Electrodialysis.

An electrodialysis procedure is developed whereby the discharge of rinsewater is eliminated. The work, according to this method, is rinsed in a sequence of two rinses; the final rinse contains a concentration of cyanide of 1/10,000 of that of the plating. These concentrations are maintained by the use of electrodialysis to transport cyanides continuously from the second rinse solution back to the first rinse solution and also from the first rinse back to the plating bath. In this way, all cyanide is recovered and returned to the bath. Design parameters are determined from the experiments and costs are estimated. The experimental system used was a prototype of a commercial size electrodialysis unit operated continuously under conditions which simulated those of the projected two-stage commercial system using a cyanide copper plating bath. (EPA)
W74-06522

TERTIARY TREATMENT WITH A CONTROLLED ECOLOGICAL SYSTEM.
Las Virgenes Municipal Water District, Calabasas, Calif.
Copy available from GPO Sup Doc as EP1.23:660/2-73-022 $0.90; microfiche from NTIS as PB-231261 $1.45. Environmental Protection Agency Technology Series Report EPA-660/2-73-022, December 1973. 43 p, 21 fig, 6 tab, 3 ref. EPA Project 16080 FBH.

Descriptors: *Waste water treatment, Water reclamation, Aquatic biology, *Tertiary treatment, Oxidation lagoons, Zooplankton, Ecosystems, *Daphnia, *Algae, Water pollution control.
Identifiers: Biological processes, Polishing(Treatment).

A two-stage pond system was operated as a process for polishing secondary sewage effluent. The shallow first stage was an oxidation pond in which a heavy growth of algae was permitted to develope. In the second stage a population of Daphnia pulex consumed the algae. Detention times were about 10 days in each stage. Chemical and biological monitoring were carried out over a year's period to determine feasibility of using the process to produce recreational-grade water and reduce algae growth potential. While the Daphnia remained as the dominant zooplankton species in the second pond throughout the observation period, their concentration varied between 100 and 1,500 organisms/liter. Excellent water clarity was obtained when the Daphnia were above 500 organisms/liter, and at such times the over-all COD reduction was greater than 40 percent. Significant removal of nutrients occurred only during the months of July and August, when N and P reductions were 48 percent and 63 percent respectively. Performance was hampered by occasional invasions of Dephnia or rotifers in the first-stage pond, which decimated the algae. Such events were not successfully controlled and remain the principal obstacle to further process development. (EPA)
W74-06524

HYPOLIMNION AERATION WITH COMMERCIAL OXYGEN - VOL. I - DYNAMICS OF BUBBLE PLUME,
Texas Univ., Austin.
R. E. Speece, F. Rayyan, and G. Murfee.
Copy available from GPO Sup Doc as EP1.23:660/2-73-025a, $2.00; microfiche from NTIS as PB $1.45. Environmental Protection Agency, Technology Series Report EPA-660/2-73-025a, December 1973. 184 p, 86 fig, 7 tab, 47 ref. EPA Project 16080 FYW.

Descriptors: Water quality, *Hypolimnion, *Aeration, Stratification, Water quality control, *Texas, *Oxygenation, *Bubbles, Model studies, Dissolved oxygen, Absorption.
Identifiers: *Lake Travis(Tex.), Bubble plumes.

This study deals with a proposed scheme for restoration and maintenance of dissolved oxygen in the hypolimnion of stratified impoundments without disturbing the stratification. Commercial oxygen is an economical alternative to air as an oxygen source for hypolimnion aeration. In addition, it possesses many other advantages, the main one being avoidance of nitrogen gas supersaturation and its related toxicity to fish. Laboratory and lake studies were conducted to demonstrate the gas transfer dynamics of a bubble plume generated by the injection of pure oxygen bubbles within the hypolimnion. The experimental results verified the practicality of the original concept-hypolimnion aeration which preserves stratification. Efficient oxygen absorption was achieved within the hypolimnion. Mathematical models were formulated and calibrated by experimental data. The calibrated model was then used to predict the oxygen transfer and hydrodynamic characteristics of the bubble plume for various oxygen injection rates and injection depths. The sensitivity of the model to the various input parameters was shown. (See also W74-66526) (EPA)
W74-06525

HYPOLIMNION AERATION WITH COMMERCIAL OXYGEN - VOL. II - BUBBLE PLUME GAS TRANSFER,
Texas Univ., Austin.
R. E. Speece, F. Rayyan, and G. Murfee.
Copy available from GPO Sup Doc as EP1.23:660/2-73-025b $1.80; microfiche from NTIS as PB $1.45. Environmental Protection Agency Technology Series Report EPA-660/2-73-025b, December 1973. 150 p, 77 fig, 2 tab, 14 ref. EPA Project 16080 FYW.

Descriptors: Water quality, *Hypolimnion, *Aeration, Stratification, Water quality control, *Texas, Model studies, *Bubbles, Dissolved oxygen, *Oxygenation, Absorption.
Identifiers: *Lake Travis(Tex.), *Gas transfer.

This study deals with a proposed scheme for restoration and maintenance of dissolved oxygen in the hypolmnion of stratified impoundments without disturbing the stratification. Commercial oxygen is an economical alternative to air as an oxygen source for hypolimnion aeration. In addition, it possesses many other advantages, the main one being avoidance of nitrogen gas supersaturation and its related toxicity to fish. Laboratory and lake studies were conducted to demonstrate the gas transfer dynamics of a bubble plume generated by the injection of pure oxygen bubbles within the hypolimnion. The experimental results verified the practicality of the original concept-hypolimnion aeration which preserves stratification. Efficient oxygen absorption was achieved within the hypolimnion. Mathematical models were formulated and calibrated by experimental data. The calibrated model was then used to predict the oxygen transfer and hydrodynamic characteristics of the bubble plume for various oxygen injection rates and injection depths. The sensitivity of the model to the various input parameters was shown. (See also W74-06525) (EPA)
W74-06526

INFORMATION RESOURCE: FINAL REPORT WATER POLLUTION CONTROL IN WATER UTILITIES,
American Water Works Association Research Foundation, New York.
For primary bibliographic entry see Field 5F.
W74-06527

A STUDY OF HAZARDOUS WASTE MATERIALS, HAZARDOUS EFFECTS AND DISPOSAL METHODS. VOLUME I.
Booz-Allen Applied Research, Inc., Bethesda, Md.
For primary bibliographic entry see Field 5C.
W74-06555

A STUDY OF HAZARDOUS WASTE MATERIALS, HAZARDOUS EFFECTS AND DISPOSAL METHODS. VOLUME II.
Booz-Allen Applied Research, Inc., Bethesda, Md.
For primary bibliographic entry see Field 5C.
W74-06556

A STUDY OF HAZARDOUS WASTE MATERIALS, HAZARDOUS EFFECTS AND DISPOSAL METHODS. VOLUME III.
Booz-Allen Applied Research, Inc., Bethesda, Md.
For primary bibliographic entry see Field 5C.
W74-06557

FRESHWATER BIOLOGY AND POLLUTION ECOLOGY: TRAINING MANUAL.
Environmental Protection Agency, Cincinnati, Ohio. Office of Water Program Operations.
For primary bibliographic entry see Field 5A.
W74-06558

EMERGENCY PLANNING FOR MUNICIPAL WASTEWATER TREATMENT FACILITIES,
Wiley and Wilson, Inc., Lynchburg, Va.
R. A. Lemon, R. L. Green, and G. L. Page, Jr.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Price $1.25. Environmental Protection Agency, Washington, D.C. Office of Water Program Operations, Report EPA-430/9-74-013, February 1974. 78 p, 7 fig, 40 ref. EPA Contract 68-01-0341.

Descriptors: *Disasters, *Waste water Treatment, *Treatment facilities, *Water pollution control, *Planning, Earthquakes, Floods, Storms, Tornadoes, Tropical cyclones, Tsunami, Acts of God, Damages, Hazards, Negligence, Warning systems, Winds, Hurricanes, Electric power failure, Failures, Sewage effluent.
Identifiers: Emergencies, Preparedness, Municipal spills, Overflows, Plant operation, and Accidents.

A study has been made of emergency planning for municipal wastewater treatment facilities to insure effective continued operation under energency conditions. These emergency conditions could be imposed by natural disasters, civil disorders, strikes, faulty maintenance, negligent operation, or accidents. Over 200 municipal treatment systems were contacted and asked to provide information for this project. This information was used to help identify the principal causes of failures within municipal treatment systems. Information on emergency planning and responses to emergency conditions was provided from these contacts. The results of this study are presented in the form of a manual for the development of emergency operating plans for municipal wastewater treatment systems. The intent is to expand the concepts stated in the Federal Control Act Amendments of 1972. (EPA)
W74-06577

START-UP OF MUNICIPAL WASTEWATER TREATMENT FACILITIES,
Wiley and Wilson, Inc., Lynchburg, Va.
R. D. Rader, R. L. Green, and G. L. Page, Jr.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 Price $1.40. Environmental Protection Agency, Washington, D.C. Office of Water Pro-

gram Operation, Report EPA-43019-74-008, December 1973. 92 p, 3 fig, 2 tab, 42 ref. EPA Contract 68-01-0341.

Descriptors: *Administrative decisions, *Treatment facilities, *Waste water treatment, *Operations, *Laboratory tests, *Sampling, Testing, Analysis, Controls, Activated sludge, Trickling filter, Oxidation lagoons, Anaerobic digestion, Safety, Chlorination, Suspended solids, Hydrogen ion concentration, Alkalinity, Biochemical oxygen demand, Chemical oxygen demand, Pre-treatment(Water), Sewage treatment.
Identifiers: Procedures, Process, Seed sludge, Staffing, Standard operating procedures, Site meetings, Inventory inspection pretestin, Operator training, Settleable solids, Total solids, Volatile solids, Volatile acids, Mixed liquor suspended solids.

This manual provides guidance for putting into initial operation municipal wastewater treatment plant, a new addition to an existing treatment plant, or a change in the mode of the treatment plant's operation so that the treatment plant or process will effectively treat the wastewater in compliance with the specific conditions and limitations established for treatment facility. The manual was developed and prepared with the aid and cooperation of wastewater treatment plant operators and superintendents, start-up experts, the academic community, manufacturers and suppliers of wastewater treatment plant equipment, and literature review of wastewater treatment plant operations and recognized start-up techniques. Information is provided on preparing for actual treatment plant start-up. Preparations for start-up include: staffing the plant, developing standard operating procedures, dry- and wet-run testing of equipment, on-site operator training, safety, and establishing procedures when construction is continuing during start-up. This manual describes start-up procedures for some of the more common pretreatment and primary treatment units; for the specific secondary treatment processes of activated sludge, trickling fileters, stablization ponds and aerated lagoons; and for the sludge handling units and the anaerobic digestion process. The start-up procedures for advanced wastewater treatment units and processes are not considered in this manual. (EPA)
W74-06578

MAINTENANCE MANAGEMENT SYSTEMS FOR MUNICIPAL WASTEWATER FACILITIES,
Wiley and Wilson, Inc., Lynchburg, Va.
J. J. Jennings, Jr., W. M. Johnson, G. L. Page, Jr., W. H. Clingenpeel, and R. L. Green.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 Price $1.60. Environmental Protection Agency, Washington, D.C. Office of Water Program Operations, Report EPA-430/9-74-004, October 1973. 118 p, 29 fig, 188 ref. EPA Contract 68-01-0341.

Descriptors: *Treatment facilities, *Operation and maintenance, *Municipal wastes, Publications, *Wastewater treatment, Costs, Personnel, Maintenance, *Management, *Operating costs.

This manual has been prepared by the Environmental Protection Agency to provide guidelines to aid plant management in selecting, instituting, and evaluating various maintenance management systems for municipal wastewater treatment plants. The principal background for this work came from the existing maintenance guidelines as outlined in 'Federal Guidelines for Design, Operation and Maintenance of Wastewater Treatment Facilities' as provided by the Environmental Protection Agency. A survey of existing maintenance management systems used by wastewater treatment facilities, industries, and the armed forces were reviewed and input was obtained from persons experienced in maintenance management. This manual includes a separate section on each of the basic features required in a sound maintenance management system. Detailed discussions of the basic features with information on how to establish and implement the system are included. Three examples are provided to aid persons in combining the features into a sound system. The examples are not intended as a rigid format but can be modified to fit the particular plant's requirements. (EPA)
W74-06579

NITROGEN ELIMINATION BY BOGUS ALTERNATION OF AEROBIC/'ANOXIC' CONDITIONS IN 'ORBAL' ACTIVATED SLUDGE PLANTS,
National Inst. for Water Research, Pretoria (South Africa).
R. J. L. C. Drews, and A. M. Greeff.
Water Research, Vol 7, p 1183-1194, 1973. 5 fig, 4 tab, 13 ref.

Descriptors: *Sewage treatment, *Denitrification, *Activated sludge, *Aeration, Pilot plants, Sludge treatment, *Waste water treatment, Nitrogen, Treatment facilities, Ammonia, Aerobic conditions.
Identifiers: Extended aeration, South Africa.

Methods of operation for obtaining maximum nitrogen elimination in the 'Orbal' endless channel extended aeration plant were compared. The most efficient method required balancing of sludge concentration, organic load and oxygen input against one another in such a way that a rapid alternation of aerobic/anoxic conditions was brought about between aeration points in each channel. This resulted in minimal amounts of ammonia and nitrate remaining in the effluent. Automated control of oxygen input and of sludge concentration is considered necessary for consistent maximum nitrogen removal. (DWA)
W74-06605

THE EFFECT OF POLLUTION ON THE VAAL RIVER BARRAGE AND THE QUEST FOR WATER QUALITY,
Rand Water Board, Johannesburg (South Africa).
For primary bibliographic entry see Field 5B.
W74-06607

ECOLOGICAL AND PHYSIOLOGICAL IMPLICATIONS OF GREENBELT IRRIGATION,
California Univ., Riverside. Dept. of Plant Sciences.
V. B. Youngner, and T. E. Williams.
Available from the National Technical Information Service as PB-231 376, $4.50 in paper copy, $1.45 in microfiche. California Water Resources Center, Davis, Contribution No. 145, Technical Completion Report (California Project UCAL-WRC-W-374), 1973. 105 p, 14 fig, 22 tab, 74 ref. OWRR B-158-CAL(1).

Descriptors: *Recirculated water, Irrigation systems, Vegetation effects, Fires, *California, *Return flow, *Water reuse, Waste water disposal, Multiple-purpose project, Water pollution sources.
Identifiers: *Maloney Canyon(Calif), *Greenbelts.

The uncontrolled influx of permanent residents into the seasonally dry mountain areas of southern California has compounded fire hazards and created serious deficiencies in water supply and waste disposal systems of mountain communities. The problem has necessitated the conservation of existing water supplies through the maximum use and reuse of potable and wastewater sources. This need for a recycling of water led to a consideration of wastewater reclamation by a multi-purpose terrestrial disposal system, and the construction, in 1970, of the Maloney Canyon Greenbelt Irrigation Project. The project was designed to examine the feasibility of an effluent-irrigated chaparral ecosystem as a greenbelt fuel break for fire prevention, and to serve as a renovation system for wastewater recycling. An expanded water monitoring program encompassing analyses of surface and ground waters was implemented as an indicator of areas of wastewater contaminant accumulation. Soils and plants were analyzed for nutrient removal characteristics and patterns of native and introduced vegetation survival and growth were correlated into a feasible design for an effective greenbelt vegetation system. Results appear to be favorable to the project objectives of wastewater renovation and fire suppression through greenbelt establishment. (Snyder-California at Davis)
W74-06608

SURVIVAL IN MATURATION PONDS OF COLIFORM BACTERIA WITH TRANSFERABLE DRUG RESISTANCE,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5C
W74-06748

1972 OPERATION OF THE ICPP RARE GAS RECOVERY FACILITY,
Allied Chemical Corp., Idaho Falls, Idaho. Idaho Chemical Programs Operations Office.
C. L. Bendixsen, F. O. German, and R. R. Hammer.
Available from the National Technical Information Service, Springfield, Va., as ICP-1023; $4.00 per copy, $1.45 microfiche. Report No. ICP-1023, March 1973. 24 p, 1 fig, 4 tab, 2 ref.

Descriptors: Operations, Fuels, Effluents, *Krypton radioisotopes, *Xenon, Gases, *Radioactivity, Control system, Cryogenic, Distillation, Retention, Evaluation, Safety, Public health, Fallout, Water pollution sources, Efficiencies, Performance, *Idaho, *Recycling.
Identifiers: Fuel reprocessing, Chemical processing, Dissolution, *Rare gas recovery.

Operation of the Rare Gas Recovery Facility at the Idaho Chemical Processing Plant during FY 1972 resulted in the recovery of 9200 curies of krypton-85 and 600 liters of xenon from off-gas produced during dissolution of spent nuclear fuel elements. Overall recovery efficiencies for krypton and xenon were 44% and 49%, respectively. Operation of a cryogenic distillation process with the potential efficiency of greater than 97% for krypton recovery was demonstrated. (Houser-ORNL)
W74-06822

EFFICIENT PRICING FOR URBAN WASTE WATER RENOVATION,
Connecticut Univ., Storrs. Inst. of Water Resources.
R. Laak, R. Leonard, and H. Kardestuncer.
Available from the National Technical Information Service as PB-231 353, $3.25 in paper copy, $1.45 in microfiche. Completion Report, 1973. 41 p, 4 tab, 5 fig, 6 ref. OWRR B-006-CONN(2). 14-31-0001-3266.

Descriptors: *Waste water treatment, Pricing, *Copper, *Activated sludge, *Mathematical models, *Cost allocation, *Industrial wastes, Effluents, Operations.
Identifiers: Unit processes, Unit operations, Treatment efficiency, Cost estimation.

For nontoxic wastes a pricing system was developed for allocating actual cost in proportion to the marginal costs associated with volume and the weight of selected contaminants. The pricing method can be used for separate allocations of capital cost and operating and maintenance cost. Digital simulation models developed for preliminary design of wastewater treatment systems can be used in estimating marginal costs for volume and weight of major contaminants. Copper affected

unit operations and unit processes of the activated sludge treatment. Activated sludge was capable of retaining a significant portion of the applied copper. The efficiency of the activated sludge aerator and final settling units were a function of copper concentration, mixed liquor suspended solids, organic loading and the overflow rate. The overall effect of copper on treatment was a function of environmental variables. No reliable basis was found for including toxic wastes in a system of charges for industrial wastewater treatment.
W74-06828

QUALITY IMPROVEMENT OF FEEDLOT LAGOON WATER BY PERCOLATION THROUGH SOIL UNDER NATIVE PASTURE,
Kansas Water Resources Research Inst., Manhattan.
W. L. Powers, L. S. Murphy, and B. R. Bock.
Available from the National Technical Information Service as PB-231 355, $3.75 in paper copy, $1.45 in microfiche. Contribution No. 131, January 1974. 50 p, 15 fig, 14 tab, 1 ref. OWRR A-046-KAN(1). 14-31-0001-3516.

Descriptors: *Feedlots, *Percolation, *Soil chemical properties, *Water reuse, *Waste water treatment, Groundwater, *Bromegrass, Potassium, Absorption, Nitrogen, *Phosphorus.

Beef feedlot runoff retained in catchment lagoons was applied as an irrigant for bromegrass to determine the effects of this practice on bromegrass yields, bromegrass N, P, K concentrations and uptake, selected soil chemical properties, and groundwater quality beneath the application area. Average applications of 9.3 and 19.0 cm of diluted lagoon water, 9.5 and 16.6 cm of straight lagoon water, and 8.0 cm of well water in one irrigation season produced no consistent differences. Lagoon water applications produced an accumulation of extractable K in the soil profile at the 0- to 90-cm depth for all treatments; largest accumulation was observed in the straight lagoon water treatment, an increase of from 470 to 588 ppm. Although approximately twice as much P was added in the lagoon water treatments as was removed by the bromegrass in one growing season, the average weak Bray extractable P for the 0- to 300-cm depth and for the 0- to 30-cm depth decreased for all treatments. After the first season of lagoon water applications, a moderate increase in the average water soluble Cl- content of from 3 to 5 ppm was observed for the 0- to 300-cm depth. Analyses of groundwater samples from beneath the application area at depths of 7.6 and 21 m revealed highly significant differences between these depths relative to concentrations of NO3--N, Ca, Mg, K. Na, Cl-, and electrical conductivity values. Concentrations greater than 10 ppm for NO3--N in the shallow wells were common while the mean for all NO3--N values from the deep wells was 0.04 ppm. Mean values of 0.12 and 0.11 ppm were found for NH4+-N in the shallow and deep wells respectively.
W74-06830

AMMONIA-NITROGEN REMOVAL BY BREAKPOINT CHLORINATION,
District of Columbia Dept. of Environmental Services, Washington.
T. A. Pressley, D. F. Bishop, A. P. Pinto, and A. F. Cassel.
Copy Available from GPO Sup Doc, as EP1.23:670/2-73-058, $0.95; microfiche from NTIS as PB-231 378 $1.45. Environmental Protection Agency, Technology Series EPA-670/2-73-058, September 1973. 45 p, 17 fig, 7 tab, 21 ref. EPA Project 11010 EYM. Contract 14-12-818.

Descriptors: *Waste water treatment, *Ammonia, Nitrogen, Filtration, Oxidation, *Chlorination, Chlorine, Alkalinity, Nutrients, *District of Columbia.
Identifiers: *Breakpoint chlorination, Lime clarification, Free chlorine, Nitrogen trichloride.

In laboratory studies of breakpoint chlorination, sodium hypochlorite oxidized the ammonia in buffered distilled water (with 20 mg/l of NH3-N), raw wastewater, lime clarified and filtered raw wastewater, secondary effluent and lime clarified and filtered secondary effluents to chiefly nitrogen gas. In the oxidation of this buffered water and the wastewaters, only small amounts of NO3-N (0.3 mg/l at pH 5 to 2.0 mg/l at pH 8) and NCl3-N (0.05 mg/l at pH 8 to 0.3 mg/l at pH 5) were produced. The oxidation of ammonia to N2 gas was best accomplished in the pH range 6-8. A Cl:NH3-N ratio of approximately 8:1 was sufficient for the buffered water and the highly treated wastewater. However, increasing Cl:NH3-N ratios (8-10:1) were required as the degree of pretreatment of the wastewater decreased. In the pilot breakpoint operation, chlorine gas with sodium or calcium hydroxide for pH control was efficiently mixed with filtered secondary effluent and with lime clarified and filtered raw wastewater. Greater than 95% of the NH3-N was converted to N2 gas. Operation at controlled pH greater than 6.0 and with low residuals of free Cl2 (2 mg/l) produced essentially no nitrogen trichloride and modest amounts of NO3-N (0.6 mg/l). (Kisenbauer-EPA)
W74-06838

ACTIVATED SLUDGE TREATMENT SYSTEMS WITH OXYGEN,
District of Columbia Dept. of Environmental Services, Washington.
J. B. Stamberg, D. F. Bishop, and A. B. Hais.
Copy Available from CPO Sup Doc as EP1.23:670/2-73-073, $0.90; microfiche from NTIS as PB-231 379 $1.45. Environmental Protection Agency, Technology Series Report EPA-670/2-73-073, September 1973. 36 p, 11 fig, 4 tab, 15 ref. EPA Project 11010 EYM. Contract 14-12-818.

Descriptors: *Waste water treatment, Sedimentation, Phosphorus, Alkalinity, Biological treatment, *Activated sludge, Oxidation, *Oxygen, Oxygenation, *District of Columbia, Aerobic conditions, Biodegredation, Biochemical oxygen demand, Dissolved oxygen.
Identifiers: *Oxygen activated sludge, *Clarification, Suspended solids, Step aeration, Contact stabilization, Solids handling.

The gas-tight biological reactor with 2.5 hour detention time or less insolubilized the biodegradable organics to less than 5 mg/l of soluble BOD. The organisms in the mixed liquor were maintained between 4000 and 8000 mg/l. Above a solids retention time (SRT) of six days, the rate of activity in the oxygen volatile solids was greater than in a parallel step aeration system. Ninety-five (95) percent of the oxygen supplied was consistently utilized in the staged reactor, which employed co-current liquid and gas flow contacting. The liquid solids separation was accomplished by conventional clarification. The clarification efficiency was a function of mixed liquor concentration, particle shape, particle density and seasonal variation (i.e., temperature, metabolic changes, and load variation). During the warmer temperature periods, the peak overflow rates of 1940 gal/day/sq ft were observed. In colder temperature periods, maximum steady state overflow rates of 975 gal/day/sq ft were obtained. The underflow solids varied with overflow rate, clarifier volume and recycle rate. Underflow concentrations up to 2.5% were obtained. Above an SRT of six days, the total production of solids was significantly less than the solids production in a similarly operated step aeration system. At an SRT of 13 days, 0.35 lb. of solids/lb. of BOD were produced.
W74-06839

LABORATORY OZONATION OF MUNCIPAL WASTEWATERS,
District of Columbia Dept. of Environmental Services, Washington.
S. G. Roan, D. F. Bishop, and T. A. Pressley.
Copy available from GPO Sup Doc as EP/23:670/2-73-075, $0.85; microfiche from NTIS as PB-231 380 $1.45. Environmental Protection Agency, Technology Series Report EPA-670/2-73-075, September 1973. 38 p, 15 fig, 4 tab, 23 ref. EPA Project 11010 EYM Contract 14-12-818.

Descriptors: Oxidation, *Ozone, *Waste water treatment, Chemical Oxygen demand, Tertiary treatment, Sewage treaetent, Ammonia, *District of Columbia.
Identifiers: *Waste water ozonation, Oxidation efficiency, Nitrogen oxidation, Total organic carbon.

Raw wastewater, secondary effluent, lime clarified and filtered raw and secondary wastewaters, carbon treated wastewaters, and breakpoint chlorinated plus carbon treated wastewaters were ozonated at pH 7.0 over a range of 5.90 minutes contact time. Ozonation of the raw wastewater, with high solids and COD content required impractical ozone dosages for appreciable COD removal. In all effluents, except raw wastewater, 100 mg/l of ozone produced at least a 70% COD removal. Organic oxidation efficiencies in the raw and secondary wastewaters, based upon one atom of available oxygen per molecule of ozone, exceeded 100% indicating that one or more atoms of the ozone molecule or molecular oxygen participated in the organic oxidation mechanism. Variable amounts of organic nitrogen and ammonia were oxidized at pH 7.0 by ozone to nitrate. Organic nitrogen and ammonia oxidation to nitrate increased with increased pretreatment (lower initial COD in the wastewater) and increased pH. Nitrate residuals formed by the oxidation of ammonia and or organic nitrogen at the 70% COD removal level were less than 3 mg/l. The ozone distribution ratio between oxidation of the NOD and COD, and the COD removals as a function of ozone dose suggested that the relative order of oxidation was; easily oxidizable organic material, NH3, TKN, and slowly oxidizable (nearly refractory) organic material. (EPA)
W74-06840

NITROGEN REMOVAL BY AMMONIA STRIPPING,
District of Columbia Dept. of Environmental Services, Washington.
T. P. O'Farrell, D. F. Bishop, and A. F. Cassel.
Copy Available from GPO Sup Doc as EP1.23:670/2-040, $0.65; microfiche from NTIS as PB $1.45. Environmental Protection Agency, Technology Series Report EPA-670/2-73-040, September 1973. 23 p, 9 fig, 1 tab, 8 ref. EPA Project 11010 EYM Contract 14-12-818.

Descriptors: Ammonia, *Mass transfer, Calcium carbonate, Lime, *Waste water treatment, *Scaling, *District of Columbia.
Identifiers: *Air Stripping, *Ammonia removal.

Ammonia removals of up to 90% from lime clarified filtered wastewater were obtained in a five stage counter current cross flow stripping tower using air to liquid rates of 400 to 500 cu ft/gal. Decreases in operating temperatures from 78F to 43F during the cold weather reduced the stripping efficiency by 30% and caused icing in the tower. The variation of stripping efficiency was also studied as a function of the inlet pH of the water and the ratio of the air to liquid rate. The rate of calcium carbonate scaling on the tower was determined for wastewater pH's of 11.5 and 10.5. The heights of transfer units (HTU) were estimated by using a mathematical model and a computer iterative technique. (EPA)
W74-06842

BIOLOGICAL TREATMENT OF FEEDLOT RUNOFF,
Nebraska Univ., Lincoln. Dept. of Civil Engineering.
M. V. O'Neal.

Available from the National Technical Information Service as PB-231 479 $6.25 in paper copy $1.45 in microfiche. MS Thesis, September 1973. 52 p. OWRR A-027-NEB(3).

Descriptors: *Biological treatment, *Feed lots, *Farm wastes, Water quality, Cattle, Nitrates, *Waste water treatment, Organic loading, *Activated sludge, Flocculation, Suspended solids, Chemical oxygen demand, Pilot plants, *Nebraska, Nitrogen compounds.
Identifiers: *Feedlot runoff, Clarifiers.

The purpose of this study was to operate and evaluate the performance of a completely mixed activated sludge unit system. Performance was to be evaluated by comparison to parameters established in the laboratory studies and by ease of operation and maintenance under field conditions. Conclusions reached were: (1)Organic loading of 0.2 gm COD/gm mixed liquor suspended solids (MLSS) or less will maximize waste strength reduction. (2) The clarifier can effectively retain solids in the system. Effectiveness of sedimentation depends upon maintenance of a flocculant sludge and MLSS concentrations not exceeding 6,000 mg/1. (3) The unit is generally maintenance free and easy to operate. Periodic measurements of settled volume provide adequate control of MLSS. (4) Foaming can become quite severe and affect the system by removing solids. Thus, laboratory studies have concluded that the runoff is amenable to aerobic treatment and a field unit was designed applying the results of these studies in order to evaluate the success of such a system in pilot scale operation. The success and subsequent application of this system will depend on the economics involved and the degree of treatment attainable.
W74-06847

EFFECTS OF SEWAGE DISPOSAL AND RECLAMATION ON GROUND WATER QUALITY,
California State Dept. of Public Health, Sacramento. Environmental Sanitation Div.
H. F. Collins.
In: Proceedings of 9th Biennial Conference on Ground Water, Sept 13-14, 1973, Francisco Torres Conference Center, Goleta, Calif: California University Water Resources Center Report No 26, p 66-77, December 1973. 4 tab, 15 ref.

Descriptors: *Waste disposal wells, *Water reuse, *Reclaimed water, *Water quality, Water pollution, Monitoring, Water pollution effects, *California, Artificial recharge, Water spreading.

Waste water spreading operations are used at selected sites in California. The City of Oceanside, followed by the County Sanitation Districts of Los Angeles County, were among the first to employ recharge by a planned spreading operation. Other planned surface recharge operations have been carried out at various locations throughout the state but only four which recharge an aquifer supplying domestic water are in operation at the present time. A few projects in California have investigated the use of reclaimed water as a source of injected water. Pilot studies were carried out from 1952 to 1963 at the Hyperion Sewage Treatment Plant, and from 1965 to 1971 by the Orange County Water District. The effects of percolating waste water on the quality of the groundwater will vary widely from one location to another depending on: (1) application rates, (2) the characteristics of the waste water, (3) geological considerations, (4) the nature of the soil, and many other factors. Constituents in the waste water that are of primary concern from a health viewpoint are biological pathogens, stable organics, and heavy metals. The soil mantle appears to be quite efficient in the removal of bacteria, viruses and many other constituents. In direct injection, the treatment phenomena which occur with percolation through the soil are not provided, nor are they duplicated with groundwater movement. Consequently, the quality of the injected water must be such that it is suitable for the eventual intended uses. The quality must be such that no adverse changes will occur in the underground travel which will impair its use for extraction. (See also W74-06942) (Knapp-USGS)
W74-06948

USE OF WASTE HEAT FOR SOIL WARMING IN NORTH CAROLINA,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering; and North Carolina State Univ., Raleigh. Dept. of Horticultural Science.
R. W. Skaggs, C. R. Willey, and D. C. Sanders.
Paper No. 73-3530 presented at 1973 Winter Meeting, American Society of Agricultural Engineers, Chicago, Ill., Dec. 11-14, 1973, 30p. 13 fig, 1 tab, 9 ref. OWRR A-060-NC(1). 14-31-0001-4033.

Descriptors: *Thermal pollution, *Heated water, *North Carolina, *Soil temperature, Irrigation effects, *Land disposal, Cooling water, Heat transfer, Power plants, *Beneficial use.

A promising alternative for removing waste heat from condenser cooling water is by using the spent cooling water for soil warming, irrigation, and evaporative cooling of soil and plant surfaces. Heat can be transferred to the soil by circulating the heated water through a network of buried pipes. In addition to removing heat, soil warming systems may stimulate crop production (sometimes doubling yield), increase the length of growing seasons, and allow earlier harvesting (and marketing). This paper describes, interprets, and extrapolates field studies of waste heat removal by soil warming in North Carolina in terms of (1) the capacity of the soil system (Wagram sandy clay loam) as a heat sink and its variation over seasons of the year and (2) the temperature regimes maintained when heated waters are used for soil warming in combination with subsurface irrigation and low volume surface irrigation. Based on extrapolation of experimental data, the land area required to handle the waste heat from a 1,000 megawatt nuclear power plant in North Carolina would be about 13,100 acres during the hottest months, based on a soil warming system of one-inch diameter plastic pipes buried 20 inches deep and 20 inches apart and a temperature reduction from 100F to 80F. The acreage required can be reduced using sprinkler irrigation and subsurface irrigation. Acreage requirements also vary with ambient temperature (much lower in winter months); pipe diameter, and spacing; flow rate; entering water temperature, and temperature differential, i.e., the difference between inlet and outlet temperatures. (McJunkin-North Carolina)
W74-07000

SEARCH FOR A METHOD FOR SANITIZING SEWAGE FROM HELMINTH EGGS USING AGROCHEMICAL MEANS. (PRELIMINARY COMMUNICATION), (IN RUSSIAN),
Institute of Medical Parasitology and Tropical Medicine, Moscow (USSR).
Yu. A. Chefranova.
Med Parazitol Parazit Bolezn. Vol 41, No 4, p 440-444, 1972. (English summary).
Identifiers: Agrochemicals, *Ammonium water, Ascarid eggs, *Helminth eggs, Methodology, *Farm wastes, *Sewage treatment, Water pollution control, Waste water treatment.

A search was made among fertilizers used in agriculture of substances possessing an ovocidal effect on ascarid eggs in sewage. The addition of ammonium water to sewage could be accompanied by death of ascarid eggs. The ovocidal effect was observed when the content of ammonium was 2.5% or more and was similar in the following substrates: feces water, feces mixture with urine, sewage precipitate and pig manure. The ovocidal effect of ammonium water depends on concentration, exposure and temperature.--Copyright 1973, Biological Abstracts, Inc.
W74-07018

INVESTIGATION OF BREWING WATER TREATMENT,
For primary bibliographic entry see Field 5A.
W74-07023

5E. Ultimate Disposal Of Wastes

GEOLOGIC AND HYDROLOGIC BACKGROUND FOR SELECTING SITE OF PILOT-PLANT REPOSITORY FOR RADIOACTIVE WASTE,
Geological Survey, Denver, Colo
For primary bibliographic entry see Field 5B.
W74-06820

A CRITICAL REVIEW OF SOLID RADIOACTIVE WASTE PRACTICES AT NUCLEAR POWER PLANTS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W74-06825

MATHEMATICAL MODEL FOR BARGED OCEAN DISPOSAL OF WASTES,
Tetra Tech, Inc., Pasadena, California.
For primary bibliographic entry see Field 5B.
W74-06837

ON THE SELECTION OF A GROUND DISPOSAL SITE BY SENSITIVITY ANALYSIS,
Kyoto Univ., (Japan). Dept. of Sanitary Engineering.
For primary bibliographic entry see Field 5B.
W74-06858

THE EFFECTS OF WASTE DISPOSAL IN THE NEW YORK BIGHT. SECTION 3: ZOOPLANKTON STUDIES.
National Marine Fisheries Service, Highlands, N.J. Sandy Hook Sports Fisheries Marine Lab.
For primary bibliographic entry see Field 5C.
W74-06866

THE EFFECTS OF WASTE DISPOSAL IN THE NEW YORK BIGHT. SECTION 5: CHEMICAL STUDIES.
National Marine Fisheries Service, Highlands, N.J. Sandy Hook Sports Fisheries Marine Lab.
For primary bibliographic entry see Field 5C.
W74-06867

THE EFFECTS OF WASTE DISPOSAL IN THE NEW YORK BIGHT. SECTIONS 7, 8, AND 9.
National Marine Fisheries Service, Highlands, N. J. Sandy Hook Sports Fisheries Marine Lab.
For primary bibliographic entry see Field 5C.
W74-06868

SLUDGE DISPOSAL TO LAND,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W74-06950

5F. Water Treatment and Quality Alteration

INFORMATION RESOURCE: FINAL REPORT WATER POLLUTION CONTROL IN WATER UTILITIES,
American Water Works Association Research Foundation, New York.
H. A. Faber, A. D. Nardozzi, and M. J. Taras.

Copy available from GPO Sup Doc as EP1.23:660/2-73-020, $1.05; microfiche from NTIS as PB $1.45. Environmental Protection Agency Technology Series Report EPA-660/2-73-020, December 1973. 64 p, 3 tab. EPA Project 12120 EUR.

Descriptors: *Sludge disposal, *Sludge treatment, *Abstracts, *Water treatment, Water purification, Utilities, Information exchange, Treatment facilities, Surveys, Water pollution control.
Identifiers: *Information clearing-house, *Information resource, *Water utility sludge, Information dissemination.

The goals of this effort were the collection, coordination, and communication of information of a scientific, technical, and administrative nature relative to control of pollution caused by wastes from water treatment plants, in accordance with the recommendations of an industry advisory committee. It covers laboratory tests underway or completed at widely dispersed water treatment plants throughout the country on the applicability of polymers as primary coagulants, coagulant aids, and sludge conditioning agents, with the objective of alleviating the problem of water treatment plant waste disposal. Also included is the evaluation in cooperating laboratories of analytical methods suitable for the physical and chemical examination of the sludge and sludge solids from water treatment plants. A total of 121 abstracts of technical articles were prepared on the varied aspects of water treatment plant waste disposal: waste problems at 26 named water treatment plants or geographical locations, waste treatment in the new water treatment plants, water conditioning practices, characteristics of alum, iron, and softening wastes; treatment of filter washwater; treatment of sludge by the reclamation of alum, lime, and magnesium carbonate, and by dewatering processes involving centrifugation, drying beds, filter pressing, freezing, and vacuum filtration; subsurface disposal and disposal of brine wastes. (EPA)
W74-06527

5G. Water Quality Control

PROCESSING, CHEMICAL COMPOSITION AND NUTRITIVE VALUE OF AQUATIC WEEDS,
Florida Univ., Gainesville. Water Resources Research Center.
For primary bibliographic entry see Field 4A.
W74-06502

TECHNICAL AND ECONOMIC EVALUATION OF COOLING SYSTEM BLOWDOWN CONTROL TECHNIQUES,
Wapora, Inc., Washington, D.C.
For primary bibliographic entry see Field 5D.
W74-06510

EVAPORATION FROM BRINE STORAGE RESERVOIRS,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2D.
W74-06517

TERTIARY TREATMENT WITH A CONTROLLED ECOLOGICAL SYSTEM.
Las Virgenes Municipal Water District, Calabasas, Calif.
For primary bibliographic entry see Field 5D.
W74-06524

HYPOLIMNION AERATION WITH COMMERCIAL OXYGEN - VOL. I - DYNAMICS OF BUBBLE PLUME,
Texas Univ., Austin.
For primary bibliographic entry see Field 5D.
W74-06525

HYPOLIMNION AERATION WITH COMMERCIAL OXYGEN - VOL. II - BUBBLE PLUME GAS TRANSFER,
Texas Univ., Austin.
For primary bibliographic entry see Field 5D.
W74-06526

EMERGENCY PLANNING FOR MUNICIPAL WASTEWATER TREATMENT FACILITIES,
Wiley and Wilson, Inc., Lynchburg, Va.
For primary bibliographic entry see Field 5D.
W74-06577

WATER QUALITY CONTROL,
Pretoria Univ. (South Africa).
F. A. Van Duuren.
The Civil Engineer in South Africa, Vol 16, No 2, p 66-68, February 1974. 2 fig.

Descriptors: *Water quality control, *Water pollution, *Systems analysis, Water requirements, Water resources development, Water supply development, Water utilization, Consumptive use, Water demand, Water quality standards.
Identifiers: *South Africa.

The availability of water in South Africa in relation to the demand for water on the part of the various sectors of the community is reviewed. Differences in the quality of water from various sources are discussed in relation to the quality standards applicable to water used for industrial, agricultural and domestic purposes. The application of a systems approach to the regulation of water quality is advocated. (DWA)
W74-06603

ECOLOGICAL AND PHYSIOLOGICAL IMPLICATIONS OF GREENBELT IRRIGATION,
California Univ., Riverside. Dept. of Plant Sciences.
For primary bibliographic entry see Field 5D.
W74-06608

DEVELOPING REGION IN SELF-AERATED FLOWS,
Karlsruhe Univ. (West Germany). Institut fuer Hydromechanik, Staunanlagen und Wasserversorgung.
For primary bibliographic entry see Field 8B.
W74-06739

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE PROPOSED ALVIN W. VOGTLE NUCLEAR PLANT UNITS 1, 2, 3, AND 4.
Directorate of Licensing (AEC), Washington, D. C.
For primary bibliographic entry see Field 5B.
W74-06821

A REVIEW OF SOVIET DATA ON THE PEACEFUL USES OF NUCLEAR EXPLOSIONS,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 6B.
W74-06823

BUFFER CAPACITY IN AQUATIC ECOSYSTEMS,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 5B.
W74-06829

MODELING AND OPTIMIZATION OF TRANSIENT COOLING WATER DISCHARGE FROM POWER GENERATING PLANTS,
Kansas State Univ., Manhattan. Dept. of Industrial Engineering.
For primary bibliographic entry see Field 5B.
W74-06832

THE SELECTIVE REMOVAL OF NITRATE AND NITRITE FROM POLLUTED WATER,
Kansas State Univ., Manhattan. Dept. of Chemistry.
C. E. Meloan.
Available from the National Technical Information Service as PB-231 471, $3.25 in paper copy, $1.45 in microfiche. Kansas Water Resources Research Institute, Manhattan, Contribution No. 138, March 1974. 34 p, 6 tab, 28 ref. OWRR A-033-KAN(1). 14-31-0001-3216.

Descriptors: *Nitrates, *Nitrites, *Resins, Water pollution, *Ion exchange, Separation techniques, *Waste water treatment.
Identifiers: Diethylaminoethanes, Nitrobenzoates, Bio-Rex 70, Bio-Gel P-300, Bio-Gel P-30, Bio-Gel P-4, Nitron.

The basic idea was to add known nitrate selective compounds to currently available ion exchange resins to produce a resin that would selectively remove nitrate from contaminated waters, be easy to handle, and be capable of regeneration. Three such resins were made and tested and were found to have some selectivity but were entirely inadequate with regards to capacity. The compounds used were alpha-phenyl-alpha-hydroxy-beta-diethylaminoethane and alpha-phenyl-beta-diethylaminoe-thyl-rho-nitrobenzoate on Bio-Rex-70 and Bio-Gel P-300, P-30 and P-4. Studies were also begun using nitron and N-diethylbenzohydrylamine.
W74-06833

THE ENVIRONMENTAL IMPULSE AND ITS COMPETITORS: ATTITUDES, INTERESTS, AND INSTITUTIONS AT LAKE TAHOE,
California Univ., Davis. Dept. of Political Science.
For primary bibliographic entry see Field 6E.
W74-06843

THE PRESENT AND FUTURE STATUS OF EASTERN NORTH CAROLINA WETLANDS,
North Carolina Univ., Chapel Hill. Dept. of Geography.
For primary bibliographic entry see Field 2L.
W74-06850

EXPLORING ENERGY CHOICES.
Energy Policy Project, Washington, D.C.
For primary bibliographic entry see Field 6D.
W74-06879

PROCEDINGS NINTH BIENNIAL CONFERENCE ON GROUND WATER.
For primary bibliographic entry see Field 5B.
W74-06942

PROTECTING GROUND WATER QUALITY--SOME PROBLEMS AND SOLUTIONS,
Luhdorff (E.E.) Co., Woodland, Calif.
For primary bibliographic entry see Field 5B.
W74-06946

THE FEDERAL ROLE AND LEGISLATIVE TRENDS IN CONTROL OF GROUND WATER QUALITY,
Environmental Protection Agency, San Francisco, Calif. Region IX.
B. D. Clark.
In: Proceedings of 9th Biennial Conference on Ground Water, Sept 13-14, 1973, Francisco Torres

Conference Center, Goleta, Calif: California University Water Resources Center Report No 26, p 104-109, December 1973.

Descriptors: *Water pollution control, *Groundwater, *Federal water pollution control act, Monitoring, Regulation, Water quality act, Planning, *California, Water law.

The passage of PL92-500 authorizes the Environmental Protection Agency and the various states to control groundwater quality. The EPA has authority in groundwater quality control in four areas--monitoring and evaluation, research and demonstration, planning and management, and enforcement--with primary emphasis in monitoring and evaluation to provide an assessment of the problem and derive means for control. (See also W74-06942) (Knapp-USGS)
W74-06952

CURRENT STATE BOARD ACTIVITIES IN GROUND WATER QUALITY MANAGEMENT,
California State Water Resources Control Board, Scramento.
P. A. Rogers.
In: Proceedings of 9th Biennial Conference on Ground Water, Sept 13-14, 1973, Francisco Torres Conference Center, Goleta, Calif: California University Water Resources Center Report No 26, p 110-113, December 1973.

Descriptors: *Water pollution control, *Groundwater, *Federal water pollution control act, Monitoring, Regulation, Water quality act, Planning, *California, Water law.

Some activities of the California State Water Resources Control Board under the new federal and state law are discussed particularly in relation to groundwater. Probably the most significant aspect of the new law is that it has forged a new partnership between the Federal Environmental Protection Agency and the State. The State Board, by contract, is preparing comprehensive water quality control plans for each of the 16 hydrologic basins in the State. This is a $7 million effort which is about 75% completed. These plans will be the basis for setting State and regional water quality standards, the disbursement of State and federal grant funds for construction of waste water treatment facilities, and for the delineation of water quality objectives to achieve and maintain the beneficial uses of the state's waters. These plans designate the waste water facilities to be built in California for the next 20-30 years. In addition to surface waters, the basin plans also concern groundwater quality management, particularly problems of salt balance, effects of waste water disposal, and problems associated with interbasin transfer of water. Of major concern are the effects from both point and nonpoint sources. (See also W74-06942) (Knapp-USGS)
W74-06953

IMPACT OF WATER POLLUTION CONTROL LEGISLATION ON MEETING FUTURE WATER NEEDS IN CALIFORNIA,
California State Dept. of Water Resources, Sacramento.
J. R. Teerink.
In: Proceedings of 9th Biennial Conference on Ground Water, Sept 13-14, 1973, Francisco Torres Conference Center, Goleta, Calif: California University Water Resources Center Report No 26, p 114-118, December 1973.

Descriptors: *Water pollution control, *Groundwater, *Federal water pollution control act, Monitoring, Regulation, Water quality act, Planning, *California, Water law.

In the context of meeting future water needs in California, the opportunities presented by water pollution control legislation are in two areas. Planning of water supply and waste disposal, both quantity and quality, is being integrated. Water pollution control and water quality legislation promote more efficient use of water, including the use of groundwater storage, as compared to surface dams and reservoirs. Waste-water reclamation is the major link between waste disposal and water supply; it is the mechanism which makes it possible for good quality water to be used again before ultimate disposal. Waste-water reclamation often produces water of appropriate mineral quality to be recharged to a groundwater basin. Once in the basin, it may be pumped for any use, including domestic. The State Department of Public Health is considering allowing up to 10% of the recharge to a basin to be reclaimed water. (See also W74-06942) (Knapp-USGS)
W74-06954

GROUND WATER POLLUTION--FROM THE WASTE DISCHARGER'S VIEWPOINT,
Gilbert (J.B.) and Associates, Sacramento, Calif.
J. B. Gilbert.
In: Proceedings of 9th Biennial Conference on Ground Water, Sept 13-14, 1973, Francisco Torres Conference Center, Goleta, Calif: California University Water Resources Center Report No 26, p 119-125, December 1973.

Descriptors: *Water pollution control, *Groundwater, *Federal water pollution control act, Monitoring, Regulation, Water quality act, Planning, California, Water law.

Because of new water pollution legislation in California, dischargers have an increasingly realistic view of the beneficial use of waste waters. They also tend to have a pragmatic view of groundwater quality, one that is frequently influenced by short-term economic or operational considerations as opposed to long-term regional water resources management. Groundwater management must be accomplished for each basin, following a definitive plan. The discharge of concentrated pollutants with irreversible long-term damage should be avoided. The control of total dissolved solids and other salts must be determined separately, considering the long-term usefulness of the basin, alternative water supplies, and the best use of the waste water containing the salts. (See also W74-06942) (Knapp-USGS)
W74-06955

THE NATIONAL ENVIRONMENTAL POLICY ACT AND THE LICENSING PROCESS: ENVIRONMENTALIST MAGNA CARTA OR AGENCY COUP DE GRACE,
A. W. Murphy.
Columbia Law Review, Vol 72, No 6, p 963-1007, October 1972. 176 ref.

Descriptors: *Agencies, *Nuclear powerplants, *Environmental effects, *Electric power, Water quality standards, Public utilities, Reasonable use, Water policy, Industries, Administration, Electric powerplants, Legislation, Legal aspects, Regulation.
Identifiers: National Environmental Policy Act(NEPA).

An extensive and comprehensive analysis is presented of the National Environmental Policy Act (NEPA) and the licensing process of the Atomic Energy Commission for facilities engaged in the production of electric power. The job required of the Atomic Energy Commission by NEPA, as interpreted by the courts, is one which the agency cannot perform, and, in any event, one which the licensing process as it currently exists is ill-designed to handle. The task imposed on an already overburdened structure has had, at least temporarily, a disastrous impact. The situation is described and the reasons for the crisis are analyzed. Suggestions are offered for changes in the structure of the licensing process to enable the AEC and other agencies to better deal with environmental questions. For power plant licensing, certain steps seem to be necessary before the goals of NEPA can be realized. Congress must make some specific judgments as to energy policy, structure of the power supply industry, organization of the regulatory process, and, more fundamentally, national growth policy. (Mockler-Florida)
W74-06963

COASTAL WETLANDS IN NEW ENGLAND,
D. P. Hill
Boston University Rev., Vol 52, p 724-762, Fall 1972. 207 ref.

Descriptors: *Legal aspects, *Wetlands, *Coastal marshes, Swamps, Aquatic Environment, Land reclamation, Wildlife conservation, Governments, Water injury, Terrestrial habitats, Land use, Regulation, Environment, Environmental effects, Eminent domain, Adjacent land owners, High water mark.

A comprehensive analysis is presented of coastal wetlands in New England and the problems faced by those interested in the regulation and protection of coastal wetlands resources through the legal process. The most immediate threat to the wetlands lies in their direct alteration and destruction by man and, therefore, land use controls should be used as the essential ingredient of a viable wetlands program. Moreover, a constitutional interpretation which would allow the states to protect valuable public resources by denying individual landowners the right to interfere with natural systems is essential. Also, effective control of marsh areas located above the high water line, which are held extensively in private hands, is critical to effective conservation. Such control is confused by legal uncertainty over the 'taking' question raised by state regulations. The prospects for New England coastal wetlands may well rest on the shoulders of those in the legal profession concerned and imaginative enough to devise acceptable machinery for effective regulation and preservation. (Mockler-Florida)
W74-06967

WHATEVER HAPPENED TO TVA,
For primary bibliographic entry see Field 6E.
W74-06968

WILL MUNICIPAL SEWAGE CONTINUE TO THREATEN PRIMARY WATER-CONTACT RECREATION: AN APPRAISAL OF THE 1972 WATER POLLUTION CONTROL ACT,
D. J. Kuchenbecker, and D. E. Long.
Rutgers-Camden Law Journal, Vol 4, p 260-288, Spring 1973. 242 ref.

Descriptors: *Water pollution, *Federal Water Pollution Control Act, *Legislation, Permits, Water quality control, Sewage disposal, Waste, Environmental protection, Water resources, Recreation demand, Sewage, Sewage treatment, Water pollution sources, Recreation, Water, Water quality, Water quality standards, Effluents.
Identifiers: Environmental quality, Discharge control, Effluent limitations.

Increasing demands on the Nation's water resources for recreational activities and continuing deterioration of the aquatic environment, largely due to negligent discharge of waste into the waterways, led Congress to enact the Water Quality Act of 1965 as an amendment to the Federal Water Pollution Control Act (FWPCA). The FWPCA as then amended required states to submit water quality standards for review by the Secretary of Interior who would approve those which protected public health and welfare. Weaknesses persisted, however, leading Congress to enact the FWPCA Amendments of 1972. Four areas of the 1972 amendments are of special significance to water recreationists. These areas are: (1) financial authorization to assist states in construction of

necessary sewage treatment plants; (2) effluent limitations at point of discharge instead of water quality standards; (3) requirement that municipalities obtain a permit to continue discharges in Nation's waters; and (4) streamlining of enforcement procedures. By enactment of the FWPCA Amendments, Congress set in motion a forceful program to meet demands of water recreationists nationwide. (Daniels-Florida)
W74-06969

THREE-YEAR EVOLUTION,
For primary bibliographic entry see Field 6G.
W74-06970

CONSERVATIONISTS GO TO COURT--PART 1,
For primary bibliographic entry see Field 4D.
W74-06971

INDUSTRIAL DEVELOPMENT--POLLUTION.
For primary bibliographic entry see Field 6E.
W74-06976

CLEANING AGENTS.
For primary bibliographic entry see Field 6E.
W74-06977

SEWER CONSTRUCTION.
For primary bibliographic entry see Field 6E.
W74-06978

SEWAGE TREATMENT FACILITIES, STATE GRANTS.
For primary bibliographic entry see Field 6E.
W74-06979

SEWAGE COLLECTION FACILITIES.
For primary bibliographic entry see Field 6E.
W74-06980

REGIONAL WATER AND SEWER DISTRICTS: RIGHTS, POWERS AND DUTIES.
For primary bibliographic entry see Field 6E.
W74-06981

WATER POLLUTION--SUMMER INTERN PROGRAM.
For primary bibliographic entry see Field 6E.
W74-06982

CHOCTAWHATCHEE RIVER AND HOLMES CREEK, FLORIDA, PERMIT APPLICATION BY FLORIDA GAME AND FRESH WATER FISH COMMISSION (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Mobile, Ala.
For primary bibliographic entry see Field 4A.
W74-06985

LEGAL AND ADMINISTRATIVE ASPECTS OF AN AQUACULTURE POLICY FOR HAWAII, AN ASSESSMENT,
Hawaii State Dept. of Planning and Economic Development, Honolulu.
For primary bibliographic entry see Field 6E.
W74-06992

PROPOSAL FOR OKLAWAHA RIVER, OCALA NATIONAL FOREST, FLORIDA, (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Forest Service (USDA), Washington, D.C.
For primary bibliographic entry see Field 4A.
W74-06993

RATIFICATION OF PROPOSED CONVENTION ON THE PREVENTION OF MARINE POLLUTION BY DUMPING OF WASTES AND OTHER MATTER (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Department of State, Washington, D.C.
For primary bibliographic entry see Field 6E.
W74-06994

URBANIZATION AND HUMAN HEALTH,
T. Bakacs.
Akademiai Kiado: Budapest, Hungary, 1972. 168 p, Illus. Maps, Price $7.00.
Identifiers: Agricultural pollution, Air pollution, Chemicals, *Ecology, Sanitation, Soil, *Urbanization, *Public health, Water pollution, Cities, Human population, Publications.

The basic biological problems of urbanization, such as the direct and indirect factors responsible for the disruption of a balanced ecology, are discussed. The extent to which the increasingly artificial environment and agricultural chemicals are responsible for this imbalance is examined. The measures necessary for the prevention of unknown long-term reactions are discussed. Air and water pollution, inadequate sewage treatment and complex health injuries connected with the urban environment are analyzed. Part 1 (Man and his Environment) discusses human ecosystems, population explosion, and the introduction of biologically active agents into the environment. Part 2 (Urbanization Induced Health Hazards) discusses the processes of urbanization, air pollution, water supply and sanitation, problems of preserving soil quality in urban areas and the complexity of urbanization noxae. Part 3 (Conclusions and Perspectives) discusses economic and demographic conclusions and future tasks and perspectives. Numerous diagrams, tables, graphs and photographs are included and each section ends with an extensive list of references.--Copyright 1973, Biological Abstracts, Inc.
W74-07017

CONTROL OF MOSQUITOES BREEDING IN RICE-FIELDS,
Microbiological Research Establishment, Salisbury (England).
G. Surtees.
J Trop Med Hyg. Vol 74, No 12, p 255-259. 1971.
Identifiers: *Breeding(Mosquitoes), Environment, Human diseases, Insecticides, Irrigation, *Mosquito control, *Rice fields, Water pollution control.

The different types of control measures used are reviewed and their relative effectiveness indicated. Future research priorities are proposed with particular reference to environmental manipulation. The purpose of these techniques is to reduce numbers of mosquitoes and so the level of transmission of disease agents to man. Although chemical poisons sometimes reduce larvae, they are not satistifactory for long time control. Agricultural irrigation schemes with environmental control offer long term alternatives. Environmental pollution and the toxicological hazard of insecticides on growing food plants and the development of insecticide-resistant strains of insects are avoided.--Copyright 1973, Biological Abstracts, Inc.
W74-07041

OBSERVATIONS ON GAMBUSIA AFFINIS INTRODUCED INTO TOKUSHIMA AS A NATURAL ENEMY OF MOSQUITOES, (IN JAPANESE),
Laboratory of Mosquito Control, Tokushima (Japan).
H. Sato, S. Okubo, M. Sasa, Y. Wada, and M. Motoki.
Jap J Sanit Zool. Vol 23, No 2, p 113-127. 1972. Illus.
Identifiers: Aedes-Dorsalis, Anopheles-Sinensis, Culex-Pipiens-Pallens, Culex-Tritaeniorhynchus, Eradication, *Gambusia-Affinis, *Japan(Tokushima), *Malaria control, Mosquitoes, Rice paddies, *Poeciliid fish.

The topminnow, G affinis (Baird et Girard, 1853), is a viviporous poeciliid fish native to the southern USA, and was introduced into a number of countries mainly for malaria control. In Japan, the fish was imported in 1916 via Hawaii and Taiwan, and was found recently to be breeding widely in polluted waters in and around the city of Tokyo. Tokushima is situated on the delta of Yoshino River, where tremendous number of mosquitoes breed every year in swamps, ditches and rice paddies difficult to drain. Surveys were carried out on the larval breeding places, and on the seasonal prevalence of adults with light traps set at 6 stations. Of 14 spp. of mosquities found in this area, Culex pipiens pallens was predominant and most widely distributed, while Anopheles sinensis and C. tritaeniorhynchus were also found abundantly in some swamp areas. In some salt marshes near the sea coast, tremendous breeding of Aedes dorsalis was observed in the rainy seasons. Under such environmental conditions, the introduction of Gambusia might be an effective measure for the control of mosquitoes. Gambusia was especially successful and effective in salt water marshes where Aedes dorsalis were breeding. Complete eradication of the mosquito larvae was achieved in these areas.--Copyright 1973, Biological Abstracts, Inc.
W74-07048

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

APPLICATION OF DDDP IN WATER RESOURCES PLANNING,
Illinois Univ., Urbana. Dept. of Civil Engineering.
V. T. Chow, and G. Cortes-Rivera.
Available from the National Technical Information Service as PB-231 231 $7.75 in paper copy, $1.45 in microfiche. Illinois Water Resources Center, Urbana, Research Report No. 78, January 1974, 89 p, 22 fig, 10 tab, 13 ref. OWRR B-060-ILL(4).

Descriptors: *Dynamic programming, Systems analysis, *Planning, *Project planning, *Optimization, Optimum development plans, Multiple-purpose projects.
Identifiers: *Hydroeconomic analysis, *Discrete differential dynamic programming.

A research program on advanced methodologies for water resources planning is presented. It summarizes the various achievements accomplished during the period of the project. The main portion of the project is devoted to the presentation of a working manual for use by practicing water resources engineers and analysts, showing the application of the discrete differential dynamic programming (DDDP). The brief theoretical background of the DDDP methodology and a review of the principal aspects of its theory are included. Then, a detailed description of the DDDP methodology is given, giving emphasis to the key steps of its procedure. The DDDP methodology as a means to solve already formulated dynamic programming problems is proposed. For illustrative purposes, three examples are given to show the application of the DDDP methodology in the solution of optimization problems arising from the planning and operation of the complex water resources projects.
W74-06503

NETWORK ANALYSIS OF CONJUNCTIVELY OPERATED GROUND WATER-SURFACE WATER SYSTEMS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W74-06504

WATER QUALITY CONTROL,
Pretoria Univ. (South Africa).
For primary bibliographic entry see Field 5G.
W74-06603

TECHNIQUES FOR IDENTIFYING AND EVALUATING MARKET AND NONMARKET BENEFITS AND COSTS OF WATER RESOURCE SYSTEMS.
Texas Water Development Board, Austin. Systems Engineering Div.
For primary bibliographic entry see Field 6B.
W74-06852

6B. Evaluation Process

GEOGRAPHY OF WATERFOWL RESOURCES OF THE SOVIET UNION. CONDITION OF RESERVES.
Available from the National Technical Information Service as TT-71-53022, $3.00 in paper copy, $1.45 in microfiche. Trans. of Geografiya Resursov Vodoplavaeushchikh Palits v SSSR, 1972. 279 p, 41 tab.

Descriptors: *Geographical regions, *Water birds, *Population, *Protection, Ducks(Wild), Seasonal, Game birds, Breeding, Migration, Hunting, Productivity, Reproduction, Geese(Wild), Management, Marketing, Ecological distribution, Assay, Analytical techniques, Distribution, Nesting, Nesting cover.
Identifiers: *Soviet Union, *Game refuges, Swans, Cootes.

To determine a basic norm of waterfowl hunt kills, the state and distribution of the bird population, changes of the game in different years relative to conditions of breeding and wintering, and the number of birds killed by hunters should be known. Information from the entire territory of the USSR is assembled. The forms and degrees of participation of organizations for protection of bird wintering grounds should be determined for game management. To give a clear picture of waterfowl populations, mass ringing of the birds is necessary. Effects of closing the spring shooting season is discussed. An experiment was carried on to evaluate the number of waterfowl shot in the Soviet Union. Results are given of the first all-Russian count of water fowl in August 1963. Seasonal geographical distribution of pintails, migration of white fronted geese, and migration and breeding of waterfowl generally are given. Waterfowl populations are described in various areas of the north European USSR, northwest European USSR, central regions of European USSR, eastern European USSR, Azov-Black Sea areas, and the Trans Caucus, especially southeastern Trans Caucus, and the northern part of the Caspian Sea. (Jones-Wisconsin)
W74-06559

DEEP PLOWING - AN ENGINEERING APPRAISAL,
Agricultural Research Service, Beltsville, Md.
For primary bibliographic entry see Field 3F.
W74-06590

LAND USE OF NORTHERN MEGALOPOLIS,
Dartmouth Coll., Hanover, N. H.
For primary bibliographic entry see Field 4A.
W74-06630

A MULTIDISCIPLINARY SURVEY FOR THE MANAGEMENT OF ALASKAN RESOURCES UTILIZING ERTS IMAGERY,
Alaska Univ., College.
For primary bibliographic entry see Field 4A.
W74-06633

MULTIDISCIPLINARY APPLICATION OF ERTS-1 DATA TO NORTH CAROLINA NATURAL RESOURCE MANAGEMENT,
North Carolina State Univ., Raleigh.
For primary bibliographic entry see Field 4C.
W74-06682

NATURAL RESOURCE INVENTORY AND MONITORING IN OREGON WITH ERTS IMAGERY,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 4A.
W74-06683

RESOURCE MANAGEMENT IMPLICATIONS OF ERTS-1 DATA TO OHIO,
Ohio Dept. of Economic and Community Development, Columbus.
For primary bibliographic entry see Field 4A.
W74-06684

USE OF ERTS-1 DATA FOR REGIONAL PLANNING IN THE METROPOLITAN WASHINGTON COUNCIL OF GOVERNMENTS--A SHORT BRIEF,
Metropolitan Washington Council of Governments, D.C. Remote Sensing Project.
For primary bibliographic entry see Field 4A.
W74-06700

RELATIONSHIPS BETWEEN REMOTELY SENSED FISHERIES DISTRIBUTION INFORMATION AND SELECTED OCEANOGRAPHIC PARAMETERS IN THE MISSISSIPPI SOUND,
National Marine Fisheries Service, Pascagoula, Miss. Southeast Fisheries Center.
For primary bibliographic entry see Field 7B.
W74-06708

A REVIEW OF SOVIET DATA ON THE PEACEFUL USES OF NUCLEAR EXPLOSIONS,
California Univ., Livermore. Lawrence Livermore Lab.
M. D. Nordyke.
Available from the National Technical Information Service, Springfield, Va., as Rept No. UCRL-51414; $4.00 per copy, $1.45 microfiche. Report No. UCRL-51414, June 1973. 50 p, 33 fig, 3 tab, 41 ref, append.

Descriptors: *Nuclear explosions, *Benefits, *Reviews, Research and development, Natural resources, Gas, Water resource development, Oil, Mineral energy, Water storage, Reservoirs, Craters, Channels, Secondary recovery(Oil), Storage, Seismology.
Identifiers: *Peaceful uses, *Public benefits.

Over the last several years through a series of international meetings sponsored by the International Atomic Energy Agency (IAEA) and a number of publications, the Soviet Union has disclosed that they have a very active program for developing peaceful uses of nuclear explosions (PNE) in their national economy. They have described the results of 14 experimental and industrial explosions designed to develop nine different applications in the petroleum, gas, and minerals industries as well as for water resources development. However, when one considers the large number of large unidentified seismic events that have been reported over the last seven years in areas of the Soviet Union outside the normal nuclear-weapon test areas, it is obvious that they have an even more active program than they have publicly described, one that must be approaching a routine industrial technology in some areas. The PNE program that the Soviets have publicly discussed in various reports and at various meetings is summarized and, when appropriate, compared to data from the U.S. Plowshare Program (Houser-ORNL)
W74-06823

WATER SUPPLY MANAGEMENT ALTERNATIVES FOR RHODE ISLAND,
Analytic Sciences Corp., Reading, Mass.
For primary bibliographic entry see Field 6D.
W74-06827

INTERGOVERNMENTAL RELATIONS AS SEEN BY FLORIDA STATE LEGISLATORS: LAND USE AND WATER RESOURCE PROBLEMS,
Florida Atlantic Univ., Boca Raton
K. E. Hamm.
Available from the National Technical Information Service as PB-231 481 $8.75 in paper copy, $1.45 in microfiche. MA Thesis, 1973. 102 p, 18 tab, 30 ref. OWRR A-020-FLA(2) 14-31-0001-3809

Descriptors: *Attitudes, Inter-agency cooperation, *Land use, *State governments, Local governments, Federal government, *Governmental interrelations, *Political aspects, *Water resources development.

The major purposes were (1) to ascertain legislators' perceptions of intergovernmental relations for policy issues and (2) to seek an explanation for these perceptions. The central focus was on the 1972 Florida Legislature. Specifically, the focus was on the legislators' perceptions with regards to land use and water resource problems in Florida. The study found that the greater the perceived seriousness of sewage treatment, water pollution, open space preservation, water supply and planning and zoning problems, the greater the preference for a governmental policy emphasizing shared responsibility among local, state and federal governments. On the other hand, the majority of the legislators perceived 'traditional' land use and water resource problems--droughts, drainage and floods--not to be as severe as the 'contemporary' problems. Therefore, the legislators preferred to have only a single level of government be responsible for solving the problem. The second major area of analysis dealt with the degree to which state, federal and local governments were to be involved in either competitive or cooperative intergovernmental relations. For land use and water resource problems, the state was mentioned by the legislators in over 70 per cent of the replies but with the majority of these involving cooperation with either local governments or local and federal governments. Legislators seem to regard the state as the unit of government where basic responsibility for domestic problem solution should be located when the problem is not severe; but this attachment to the state decreases as problem intensity increases.
W74-06845

AREA FINANCING OF WATER RESOURCE DEVELOPMENT IN WEST MINNESOTA,
Minnesota Univ., St. Paul. Dept. of Agricultural and Applied Economics.
W. R. Maki.
Available from the National Technical Information Service as PB-231 476 $4.75 in paper copy, $1.45 in microfiche. University of Minnesota, St. Paul, Water Resources Research Center. Bulletin 66, January 1974. 123 p, 7 fig, 56 tables, 94 ref. OWRR B-044-Minn(3).

Descriptors: *Financing, *Water Resources Development, *Planning, *Minnesota, *Alternative planning, Economic efficiency.
Identifiers: Area Product Accounts, Income accounts, *Public financing Potentials.

A 14-county environmental planning area in West Minnesota was identified for the purpose of studying financing alternatives in water resource development. Altogether, 719 units of local government (exclusive of the newly established planning commissions) were included in the study area in 1967, which is the base year for the study. Economic and organizational structures in the 14-county area are described and analyzed. A computable model of the area economy is presented. Estimates of the degree of internal interdependence of the area economy are derived as basis for assessing the current status of the area economy and its public financing potentials. The base-year data are used subsequently in the preparation of a projected 1980 inter-industry transactions table. An expanded system of area product and income accounts is presented, also, for both the base year and the target year. These accounts are used in assessing the public economy as part of a total area economy. Water resource development potentials and financing requirements and alternatives are identified in the contest of all public expenditures and outlays in a multi-county area. (Walton-Minnesota)
W74-06846

TECHNIQUES FOR IDENTIFYING AND EVALUATING MARKET AND NONMARKET BENEFITS AND COSTS OF WATER RESOURCE SYSTEMS.
Texas Water Development Board, Austin. Systems Engineering Div.
Available from the National Technical Information Service as PB-231 485 $6.00 in paper copy, $1.45 in microfiche. Completion Report, June 1973. 227 p, 59 fig, 33 tab, 34 ref. OWRR C-3352(3738)(1).

Descriptors: Planning, *Economic impact, Environmental effects, *Texas, Social aspects, Long-term planning, Water allocation, Water resources development, Multi-purpose projects, *Input-output analysis, Resource allocation, Mathematical models, Aquatic environments, Terrestrial habitats, Systems analysis, *Regional analysis, *Cost benefit analysis, *Simulation analysis, *Water policy, *Alternative planning, Water management(Applied), Water demand.
Identifiers: Lake Whitney(Tex), Lake Lewisville(Tex), Lake Belton(Tex).

This research project was designed to provide a set of analytical tools for water resource planners and decision-makers to assist them in measuring and evaluating the market and non-market benefits and costs of water resource systems. The techniques are designed to be sufficiently flexible to analyze all types of water development and management policies. This report describes: (1) the techniques developed to measure the economic, environmental, and social impacts of water policy alternatives, and (2) the application of these techniques to a test case of three existing reservoirs to determine the method's efficacy. The analyses are conducted in three major areas: economic, environmental, and social. In the economic area a regional input-output model, modified to operate in a simulation framework, is used to estimate demand and output in the regional economy subject to primary resource constraints, which include water. Environmental effects of water development and management are estimated by using a simulation model of the aquatic environment. Social impacts of water resource systems are considered by means of selected social indicators and the differences in perceived and measured changes thereto. The three impact areas are tied together in an evaluative framework and a methodology is presented for asking and answering questions about water policy alternatives using the simulation techniques.
W74-06852

BIBLIOGRAPHY OF WATER MANAGEMENT.
Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering.
For primary bibliographic entry see Field 3F.
W74-06854

A SIMULATION APPROACH TO RECREATION PLANNING (A CASE OF CHANGING QUALITY),
California Univ., Davis. Dept. of Agricultural Economics.
R. E. Howitt, S. F. Moore, C. V. Moore, and J. H. Snyder.
The Annals of Regional Science, Vol 8, No 1, p 35-50, February, 1974. OWRR B-136-CAL(2).

Descriptors: *Recreation, Economics, *Simulation analysis, Recreation facilities, *California, *Planning, *Projections, Model studies, Alternative planning, Demand.
Identifiers: *Salton Sea(Calif).

Conventional demand based approaches to recreational economics are reviewed and found unsuitable for analyzing the effects of changes of the quality of recreation. An alternative approach using a simulation model is proposed, which allows the use of both quantitative data and subjective input on the qualitative effects. The critical economic variables are found to be fishing recreation visitor days and investment in recreational facilities at the Salton Sea, California. The model results are projected for 20 years and key parameters and assumptions are identified by parametric analysis. These parameters were then subjected to critical interaction by a group of specialists in the area, during a workshop session. Results of the final model are compared to a previous economic study of the region and found to be more pessimistic about the benefits of quality control. Verification of the model is performed by tests of deviation of the predictions of visitor days by the model from the actual visitor days recorded over eight years.
W74-06996

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

A DESIGN AND ECONOMIC EVALUATION OF CATALYTIC OXIDATION OF PHENOLS IN WASTEWATER,
Delaware Univ., Newark.
For primary bibliographic entry see Field 5D.
W74-06516

MAINTENANCE MANAGEMENT SYSTEMS FOR MUNICIPAL WASTEWATER FACILITIES,
Wiley and Wilson, Inc., Lynchburg, Va.
For primary bibliographic entry see Field 5D.
W74-06579

EFFICIENT PRICING FOR URBAN WASTE WATER RENOVATION,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 5D.
W74-06828

U.S. DEEPWATER PORT STUDY, VOL. 2. COMMODITY STUDIES AND PROJECTIONS,
Nathan (Robert R.) Associates, Inc., Washington, D.C.
For primary bibliographic entry see Field 6D.
W74-06863

U.S. DEEPWATER PORT STUDY, VOL 3. PHYSICAL COAST AND PORT CHARACTERISTICS, AND SELECTED DEEPWATER PORT ALTERNATIVES,
Nathan (Robert R.) Associates, Inc., Washington, D.C.
For primary bibliographic entry see Field 6D.
W74-06864

PRODUCTION FUNCTION THEORY AND THE OPTIMAL DESIGN OF WASTE TREATMENT FACILITIES,
Krannert Graduate School of Industrial Administration, Lafayette, Ind.
For primary bibliographic entry see Field 6D.
W74-06997

6D. Water Demand

WATER SUPPLY MANAGEMENT ALTERNATIVES FOR RHODE ISLAND,
Analytic Sciences Corp., Reading, Mass.
R. J. Martel.
Available from the National Technical Information Service as PB-231 362, $4.00 in paper copy, $1.45 in microfiche. Final Report No. TR-319, October 1973, 60 p. 13 fig, 6 tab, 24 ref. OWRR C-4260(No 9039)(1). 14-31-0001-9039.

Descriptors: Water resources development, Forecasting, State governments, *Rhode Island, Planning, Water conservation, Water policy, *Water supply, Reservoirs, Groundwater, Economics, Water requirements, *Water demand, *Management, *Alternative planning.
Identifiers: Big River(R.I.), Wood River(R.I.).

Water supply management in Rhode Island has evolved under the traditional public service criterion of meeting the projected requirements for water. Continuation of this policy could exhaust the state's developable fresh water resources in another 40 years. An alternative is for the state to adopt a policy of resource management, under which both supply and demand would be regulated to achieve broader economic and social objectives. The Big-Wood reservoir project provides the state government with an opportunity to implement resource management policies by maintaining control over the development of these reservoirs and the allocation and pricing of their waters. The economic, environmental, and institutional implications of this project are analyzed, and policy options for the state are presented. The technical approach is a systems analysis of policy alternatives. It was concluded that the broader economic, social and environmental implications of water supply development weigh in favor of the state retaining its responsibility for developing and managing the water and related land resources of the Big River and Wood River basins.
W74-06827

AREA FINANCING OF WATER RESOURCE DEVELOPMENT IN WEST MINNESOTA,
Minnesota Univ., St. Paul. Dept. of Agricultural and Applied Economics.
For primary bibliographic entry see Field 6B.
W74-06846

U.S. DEEPWATER PORT STUDY, VOL. 2. COMMODITY STUDIES AND PROJECTIONS,
Nathan (Robert R.) Associates, Inc., Washington, D.C.
R. L. Trisko, P. Chevey, J. deRover, J. C. Ulin, and B. Abnert.
Available from the National Technical Information Service as AD-750 091, $12.50 in paper copy, $1.45 in microfiche. Army Engineer Institute for Water Resources, Alexandria, Va., IWR Report 72-8, Vol 2, August 1972. 603 p, 13 fig, 220 tab, 30 ref. DACW 31-71-C-0045.

Descriptors: *Future planning(Projected), *Harbors, *Export, *Import, Human population, Gross National Product, Foreign trade, Oil, Supply, Demand, Transportation, Canada, Steel, Aluminum, Aluminum alloys, Industries, Bituminous coal, Coals, Grains(Crops), Soybeans, Feeds, Foods, Technology, Fertilizers.
Identifiers: *Deepwater ports, *Bulk commodities, Crude petroleum, Petroleum products, Iron ore, Bauxite, Alumina, Meal, Phosphate rock, China, Japan, Western Europe.

The increasing demands on United States deepwater ports handling bulk commodities, specifically petroleum, raw aluminum materials, phosphate rock, bituminous coal, iron ore, and grains, are projected for the years 1980, 1990, and 2000. The determination of the projected demands for the six commodities are based on the population and economic growth of the United States, Canada, Western Europe, and Japan. Demand, internal supply, and imports are projected for the United States consumption of petroleum, aluminum raw materials and iron ore, and the movement of each is traced from its source of origin to its final destination through United States' deepwater ports. Intra-United States movement of these commodities is also examined. Demand, internal supply, and exports of food and feed grains, soy beans, meals, phosphate rock and bituminous coal are also projected and their shipment traced. The sensitivity of each of these projections is discussed relative to changes in technological, economic, and political factors. The potential impact of mainland China's increased activity in the world markets is also evaluated, particularly its prospects for grain import requirements and coking coal exports. (See also W74-06864) (Schroeder-Wisconsin)
W74-06863

U.S. DEEPWATER PORT STUDY, VOL 3. PHYSICAL COAST AND PORT CHARACTERISTICS, AND SELECTED DEEPWATER PORT ALTERNATIVES,
Nathan (Robert R.) Associates, Inc., Washington, D.C.
R. L. Trisko, P. Chevey, J. deRover, J. C. Ulin, and B. Abnert.
Army Engineer Institute for Water Resources, Alexandria, Va. IWR Report 72-8, Vol 3, August 1972. 542 p, 91 fig, 148 tab. DACW 31-71-C-0045.

Descriptors: *Harbors, *Future planning(Projected), *Physical properties, Coasts, Access routes, Depth, Import, Export, Foreign trade, Oil transportation, Steel, Aluminum, Aluminum alloys, Bituminous coal, Coals, Grains(Crops), Soybeans, Foods, Feeds, Fertilizers, Channels, Costs, Pipelines, Ships.
Identifiers: *Deepwater ports, *Bulk commodities, Crude petroleum, Petroleum products, Iron ore, Bauxite, Alumina, Meal, Phosphate rock, Supertankers, Transshipment.

Reconnaissance surveys of United States port facilities, coastal areas, and ports are provided for the north Atlantic coast, including Maine through Virginia, the south Atlantic coast, including North Carolina through the Atlantic coast of Florida, the Gulf coast of Florida through Texas, the south Pacific coast including California, and the north Pacific coast including Oregon and Washington. Embraced in the surveys are general descriptions of the physical characteristics of the coastlines and the major harbors showing water depth, distance contour lines of 60, 90, and 120 feet, and longitudinal cross sections of major channels from the major facilities to a depth of 120 feet. Descriptive information is also provided on docking and commodity handling facilities within the ports, their physical design, and constraining features which might limit the form of future development within major harbors and channels. 1968-69 imports and exports, and 1969 intracoastal transfers data are also provided by port for crude petroleum and petroleum products, iron ore, alumina, bauxite, coal, phosphate rock, food and feed grain, soybeans, and soybean meal. (See also W74-06863) (Schroeder-Wisconsin)
W74-06864

EXPLORING ENERGY CHOICES.
Energy Policy Project, Washington, D.C.
Available from The Energy Policy Project, P O Box 23212, Washington, D.C. 20024, Price $0.75. Ford Foundation Energy Policy Project Preliminary Report, Washington, D.C., 1974. 81 p, 13 fig, 3 tab, 3 append.

Descriptors: *Energy, *Water resources, *Water pollution, *Water demand, Nuclear energy, Thermal powerplants, Water utilization, Oil fields, Coal mines, Electric power, Electric power demand, Planning, Regulation
Identifiers: *Energy supply and demand

The gap between domestic energy consumption and domestic production emerged in the 1950's and has grown rapidly since 1970. Three descriptive scenarios of the future are presented to show the range of feasible energy consumption patterns from which the nation can choose. These scenarios differ in their impacts on availability of energy supply, the environment, foreign policy, life styles, and the economy. One scenario is based on the persistence of present growth trends, another is a technical fix solution, which maintains the same growth in energy services, but stresses policies needed to reduce growth in energy use; a zero energy growth scenario would require changes in both life styles and the economy to reach a steady no-growth state. Water scarcity is a major factor limiting the development of coal industries in the West. While there may be adequate water for mining and rehabilitation of many areas, there is not enough water available there for large-scale operations. A pollution problem is acid mine drainage. A potential for oil spills exists in drilling and recovery operations on the Continental Shelf, in transporting Alaskan oil, and in importing oil. Oil shale development also raises serious environmental problems. Large amounts of water would be needed for commercial operations in a region where water resources are limited. Nuclear risks are qualitatively very different from those of fossil fuel systems. Like coal- and oil-fired plants, nuclear plants produce thermal pollution, but in their day-to-day operation they produce no air pollution. (Knapp-USGS)
W74-06879

A SIMULATION APPROACH TO RECREATION PLANNING (A CASE OF CHANGING QUALITY),
California Univ., Davis. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W74-06996

PRODUCTION FUNCTION THEORY AND THE OPTIMAL DESIGN OF WASTE TREATMENT FACILITIES,
Krannert Graduate School of Industrial Administration, Lafayette, Ind.
J. R. Marsden, D. E. Pingry, and A. Whinston.
Applied Economics, v 4, p 279-290, 1972. 8 ref. OWRR A-024-IND(2).

Descriptors: *Waste water treatment, *Planning, *Decision making, *Optimization, Activated sludge, Trickling filters, Aeration, *Treatment facilities.
Identifiers: *Production functions, *Cost functions, Non-linear programming.

The theoretical production framework of the current study is compared with that of predecessors. Then the development of theoretical micro-production and cost functions for water treatment plants is considered. Much of the previous work dealing with the development of production functions fail to comply with the concepts set forth by R.W. Shepard. Several papers begin with a hypothetical production functional form which is then fit to some set of empirical data. The assumptions of efficiency and cost-minimization are generally imposed in what are treatises on the technological level currently employed. An alternative approach is presented which obviates the need for the above assumptions - an approach which is more appropriate for planning purposes than the conventional descriptive procedures. The importance and usefulness of efficient production processes is emphasized. A production function is not related to what people do, but rather is a function relating inputs to outputs summarizing efficient production methods (Wiersma-Indiana)
W74-06997

6E. Water Law and Institutions

EMERGENCY PLANNING FOR MUNICIPAL WASTEWATER TREATMENT FACILITIES,
Wiley and Wilson Inc., Lynchburg, Va.
For primary bibliographic entry see Field 5D
W74-06577

ESTABLISHMENT OF MEAN HIGH WATER LINES IN FLORIDA LAKES,
Florida Univ., Gainesville. Water Resources Research Center
For primary bibliographic entry see Field 2H
W74-06610

A CHART OF NEW YORK WATER LAW,
Cornell Univ., Ithaca, N.Y. Dept. of Natural Resources
R. Kasvinsky, and J. B. Bughan
Available from the National Technical Information Service as PB-231 373, $4.00 in paper copy, $1.45 in microfiche. A.E. Ext. 598, Dept. of Agricultural Economics, Cornell University, Ithaca, N.Y., Technical Report 32, October 1971. OWRR A-027-NY(1). 14-01-0001-1852

Descriptors: *New York, *Water law, *Water rights, *Charts, *Riparian rights, Riparian waters, Governments, Groundwater, Surface waters, Percolating water.

The law affecting private water rights in New York State is summarized briefly in the form of a chart. The chart divides the water-affecting law via distinctions concerning the actual nature of the water involved, i.e., water flowing in a defined channel (watercourses - surface and underground streams and lakes) and water not flowing in a defined channel (diffused surface water, percolating underground water). Discussed in a substantial introduction to the chart are the two sources of New York State Water Law, the common law and statutory law; considered also is the limitation of Government removal of water rights for public purposes from private property owners. The material provided in the chart attempts to be as thorough as possible, but it is not absolutely complete or definitive owing to the unstable, changing nature of the law in this area. Many nuances and exceptions have been excluded. The chart represents only a general guide and should be substituted for professional legal counsel in case of a legal controversy. (Bell-Cornell)
W74-06614

THE ENVIRONMENTAL IMPULSE AND ITS COMPETITORS: ATTITUDES, INTERESTS, AND INSTITUTIONS AT LAKE TAHOE,
California Univ., Davis. Dept. of Political Science.
E. Costantini, and K. Hanf.
Available from NTIS as PB-231 487 $4.00 microfiche $1.45. Institute of Governmental Affairs Research Report No. 29, October 1973, 85 p, 11 tab, 4 ref, (California Water Resources Center Project UCAL-WRC-W-299), OWRR-A-037-CAL(3).

Descriptors: *California, *Environmental effects, *Decision making, Constraints, *Political constraints, *Institutions, Psychological aspects, Attitudes, Social values.
Identifiers: *Lake Tahoe(Calif).

Inevitably, the question of what constitutes unacceptable environmental conditions is a political one: Environmental policy cannot be an irresistible, simple, unchallenged response to empirical or scientific fact alone. No matter how weighty the evidence of degradation may be, the environmen-

tal impulse inevitably competing, perhaps stronger, impulses. As a consequence, what constitutes unacceptable environmental conditions and what to do about them are political questions, for it is in the political process that disagreement over significant social values and conflicting interests finds expression and seeks some form of resolution. Two central ingredients of that process are considered: First, the attitudes and backgrounds of persons critically affecting environmental decision-making in the Tahoe Basin, and second, the framework of political institutions within which decisions regarding the Basin are made. In particular, the extent to which these institutions have been responsive to the values of environmental quality, is examined. The objective is to explore the relationships between political institutions and institution building at Tahoe on the one hand, and the environmental impulse and its competitors on the other. (Snyder-California)
W74-06843

INTERGOVERNMENTAL RELATIONS AS SEEN BY FLORIDA STATE LEGISLATORS: LAND USE AND WATER RESOURCE PROBLEMS,
Florida Atlantic Univ., Boca Raton.
For primary bibliographic entry see Field 6B.
W74-06845

OHIO RIVER BASIN COMMISSION ANNUAL REPORT, FISCAL YEAR ENDING JUNE 30, 1972.
Ohio River Basin Commission, Cincinnati.
Available from NTIS, Springfield, Va. 22151 as PB-221 029, $3.00 in printed copy; $1.45 in microfiche. Report to the President through Water Resources Council, 1972. 17 p.

Descriptors: *Ohio River, *Planning, *River basin commissions, River basin development.
Identifiers: *Ohio River Basin Commission.

The Ohio River Basin Commission Annual Report is presented for Fiscal Year 1972. Initial planning efforts undertaken during the Commission's first full year of operation are discussed, and included adoption of the Ohio River Basin Comprehensive Survey Report as the Level A Framework Plan for the development of ORBC's Comprehensive Coordinated Joint Plan (CCJP). (Knapp-USGS)
W74-06918

PROCEEDINGS NINTH BIENNIAL CONFERENCE ON GROUND WATER.
For primary bibliographic entry see Field 5B.
W74-06942

THE FEDERAL ROLE AND LEGISLATIVE TRENDS IN CONTROL OF GROUND WATER QUALITY,
Environmental Protection Agency, San Francisco, Calif. Region IX.
For primary bibliographic entry see Field 5G.
W74-06952

CURRENT STATE BOARD ACTIVITIES IN GROUND WATER QUALITY MANAGEMENT,
California State Water Resources Control Board, Scramento.
For primary bibliographic entry see Field 5G.
W74-06953

IMPACT OF WATER POLLUTION CONTROL LEGISLATION ON MEETING FUTURE WATER NEEDS IN CALIFORNIA,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 5G.
W74-06954

GROUND WATER POLLUTION--FROM THE WASTE DISCHARGER'S VIEWPOINT,
Gilbert (J.B.) and Associates, Sacramento, Calif.
For primary bibliographic entry see Field 5G.
W74-06955

ENVIRONMENTAL QUALITY: AS AN OBJECTIVE OF GROUND WATER MANAGEMENT,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 5B.
W74-06956

THE NATIONAL ENVIRONMENTAL POLICY ACT AND THE LICENSING PROCESS: ENVIRONMENTALIST MAGNA CARTA OR AGENCY COUP DE GRACE,
For primary bibliographic entry see Field 5G.
W74-06963

THE LAW TO GOVERN DEEPSEA MINING UNTIL SUPERSEDED BY INTERNATIONAL AGREEMENT,
J. G. Laylin.
San Diego Law Review, Vol 10, No 3, p 433-445, May 1973. 15 ref.

Descriptors: *Resource allocation, *Resource development, *Mining engineering, *Engineering geology, *Ownership of beds, Continental shelf, Marine geology, Law of the sea, Oceans, Jurisdiction, Legislation.
Identifiers: Deepsea mining, Seabed.

There presently is no international law limiting freedom to recover mineral resources of the seabed beyond coastal state jurisdiction, nor is there any United States statutory or common law limitations. Pending the adoption of an international regime under the multi-lateral convention that the United Nations Seabed Committee is seeking to bring about, the United States can, by legislation, regulate deep seabed mining by all of its citizens and companies to promote conservation and orderly development of hard mineral resources on the deep seabed. Such legislative regulation is advocated, since the prospects for an international pact in the near future are dim. It is desirable that states having the capability to carry on mining put restraints upon themselves that encourage activity but do not permit assertion of rights beyond those necessary to assure progress, equity and order in ocean development. Legislation now before Congress provides for licensing of American mining activities beyond the continental shelf. Such legislation should include, a provision for reciprocity with other nations enacting similar legislation. (Flowers-Florida)
W74-06964

RECENT DEVELOPMENTS IN THE LAW OF THE SEA IV: A SYNOPSIS,
G. D. Greenblatt, J. R. Miller, and A. J. Waldchen.
San Diego Law Review, Vol 10, No 3, p 559-598, May 1973. 101 ref.

Descriptors: *Fish conservation, *Commercial fishing, *Foreign waters, *Law of the sea, International waters, Judicial decisions, Oil exploration, Water resources, Water resources development, Fish harvest, Pacific Ocean, Boundary disputes, Oil industry, Jurisdiction, Oceans, Atlantic Ocaen.
Identifiers: *Territorial waters, *Seabed resources, *Sovereignty, *International agreements, *Coastal waters, Comparative law.

A synopsis is presented of important events pertaining to the law of the sea during the last two years. The President's message to Congress is discussed along with the internationally sanctioned reduction in whale kill, the salmon fishing curb in Canada, and other fisheries acts for control, conservation, and research and development. Many fishing agreements are recounted such as those between Peru and the Soviet Union, Chile and the Soviet Union, and Japan and the United States. Legislation was also passed to develop tuna resources. This was spurred by Ecuadorian and Peruvian seizures for alleged invasions of their claimed two hundred mile territorial limit. An Alaskan fishing law was upheld in the face of a Constitutional attack. The law prohibited the use of a power drum to bring in cast nets in Alaskan territorial waters. The court found a compelling state interest in the conservation of salmon. Seabed resources are also discussed with particular attention to new oil leases and exploration. Attempts to protect shipping by avoiding incidents on the high seas as well as extensions of sovereignty by extending territorial waters are also discussed. (Sperling-Florida)
W74-06965

SEAMOUNTS AND GUYOTS: A UNIQUE RESOURCE,
S.K. Eaton, Jr., and J. Judy.
San Diego Law Review, Vol 10, No 3, p 599-637, May 1973. 129 ref.

Descriptors: *Geology, *Law of the sea, *International waters, *Marine fishery, *Engineering geology, Foreign waters, Terrain analysis, Research and development, Weather forecasting, Fish handling facilities, Commercial fishing, Communication, Marine geology, Oceans.
Identifiers: *Seamounts, *Guyots, *Sovereignty, *Seabed resources, International agreements, International regime.

The potential of the seabed as a source of natural resources is discussed. Recent advances in technology have made possible exploration of the deep seabed. This exploration has fostered concern for the establishment of a legal regime for regulation of the ocean floor. The necessity for such regulation is due to the fact that existing International Law principles do not or cannot apply to the seabed beyond national jurisdiction. The 1973 Conference on the Law of the Sea will attempt the formulization and adoption of an integrated plan, to exploit and develop ocean resources for the benefit of mankind as a whole. Seamounts and guyots, their legal status under international law, and the possible uses to which these phenomena may be put are described. Discussed as possible uses are: military utilization, mineral resource development, transportation, fishing, communications, weather forecasting, and expansion of territory. Alternate proposals to the formation of an international regime are also discussed. (Sperling-Florida)
W74-06966

COASTAL WETLANDS IN NEW ENGLAND,
For primary bibliographic entry see Field 5G.
W74-06967

WHATEVER HAPPENED TO TVA,
G. Young.
National Geographic, Vol 143, p 831-863, June 1973. 1 map, 10 photo.

Descriptors: *Tennessee Valley Authority, *Tennessee River, *Management, *Nuclear energy, *Environmental control, Environmental effects, Tennessee, Strip mines, Coal, Water resources development, Recreation, Multiple purpose projects, Mussels, Fertilizers, Hydroelectric plants.

The entire countryside surrounding the Tennessee Valley Authority (TVA) project is examined, seeing what it has done and what it has meant to the people. A short history of TVA is presented. The cries of socialism during the 1930's and the Manhattan Project and the atom bomb of the 1940's are described. Throughout both of these periods as well as now, the purpose of the program is to generally upgrade life surrounding the area. The

project now is concerned with peaceful uses of the atom in nuclear power, and environmental programs concerning land-management and water-quality studies. One such program especially noted is the Rapid Adjustment Farming Program which helps farmers specialize in the crops and livestock that best fit their needs and land. The manner in which TVA has helped to better utilize the surrounding recreational facilities and research on the development of fertilizer are described. As TVA represents the largest coal consumer in the United States, the new problem is the environmentalists and their assertion that TVA is doing far too little to prevent strip miners from leaving ugly gashes on the land. While admitting this to some extent, TVA directors say they do realize the problems and recently have begun to do more about it. (Sutton-Florida)
W74-06968

WILL MUNICIPAL SEWAGE CONTINUE TO THREATEN PRIMARY WATER-CONTACT RECREATION: AN APPRAISAL OF THE 1972 WATER POLLUTION CONTROL ACT,
For primary bibliographic entry see Field 5G.
W74-06969

THREE-YEAR EVOLUTION,
For primary bibliographic entry see Field 6G.
W74-06970

CONSERVATIONISTS GO TO COURT--PART 1,
For primary bibliographic entry see Field 4D.
W74-06971

DRAINAGE DISTRICTS.
N.C. Gen. Stat., sec. 159-69, p 227-228 (1973).

Descriptors: *North Carolina, *Legislation, *Surveying, *Mapping, *Drainage districts, State governments, Adoption of practices, Drainage patterns, Irrigation canals, Irrigation ditches, Bench marks, Data collections, Terrain analysis, Evaluation, Laterals, Outlets, Water management(Applied), Land management, Watercourses, Ditch, Channel, Administration, Engineering structures, Regulation.
Identifiers: *Administrative regulations.

This statute provides for the survey of drainage districts. Each drain, lateral drain, ditch, and levy shall be marked on the ground. Also, the course and distance of each ditch is to be mapped. If an old watercourse, ditch, or channel is being widened, deepened, or straightened, the cross-section will be accurately determined. The board of viewers will consider the effect of the proposed improvements upon the habitat of fish and wildlife. The need for and feasibility of structures to control the flow of water, to impound or store water, and to provide areas for the conservation and replacement of fish and wildlife habitat will be considered by the board. If structures are to be recommended, the report will include specifications, the location of the structure, and the estimated cost. The report will also set forth the areas of land needed for construction and maintenance of the canals and drainage system and structures to control, impound, or store water as well as fish replacement and will also include on whose land such areas are located, and the area of land necessary to be acquired from each landowner. (Sperling-Florida)
W74-06972

GROUNDWATER USE ACT OF 1969.
S.C. Code Ann., secs. 70-31 through 70-42 (1969).

Descriptors: *South Carolina, *Legislation, *Groundwater, Consumptive use, Aquifer, Water, Water law, Water resources, Water utilization, Legal aspects, Regulation, Permit, Non-consumptive use, Penalties(Legal), Underground streams, Subsurface waters, Water table, Water sources.
Identifiers: Injunctive relief.

The water resources of the state of South Carolina shall be put to beneficial use to the fullest extent possible, subject to reasonable regulation in order to conserve and develop these resources. The South Carolina Water Resources Planning and Coordinating Commission is authorized to develop capacity use areas in any area where aggregate uses exceed or threaten to impair the renewal or replenishment of waters in that area. The Commission shall then prepare regulations governing the use of groundwaters in the area to prevent untimely withdrawals and saltwater intrusion as well as provisions governing well depth and spacing controls. In such areas no person shall withdraw in excess of one hundred thousand gallons per day without a permit from the Commission. Penalties for violations of provisions of this statute are contained therein, and the Commission is empowered to obtain injunctive relief when necessary. (Ritchie-Florida)
W74-06973

DIVISION OF WATER: POWERS AND DUTIES.
Ohio Rev. Code Ann. secs 1521.03 (Supp. 1972).

Descriptors: *Ohio, *Groundwater recharge, *Water resources, Water resources development, Watershed management, Flood control, Drainage systems, Flood protection, Flood proofing, Water pollution control, Legislation, Regulation, Conservation, Construction, Research and development, Governments, Administration, Administrative agencies.
Identifiers: *Administrative regulations.

The division of water shall play an advisory role in any watershed district, soil conservation district, county, municipal corporation, or other agency of the state of Ohio in the planning of works for ground water recharge and water conservation practices. This division has authority to inventory water and related resources in each drainage basin in the state, and to formulate a plan which recognizes the variety of uses to which water may be put and the need for its retention and control. It can also investigate and study all factors relating to floods and flood control with particular attention to maintenance of the efficiency of the channels of rivers, streams, and watercourses as a means of carrying off flood waters. The division's aid can also be enlisted in planning and constructing flood control works. (Sperling-Florida)
W74-06974

POWERS OF THE WATER POLLUTION CONTROL BOARD: POWERS OF DIRECTOR OF ENVIRONMENTAL PROTECTION.
Ohio Rev. Code Ann. sec 6111.03 (Supp. 1972).

Descriptors: *Ohio, *Waste disposal, *Water pollution control, Legislation, Water pollution, Pollution abatement, Water quality control, Standards, Regulation, Wastes, Sewage disposal, Permits, Construction, Governments, Administrative agencies, Supervisory control(Power).
Identifiers: *Administrative regulations, Injunctive relief, Licenses.

The director of environmental protection has power to develop plans and programs for the prevention, control, and abatement of new or existing pollution of the waters of the state of Ohio. The director also has the power to encourage and participate in investigations related to water pollution. He can require the construction of new disposal systems as well as modification of existing systems. The director can issue, revoke, or deny permits and specify conditions for the discharge of sewage, industrial waste, or other wastes. The director can also institute proceedings to compel compliance with his orders. (Sperling-Florida)
W74-06975

INDUSTRIAL DEVELOPMENT--POLLUTION.
Mich. Comp. Laws Ann. sec 125.1253a (Supp. 1973), as amended, act 7, sec 1 (1973) Mich. Pub. Acts.

Descriptors: *Michigan, *Air pollution, *Water pollution, *Legislation, *Water law, *Water pollution abatement, *Water pollution control, *Financing, Cities, Public utilities, Industries, Industrial wastes, Water pollution sources, Equipment, Abatement, Public health, Pollution abatement, Air, Water.

To protect the public health, safety and welfare of the residents of Michigan, there is a continuing need for water and air pollution control for industries and public utilities. It is thus necessary that these industries and public utilities acquire, construct, refurbish, enlarge and repair the operation and maintenance of adequate and proper equipment to control air and water pollution. This act confers the authority and power to municipalities to acquire, construct, improve, enlarge and maintain such necessary facilities, to issue revenue bonds to finance such acquisitions and improvements, to enter into lease or lease purchase agreements regarding such equipment and to sell any such equipment. The interest of the municipality in the water and air pollution control equipment may be made subject to a mortgage, lien, security interest or encumbrance given by a public utility from which the municipality acquired its interest. (Silber-Florida)
W74-06976

CLEANING AGENTS.
Mich. Comp. Laws Ann. secs. 323.231-323.236 (Supp. 1973).

Descriptors: *Water pollution, *Legislation, *Michigan, Detergents, Phosphorus, Legislation, Water resources, Algae, Weeds, Aquatic week control, Slime, Environmental effects.

The content of cleaning agents is restricted in order to protect water quality by preventing and controlling growth of algae, weeds and slimes. Cleaning agents which contain phosphorus in any form in excess of 8.7% by weight are prohibited. The Michigan water resources commission promulgates rules for this clean agents act. The rules may further provide restriction of nutrient content and other contents of cleaning agents and water conditioners, to prevent unlawful pollution and control nuisance growths of algae, weeds and slimes which are or may become injurious to other lawful water uses. A person is prohibited from selling detergents or cleaning compounds containing any substance other than phosphorous that may cause unlawful pollution of the waters when discharged thereto. The water resources commission shall enforce this act and seek court enforcement of its orders. (Daniels-Florida)
W74-06977

SEWER CONSTRUCTION.
Mich. Comp. Laws Ann. secs. 323.412 (Supp. 1973).

Descriptors: *Legislation, *Michigan, Construction, Sewerage, Structures, *Water pollution control, Economics, Budgeting, Legal aspects, Sewage treatment, Sewage.

Procedures are outlined for applications for collecting sewer construction grants. The construction grants projects are to be certified by the Director of the Michigan Department of Administration and the State Treasurer. The Michigan Water Resources Commission shall report to the Legislature the collecting sewer projects eligible for grants, the points and priorities assigned to them pursuant to this Act and a list of projects that are recommended to be funded. (Daniels-Florida)
W74-06978

SEWAGE TREATMENT FACILITIES, STATE GRANTS.
Mich. Comp. Laws Ann. secs. 323.112, 323.113, 323.113a, 323.125, 323.126 (Supp. 1973).

Descriptors: *Water pollution control, *Sewage treatment, Construction, *Michigan, Environmental effects, Legislation, Grants, Projects, Water resources development, Governmental interrelations, Economics, Budgeting.

The Michigan state sewer construction fund is transferred to the water pollution fund. Disbursements from the water pollution control fund are provided for specific eligible treatment works projects. The eligible projects for a federal grant can receive a state grant up to 25% of construction costs for the treatment project. Disbursements from the fund shall be made by the Director of the Department of Administration and the state treasurer. Grants and advances to local agencies shall be funded from the State Water Pollution Control Fund for treatment works projects in descending order of their priority as established by the Water Resources Commission until all projects which have been approved have been funded. (Daniels-Florida)
W74-06979

SEWAGE COLLECTION FACILITIES.
Mich Comp Laws Ann, sec 123.192, 123.193 (Supp 1973).

Descriptors: *Michigan, *Sewerage, *Sewage disposal, *Wastes, *Domestic wastes, Sanitary engineering, Sewage treatment, Water pollution sources, Pipelines, Sewage sludge, Wastewater disposal, Sewage effluents, Legislation, State governments.

Section 123.192 provides that any property from which sanitary sewage emanates must be connected to a public sewage collection facility within eighteen months of the occurrence of the last of the following events: (1) availability of a public facility; (2) improvement of the property so as to become property from which sewage emanates; (3) this act's effective date. A new addition to the statute gives municipalities the power to require connection in a shorter time, but not less than six months. Section 123.193 provides that if any property is not connected within the time periods set out above, the owner or operator of the nearest available facility shall require connection forthwith, by written demand mailed to the record owner of the property and posted beside an entrance to the property. The demand must give the location of the nearest collection facility and advise the owner of the other requirements of the statute. (Flowers-Florida)
W74-06980

REGIONAL WATER AND SEWER DISTRICTS: RIGHTS, POWERS AND DUTIES.
Ohio Rev. Code Ann. sec. 6119.06 (Supp. 1972).

Descriptors: *Ohio, *Flow measurement, *Flow rates, Flow augmentation, Flow profiles, Public health, Planning, Natural resources, Water pollution control, Regulation, Conservation, Construction, Administrative agencies, State governments, Sewage districts, Water districts.
Identifiers: *Administrative regulations.

The regional water and sewer districts may make loans or grants to political subdivisions for the construction of water resource projects. They may also acquire, reconstruct, enlarge, equip, maintain, repair, or rent water resource projects. The districts may adopt regulations to protect augmented flow in waters of the state of Ohio from depletion so it will be available for use by the public. It can change or remove any building or structure to carry out its objectives. The owner of any premises in the district can be required to connect his premises to a water resource project as to prevent or abate pollution or protect the health and property of persons in the district. (Sperling-Florida)
W74-06981

WATER POLLUTION--SUMMER INTERN PROGRAM.
Ch. 79 (1973) Laws of New Jersey, to be enacted as, N.J. Stat. Ann., ch. 13:1D-20 to 13:1D-28.

Descriptors: *New Jersey, *Legislation, *Water pollution, *Financing, *Programs, *Pollution abatement, Budgeting, Surveys, Data collections, Measurement, Monitoring, Streams.

The New Jersey legislature has declared as a state goal the elimination of all pollution and polluting substances from the state's waters. The legislature has thus appropriated $100,000 to the Department of Environmental Protection for the purpose of employing college students during the summer months to aid in cleaning those waters. Summer interns will be assigned to such projects as making surveys of all places where polluting materials are entering streams, providing water sampling and monitoring activities, desnagging and removing debris, and performing any other projects designed to carry out the intent of this act. Any New Jersey resident enrolled full-time in any college or university may apply as an intern provided he has completed his freshman year of schooling but has not completed his final year of college. The program shall be administered by the Director of the Division of Water Resources in the Department of Environmental Protection. (Ritchie-Florida)
W74-06982

DRAINAGE.
N.Y. Sess. Laws, Ch. 664, secs. 15-1901 through 15-1983 (McKinney 1972).

Descriptors: *New York, *Drainage, *Drainage districts, *Agriculture, Legislation, Structures, Construction, Public health, Petitions, Projects, Agricultural runoff, Financing.
Identifiers: Drainage systems.

This statute gives the New York (drainage improvement) department powers and duties herein described with respect to drainage. The purpose is to provide for the drainage of agricultural land so that it can be more productive in order to benefit the public health, safety and welfare. The statute sets up drainage improvement districts and associations which represent the interests of its members in drainage matters. To carry out surveys and examinations, the department may enter upon any lands, structures and waters as necessary. Procedures have been established for petitions, district formation, enhancements, authorization for construction, financing of projects, assessment and collection of cost, and for discontinuance of the districts. All work is to be done by contract and the department should prepare the contracts, plans and specifications for doing such construction and furnishing the necessary materials. The care, operation and maintenance of the drainage works is subject to the control and supervision of the department. (Daniels-Florida)
W74-06983

RIVER V. RICHMOND METROPOLITAN AUTHORITY.
359 F. Supp. 611-643 (E.D. Va. 1973).

Descriptors: *Judicial decisions, *Rivers and Harbors Act, *Navigable waters, *Environmental effects, *Highways, Construction, Legislation, *Virginia, Environment, Permits, Drainage, Navigation, Transportation, Canals, Roads, Governments, Social aspects, Natural resources.
Identifiers: Injunctive relief, National Environmental Policy Act(NEPA), Navigation obstructions, *Richmond(Va).

A nonprofit corporation brought an action against state and federal authorities for injunctive relief with respect to proposed construction of a limited access expressway in the downtown area of Richmond, Virginia. Plaintiffs in one count alleged that because the proposed expressway requires encroachment upon navigable waters, the defendants must apply, pursuant to the Rivers and Harbors Act of 1899, to the Corps of Engineers for a construction permit. The court did not determine the desirability of the expressway but rather the applicable law. The protection of the environment is of utmost importance and the decision to protect it is up to Congress. The court held that the river and canal which was drained and filled did not constitute navigable waters for the purpose of determining whether the proposed construction would be violative of the sections of the rivers and harbors act, relating to approval for construction of any bridge or causeway over navigable water. Summary judgment motion for defendant was granted. (Daniels-Florida)
W74-06984

LEGAL IMPEDIMENTS TO THE USE OF INTERSTATE AGREEMENTS IN COORDINATED FISHERIES MANAGEMENT PROGRAMS: STATES IN THE N.M.F.S. SOUTHEAST REGION,
Louisiana State Univ., Baton Rouge. Law School.
H. G. Knight, and T. V. Jackson.
September 28, 1973. 120 p, 140 ref.

Descriptors: *Southeast U.S., *Research and development, *State governments, *Coordination, Adoption of practices, Legislation, Fish conservation, Fish establishment, Fish management, Commercial fishing, Estuarine fisheries, Saline water, Fish, Water resources development, Coasts, Judicial decisions, Governments, Political aspects, Interstate commissions, Governmental interrelations.
Identifiers: Coastal zone management.

The purpose is to identify and analyze existing impediments to coordinated interstate fisheries management agreements among coastal states in the Southeastern United States. Another purpose is to identify and analyze alternative methods for developing a system of coordinated fisheries management among those states. This study is limited exclusively to marine fisheries and does not cover fresh water fishery management problems; however, much of the study is equally applicable in fresh water fisheries. The coastal fisheries management systems of each of the eight states in the Southeast are included. Discussions were conducted with each of the resource managers and attorneys of the states to gain a better understanding of the state's coastal fishery management system and seek new ideas and comments relating to the use of interstate agreements in coastal fisheries management programs. Research was also directed to the broader implications of the study such as the general use of interstate agreements and the requirement of Congressional consent to interstate agreements. (Sperling-Florida)
W74-06991

LEGAL AND ADMINISTRATIVE ASPECTS OF AN AQUACULTURE POLICY FOR HAWAII, AN ASSESSMENT,
Hawaii State Dept. of Planning and Economic Development, Honolulu.
G. M. Trimble.
Available from the National Technical Information Service as PB-220 186. Western Interstate Commission for Higher Education report, December, 1972. 61 p, 1 tab.

Descriptors: *Hawaii, *Aquiculture, Agriculture, Effluents, Laboratory tests, Fisheries, Commercial fishing, Fish management, Research and development, Water rights, Water quality, Water quality standards, Coasts.

This assessment is the first of a series to be undertaken to provide recommendations for Hawaii decision makers. Findings are based on project results and recommendations are based on literature searchers, interviews, questionnaires and a one day structured Assessment Workshop. The project resulted in studies of ancient Hawaiian konohiki fishing rights, kuleana water rights, and fish pond cultures of mullet and milk fish, showing that they are compatible with the development of modern aquaculture in Hawaii. Most of the forthcoming needs of commercial aquaculture development in Hawaii can be adequately handled by administrative or regulatory action. In the near future aquaculture in Hawaii is most likely to occur on agricultural lands or at inland locations where no effluent discharge occurs. Hawaii's present institutional structure supports laboratory research and commercial operations, and it is unlikely that incentives to commercial enterprise to undertake long term research and development in aquaculture will succeed. There is a need for commercial identification and quality standards to insure high-quality aquaculture products, thereby enhancing customer acceptance. Included is a bibliography containing thirty-eight sources. (Sears-Florida)
W74-06992

RATIFICATION OF PROPOSED CONVENTION ON THE PREVENTION OF MARINE POLLUTION BY DUMPING OF WASTES AND OTHER MATTER (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Department of State, Washington, D.C.
Available from National Technical Information Service, U.S. Dept of Commerce, Springfield, Va, as EIS-AA-73-0177-F. PC $10.00, microfiche $1.45. January 1973. 160 p, 2 tab.

Descriptors: *United States, *Environmental effects, *International law, *International waters, *Governmental interrelations, Federal government, Legislation, Political aspects, Foreign waters, Law of the sea, Commercial fishing, Water pollution, Oceans, Ocean circulation, Coasts, Pollutants.
Identifiers: *Environmental Impact Statements, *Coastal waters.

The action under consideration is the ratification by the United States of a convention developed at a governmental Conference. It would prohibit all deliberate disposal at sea from vessels and aircraft of certain dangerous substances, and require permits for the dumping of other substances in accordance with detailed criteria. All coastal states bordering upon the high seas would be particularly affected by the action under consideration. The convention would hopefully stimulate other nations to abide by procedures and standards for ocean dumping that are in general harmony with those contemplated in the U.S. Marine Protection, Research and Sanctuaries Act of 1972. Alternatives include reliance solely on domestic laws, expansion of the subject convention to cover other forms of marine pollution, and U.S. participation in a regional rather than a global ocean dumping convention. (Conko-Florida)
W74-06994

6G. Ecologic Impact Of Water Development

GEOGRAPHY OF WATERFOWL RESOURCES OF THE SOVIET UNION. CONDITION OF RESERVES.
For primary bibliographic entry see Field 6B.
W74-06559

ASSESSMENT OF SOUTHERN CALIFORNIA ENVIRONMENT FROM ERTS-1,
California Univ., Riverside. Dept. of Geography.
For primary bibliographic entry see Field 4A.
W74-06685

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE PROPOSED ALVIN W. VOGTLE NUCLEAR PLANT UNITS 1, 2, 3, AND 4.
Directorate of Licensing (AEC), Washington, D. C.
For primary bibliographic entry see Field 5B.
W74-06821

THE ENVIRONMENTAL IMPULSE AND ITS COMPETITORS: ATTITUDES, INTERESTS, AND INSTITUTIONS AT LAKE TAHOE,
California Univ., Davis. Dept. of Political Science.
For primary bibliographic entry see Field 6E.
W74-06843

THREE-YEAR EVOLUTION,
C. G. Ash.
Water Spectrum, Vol 5, No 4, p 28-35, 1973. 4 photo, 2 fig, 1 chart.

Descriptors: *Environmental effects, *Environmental engineering, *Balance of nature, *Federal project policy, *Inter-Agency Comm. on Water Resources, *Water resources development, Feasibility studies, Project planning, Federal government, Administrative agencies, Project purposes, Water policy, Water conservation, Ecology, Land conservation, Inter-agency cooperation.
Identifiers: *National Environmental Policy Act, *Environmental impact statement.

The environmental impact statements required by the National Environmental Policy Act (NEPA) and the changes which have occurred during the past three years are described. The evolution reflects new approaches to resources and their use and new concepts in planning. In retrospect, there appear to be three distinct phases which the implementation of NEPA has gone through. The first phase, or period of interpretation, was characterized by much speculation but little action. In the second phase, the procedural phase, the emphasis was placed on adhering to the letter of the law. The third phase is termed the integrated planning phase. Under this third stage concept, adherence to NEPA for a particular project requires the examination of a least three separate Corps of Engineers documents. Statements prepared recently generally meet the full disclosure concepts of NEPA and relate the activities involved to environmental impacts at various stages of project completion. The use of matrix factors in determining environmental effects and the disadvantages of this method are described. The procedure in both the pre- and post-authorization stages is outlined. (Sutton-Florida)
W74-06970

CONSERVATIONISTS GO TO COURT--PART 1,
For primary bibliographic entry see Field 4D.
W74-06971

POWERS OF THE WATER POLLUTION CONTROL BOARD: POWERS OF DIRECTOR OF ENVIRONMENTAL PROTECTION.
For primary bibliographic entry see Field 6E.
W74-06975

CHOCTAWHATCHEE RIVER AND HOLMES CREEK, FLORIDA, PERMIT APPLICATION BY FLORIDA GAME AND FRESH WATER FISH COMMISSION (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Mobile, Ala.
For primary bibliographic entry see Field 4A.
W74-06985

WOODCOCK CREEK LAKE, FRENCH CREEK BASIN, PENNSYLVANIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Pittsburgh, Pa.
For primary bibliographic entry see Field 8A.
W74-06986

PATTERSON WATERSHED PROJECT STANISLAUS COUNTY, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Berkeley, Calif
For primary bibliographic entry see Field 4A
W74-06987

HURRICANE CREEK WATERSHED PROJECT HUMPHREYS AND DICKSON COUNTIES, TENNESSEE (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 4D
W74-06988

LOWER KLAMATH RIVER FLOOD CONTROL PROJECT, DEL NORTE COUNTY, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATMENT).
Army Engineer District, San Francisco, Calif
For primary bibliographic entry see Field 4A.
W74-06989

NUTWOOD WATERSHED, ILLINOIS (FINAL ENVIRONMENTAL STATEMENT).
Soil Conservation Service, Washington, D. C.
For primary bibliographic entry see Field 4A.
W74-06990

PROPOSAL FOR OKLAWAHA RIVER, OCALA NATIONAL FOREST, FLORIDA, (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Forest Service (USDA), Washington, D.C.
For primary bibliographic entry see Field 4A.
W74-06993

RATIFICATION OF PROPOSED CONVENTION ON THE PREVENTION OF MARINE POLLUTION BY DUMPING OF WASTES AND OTHER MATTER (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Department of State, Washington, D.C.
For primary bibliographic entry see Field 6E.
W74-06994

COOPERATIVE GULF OF MEXICO ESTUARINE INVENTORY AND STUDY FLORIDA: PHASE 1 AREA DESCRIPTION,
National Marine Fisheries Service, St. Petersburg Beach, Fla. Gulf Coast Fisheries Center.
For primary bibliographic entry see Field 2L.
W74-06995

URBANIZATION AND HUMAN HEALTH,
For primary bibliographic entry see Field 5G.
W74-07017

ENERGY FLOWS IN THE BIOSPHERE: THE IMPACT OF MAN,
Australian National Univ., Canberra. Research School of Biological Sciences.
For primary bibliographic entry see Field 2B.
W74-07043

7. RESOURCES DATA

7A. Network Design

QUANTITATIVE METHODS FOR PRELIMINARY DESIGN OF WATER QUALITY SURVEILLANCE SYSTEMS,
Raytheon Co., Portsmouth, R. I. Oceanographic and Environmental Services.
For primary bibliographic entry see Field 5A.
W74-06885

7B. Data Acquition

A SIMPLE AUTOMATIC SOIL PERCOLATOR,
Hawaii Univ., Honolulu.
K. P. Goswami, and K. P. Green.
Soil Biol Biochem. Vol 3, No 4, p 389-391. 1971, Illus.
Identifiers: *Automatic equipment, *Soil percolator, Apparatus.

The apparatus differs from those previously described in the manner in which small volumes of solution are introduced into the lift tube which delivers solution to the tops of a soil column. An inverted glass 'y-joint' submerged in the reservoir solution allows alternate increments of air and solution to proceed up the lift tube without adjustment of tubing and liquid levels.--Copyright 1973, Biological Abstracts, Inc.
W74-06531

A LARGE UNDISTURBED, WEIGHING LYSIMETER FOR GRASSLAND STUDIES,
Wyoming Univ., Laramie. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W74-06581

CARTOGRAPHIC QUALITY OF ERTS-1 IMAGES,
Georgia Univ., Athens.
For primary bibliographic entry see Field 7C.
W74-06620

PROGRESS IN CARTOGRAPHY, EROS PROGRAM,
Geological Survey, McLean, Va.
For primary bibliographic entry see Field 7C.
W74-06621

ATMOSPHERIC EFFECTS IN ERTS-1 DATA, AND ADVANCED INFORMATION EXTRACTION TECHNIQUES,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 7C.
W74-06646

DETERMINATION OF AEROSOL CONTENT IN THE ATMOSPHERE,
Science Applications, Inc., La Jolla, Calif.
For primary bibliographic entry see Field 7C.
W74-06647

A TECHNIQUE FOR CORRECTING ERTS DATA FOR SOLAR AND ATMOSPHERIC EFFECTS,
Bendix Aerospace Systems Div. Ann Arbo, Mich.
For primary bibliographic entry see Field 7C.
W74-06648

EXPERIMENTAL MASKING OF RBV IMAGES TO REDUCE STATIONARY RESIDUAL INACCURACIES IN RADIOMETRIC CORRECTION,
International Imaging Systems, Mountain View, Calif.
For primary bibliographic entry see Field 7C.
W74-06649

DIGITAL RECTIFICATION OF ERTS MULTISPECTRAL IMAGERY,
TRW Systems Group, Redondo Beach, Calif.
For primary bibliographic entry see Field 7C.
W74-06650

RESULTS OF PRECISION PROCESSING (SCENE CORRECTION) OF ERTS-1 IMAGES USING DIGITAL IMAGE PROCESSING TECHNIQUES,
IBM Federal Systems Div., Gaithersburg, Md.
For primary bibliographic entry see Field 7C.
W74-06651

SIGNIFICANT TECHNIQUES IN THE PROCESSING AND INTERPRETATION OF ERTS-1 DATA,
Lockheed Electronics Co., Inc., Houston, Tex. Houston Aerospace Systems Div.
For primary bibliographic entry see Field 7C.
W74-06652

COMPUTER TECHNIQUES USED FOR SOME ENHANCEMENTS OF ERTS IMAGES,
Jet Propulsion Lab., Pasadena, Calif.
For primary bibliographic entry see Field 7C.
W74-06653

DIGITAL ENHANCEMENT OF MULTISPECTRAL MSS DATA FOR MAXIMUM IMAGE VISIBILITY,
California Univ., Davis. Dept. of Electrical Engineering.
For primary bibliographic entry see Field 7C.
W74-06654

ERTS-1 IMAGE ENHANCEMENT BY OPTICALLY COMBINING DENSITY SLICES,
California Univ., Riverside. Dept. of Geography.
For primary bibliographic entry see Field 7C.
W74-06655

PSEUDOCOLOR TRANSFORMATION OF ERTS IMAGERY,
RAND Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 7C.
W74-06656

DIGITAL INTERACTIVE IMAGE ANALYSIS BY ARRAY PROCESSING,
Tetra Tech, Inc., Houston, Tex.
For primary bibliographic entry see Field 7C.
W74-06657

COMBINING HUMAN AND COMPUTER INTERPRETATION CAPABILITIES TO ANALYZE ERTS IMAGERY,
California Univ., Berkeley. Forestry Remote Sensing Lab.
For primary bibliographic entry see Field 7C.
W74-06658

ANALYSIS OF ERTS IMAGERY USING SPECIAL ELECTRONIC VIEWING/MEASURING EQUIPMENT,
Stanford Research Inst., Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W74-06659

COMBINED SPECTRAL AND SPATIAL PROCESSING OF ERTS IMAGERY DATA,
Kansas Univ., Lawrence. Space Technology Center.
For primary bibliographic entry see Field 7C.
W74-06660

TERRAIN TYPE RECOGNITION USING ERTS-1 MSS IMAGES,
Itek Corp., Lexington, Mass. Optical Systems Div.
For primary bibliographic entry see Field 7C.
W74-06661

CLASSIFICATION OF ERTS-1 MSS DATA BY CANONICAL ANALYSIS,
Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.
For primary bibliographic entry see Field 7C.
W74-06662

DCP-COLLECTED ABSOLUTE TARGET REFLECTANCE SIGNATURES ASSIST ACCURATE INTERPRETATION OF ERTS-1 IMAGERY,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 7C.
W74-06688

UNIQUE CHARACTERISTICS OF ERTS,
Geological Survey, Washington, D.C.
A. P. Colvocoresses.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1523-1525, 1973.

Descriptors: *Remote sensing, Satellites(Artificial), *Data collections, Radiation, Wavelengths, Mapping, Surveys, Monitoring, Geologic mapping.
Identifiers: *ERTS.

ERTS-1 has unique characteristics or advantages in the electronic transmission (TV) earth-sensing system for the mapmaker. ERTS-1 may survive for 2 or more years and thus provide repetitive as well as complete coverage, making the most of only one launch, spacecraft, and instrument package. ERTS is proving that imagery can be electronically transmitted without serious distortion. The field of view of the ERTS MSS extends only 5.76 deg from the nominal vertical. The ERTS signals, particularly those of the MSS, are in effect those of a focusing radiometer, recording radiated energy with a range and precision well beyond the capability of any current film system. MSS band 7, at 0.8 to 1.1 microns, has opened a window for remote sensing for which operational film systems do not have a capability. Geologists and others are selecting MSS 7 as the best single band for depicting the earth's physiographic structure. (See also W74-06619) (Knapp-USGS)
W74-06689

ERTS-1 APPLIED FOR STRUCTURAL AND MORPHOLOGICAL INVESTIGATIONS CASE STUDIES: (1) LOS ANGELES, CALIFORNIA AND (2) COASTAL PLAIN, NEW JERSEY,
William Paterson Coll. of New Jersey, Wayne. Dept. of Geography.
For primary bibliographic entry see Field 7C.
W74-06690

THE USE OF PHOTOGRAPHIC METHODS IN CONTRAST ENHANCEMENT OF ERTS-1 IMAGES,
Geological Survey, Flagstaff, Ariz.
For primary bibliographic entry see Field 7C.
W74-06704

RELATIONSHIPS BETWEEN REMOTELY SENSED FISHERIES DISTRIBUTION INFORMATION AND SELECTED OCEANOGRAPHIC PARAMETERS IN THE MISSISSIPPI SOUND,
National Marine Fisheries Service, Pascagoula, Miss. Southeast Fisheries Center.
A. J. Kemmerer, and J. A. Benigno.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1685-1695, 1973. 2 fig, 5 tab, 6 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Fisheries, Oceanography,

Chlorophyll, Turbidity, Algae, Gulf of Mexico, Data collections, Data processing.
Identifiers: *ERTS, *Mississippi Sound.

A feasibility study to demonstrate the potential of ERTS for providing fisheries significant information was conducted in the Mississippi Sound and adjacent offshore waters. Attempts were made to relate satellite-acquired imagery to selected oceanographic parameters and then to relate these parameters to aircraft remotely sensed distribution patterns of resident surface schooling fishes. Initial results suggest that this approach is valid and that the satellite-acquired imagery may have important fisheries resource assessment implications. (See also W74-06619) (Knapp-USGS)
W74-06708

ADVANCED SCANNERS AND IMAGING SYSTEMS FOR EARTH OBSERVATIONS.
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
Available from Sup Doc, GPO, Washington, D C 20402, Price $3.90. Report SP-335, 1973. 604 p.

Descriptors: *Remote sensing, *Satellites(Artificial), Infrared radiation, Photography, Data transmission, Meteorology, Water resources, Data processing, Crops, Ice, Sea ice, Mapping, Geomorphology, Geology, Monitoring.

The Advanced Imagers and Scanners Working Group met at Cocoa Beach, Florida from December 11 to 15, 1972. The meeting addressed sensors, sensors systems and user applications for remote monitoring of the earth from orbiting satellites. The Working Group limited itself to consideration of electromechanical scanners and electronic imaging systems for the spectral region including the visible through the thermal infrared. The use of photographic cameras and film was addressed only briefly, and microwave imaging was excluded. In addressing remote sensing technology and its applications, the Working Group was asked to consider the present and then project into a period both 4 and 8 years hence, the growth of technical capability and the expansion of requirements in terms of performance specifications. Both broad assessments of present and future sensors and sensor related technology, as well as a description of user needs and applications are provided. (Knapp-USGS)
W74-06712

GAMMA RADIATION MEASUREMENTS OF BULK DENSITY CHANGES IN A SOIL PEDON FOLLOWING IRRIGATION,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 2G.
W74-06715

MESOSCALE STRAIN MEASUREMENTS ON THE BEAUFORT SEA PACK ICE,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2C.
W74-06717

COMPUTER MONITORING OF PRECIPITATION IN HUNGARY,
For primary bibliographic entry see Field 2B.
W74-06726

MEASUREMENT OF HYDRAULIC CONDUCTIVITY BY MEANS OF STEADY, SPHERICALLY SYMMETRIC FLOWS,
Agricultural Research Service, Madison, Wis. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 2G.
W74-06735

A UNIVERSAL ION-SELECTIVE ELECTRODE BASED ON GRAPHITE PASTE,
Connecticut Univ., Storrs. Dept. of Chemistry.
For primary bibliographic entry see Field 2K.
W74-06758

AERIAL RADIOLOGICAL MEASURING SURVEY OF THE FORT CALHOUN STATION, FORT CALHOUN, NEBRASKA, AUGUST 9-10, 1972.
EG and G, Inc., Las Vegas, Nev.
For primary bibliographic entry see Field 5A.
W74-06815

AERIAL RADIOLOGICAL MEASURING SURVEY OF THE AREA SURROUNDING THE PALISADES PLANT, SOUTH HAVEN, MICHIGAN, JULY 29, 1970.
EG and G, Inc., Las Vegas Nev.
For primary bibliographic entry see Field 5A.
W74-06816

AERIAL RADIOLOGICAL MEASURING SURVEY OF THE AREA SURROUNDING THE ENRICO FERMI ATOMIC POWER PLANT, MONROE, MICHIGAN, SEPTEMBER 1970.
EG and G, Inc., Las Vegas, Nev.
For primary bibliographic entry see Field 5A.
W74-06817

GROUNDWATER TRACING WITH POST SAMPLING ACTIVATION ANALYSIS,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 2F.
W74-06889

A COMPARISON OF HYDRAULIC CONDUCTIVITIES CALCULATED WITH MORPHOMETRIC AND PHYSICAL METHODS,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W74-06899

AN ISOKINETIC SAMPLER FOR WIND EROSIBLE SILT AND CLAY PARTICLE MEASUREMENT,
Illinois Univ., Urbana. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2J.
W74-06902

ANALYSIS OF THE FEASIBILITY OF AN EXPERIMENT TO MEASURE CARBON MONOXIDE IN THE ATMOSPHERE,
General Electric Co., Philadelphia, Pa.
For primary bibliographic entry see Field 5A.
W74-06917

THE CBI POGO STICK CORER,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
J. R. Schubel, and E. W. Schiemer.
Special Report 34 (Reference 73-13), November 1973. 8 p, 4 fig, 1 ref.

Descriptors: *Core drilling, *Bottom sediments, Cores, Sampling, Mud, Sedimentology, Equipment.

The Chesapeake Bay Institute Pogo Stick Corer is a novel and useful device for collecting short, relatively undisturbed cores of fine-grained sediments in waters up to about 3 meters deep. The corer is patterned after a child's pogo stick. The operator thrusts the corer into the bottom by hand, then mounts the device and jumps it into the sediment. (Knapp-USGS)
W74-06923

RADAR STUDIES OF URBAN PRECIPITATION ANOMALY,
Chicago Univ., Ill. Dept. of the Geophysical Sciences
For primary bibliographic entry see Field 2B.
W74-06938

ORIGIN OF CIRCULAR BEDS OF THALASSIA (SPERMATOPHYTA:HYDROCHARITACEAE) IN SOUTH BISCAYNE BAY, FLORIDA, AND THEIR RELATIONSHIP TO MANGROVE HAMMOCKS,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences
For primary bibliographic entry see Field 5A.
W74-07022

7C. Evaluation, Processing and Publication

CLIMATIC DATA OF THE HIGH ALTITUDE METEOROLOGICAL STATIONS OF THE GENEVA REGION FOR 1970, (IN FRENCH),
Conservatoire Botanique, Geneva (Switzerland).
P. Hainard, J. Miege, O. Monthoux, and G. Tcheremissinoff.
Condollea. Vol 27, No 2, p 211-217. 1972. Illus. (English summary).
Identifiers: *Climatic data, High altitude, Meteorological stations, *Switzerland(Geneva).

Data for 1970 from 5 meteorological outposts are presented.--Copyright 1973, Biological Abstracts, Inc.
W74-06532

A COMPUTERIZED SOLUTION FOR BENCH LEVELING DESIGN,
Archer Daniels Midland Co., Lincoln, Neb.
For primary bibliographic entry see Field 4A.
W74-06600

SYMPOSIUM ON SIGNIFICANT RESULTS OBTAINED FROM THE EARTH RESOURCES TECHNOLOGY SATELLITE-1, VOLUME I: TECHNICAL PRESENTATIONS, SECTION B.
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
GPO, Washington, DC 20402, Price $13.65 domestic postpaid or $12.50 GPO Bookstore per set (Sect A and B). Symposium held at Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, Section B, 851 p, 1973.

Descriptors: *Remote sensing, *Satellites(Artificial), *Mapping, *Surveys, *Monitoring, Land use, Geologic mapping, Terrain analysis, Water resources, Snow, Ice, Lakes, Glaciers, Management, Planning, Water resources development, Wildlife.
Identifiers: *ERTS.

The first Earth Resources Technology Satellite (ERTS-1) was launched on July 23, 1972. In the 7 months since it was activated, over 34,000 scenes of the earth have been obtained covering all major land masses and about 75% of the world's land area. Some areas, such as the United States, have been imaged at least 12 times. The purpose of this program is to provide an assessment of remote sensing from a satellite as a technique for inventorying and monitoring the earth's resources to provide better management of these resources. The quality of the products produced by the ERTS-1 system during its initial period of operations is, from a resolution and radiometric accuracy viewpoint, quite consistent with prelaunch estimates. In the geometric sense, these data products are somewhat better (and in a few cases considerably better) than prelaunch estimates. (See W74-01663 and W74-06620 thru W74-06711) (Knapp-USGS)
W74-06619

CARTOGRAPHIC QUALITY OF ERTS-1 IMAGES,
Georgia Univ., Athens.
R. Welch.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 879-886, 1973. 2 fig, 2 tab, 6 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Mapping, Surveys, Geologic mapping, Terrain analysis, Topographic mapping, Data collections, Data processing.
Identifiers: *ERTS.

Analyses of simulated and operational ERTS images provide initial estimates of resolution, ground resolution, detectability thresholds and other measures of image quality of interest to earth scientists and cartographers. Ground resolution is about 250 meters for both RBV and MSS systems. The ERTS-1 images appear suited to the production and revision of planimetric and photo maps of 1:500,000 scale and smaller for which map accuracy standards are compatible with the imaged detail. Thematic mapping, although less constrained by map accuracy standards, will be influenced by measurement thresholds and errors which have yet to be accurately determined for ERTS images. (See also W74-06619) (Knapp-USGS)
W74-06620

PROGRESS IN CARTOGRAPHY, EROS PROGRAM,
Geological Survey, McLean, Va.
A. P. Colvocoresses, and R. B. McEwen.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 887-898, 1973. 2 fig, 3 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Mapping, Surveys, Geologic mapping, Terrain analysis, Topographic mapping, Data collections, Data processing.
Identifiers: *ERTS.

Several cartographic applications of ERTS imagery are described. Revising line maps is one in which the image is not retained, but the other applications defined to date retain the image or a derivative of the image. Monochromatic orthophotos are normally derived from one spectral band and portrayed in gray tones. Colors may be assigned as a function of density, but the basic input is a single gray-tone image. Polychromatic orthophotos are the color image application; with ERTS, they normally give a false-color rendition that includes the near-infrared. Autographic theme extraction is a derivative application that isolates one or more basic themes, such as water, snow and ice, or infrared-reflective vegetation. (See also W74-06619) (Knapp-USGS)
W74-06621

CHANGE IN LAND USE IN THE PHOENIX (1:250,000) QUADRANGLE, ARIZONA BETWEEN 1970 AND 1972: SUCCESSFUL USE OF A PROPOSED LAND USE CLASSIFICATION SYSTEM,
Geological Survey, Washington, D.C. Geographic Applications Program.
For primary bibliographic entry see Field 4A.
W74-06622

LAND USE INVESTIGATIONS IN THE CENTRAL VALLEY AND CENTRAL COASTAL TEST SITES, CALIFORNIA,
California Univ., Santa Barbara. Geography Remote Sensing Unit.
For primary bibliographic entry see Field 4A.
W74-06623

LAND USE IN NORTHERN COACHELLA VALLEY,
California Univ., Riverside. Dept. of Geography.
For primary bibliographic entry see Field 4A.
W74-06624

LAND USE CLASSIFICATION AND CHANGE ANALYSIS USING ERTS-1 IMAGERY IN CARETS,
Geological Survey, Washington, D.C. Geographic Applications Program.
For primary bibliographic entry see Field 4A.
W74-06625

ERTS REGIONAL-SCALE OVERVIEW LINKING LAND USE AND ENVIRONMENTAL PROCESSES IN CARETS,
Geological Survey, Washington, D.C. Geographic Applications Program.
For primary bibliographic entry see Field 4A.
W74-06626

EVALUATION OF LAND USE MAPPING FROM ERTS IN THE SHORE ZONE OF CARETS,
Viginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 4A.
W74-06627

GEOGRAPHIC APPLICATIONS OF ERTS-1 DATA TO LANDSCAPE CHANGE,
Tennessee Univ., Knoxville. Dept. of Geography.
For primary bibliographic entry see Field 4A.
W74-06628

IDENTIFICATION OF SOIL ASSOCIATIONS IN WESTERN SOUTH DAKOTA ON ERTS-1 IMAGERY,
South Dakota State Univ., Brookings. Dept. of Plant Science; and South Dakota State Univ., Brookings. Remote Sensing Inst.
For primary bibliographic entry see Field 2G.
W74-06629

LAND USE OF NORTHERN MEGALOPOLIS,
Dartmouth Coll., Hanover, N. H.
For primary bibliographic entry see Field 4A.
W74-06630

REMOTE SENSING APPLIED TO LAND-USE STUDIES IN WYOMING,
Wyoming Univ., Laramie. Dept. of Geology.
For primary bibliographic entry see Field 4A.
W74-06631

ERTS-1 APPLICATIONS TO MINNESOTA LAND USE MAPPING,
Minnesota Univ., Minneapolis. Dept. of Geography.
For primary bibliographic entry see Field 4A.
W74-06632

A MULTIDISCIPLINARY SURVEY FOR THE MANAGEMENT OF ALASKAN RESOURCES UTILIZING ERTS IMAGERY,
Alaska Univ., College.
For primary bibliographic entry see Field 4A.
W74-06633

THE USE OF ERTS-1 DATA FOR THE INVENTORY OF CRITICAL LAND RESOURCES FOR REGIONAL LAND USE PLANNING,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 4A.
W74-06634

INVESTIGATIONS OF AN URBAN AREA AND ITS LOCALE USING ERTS-1 DATA SUPPORTED BY U-PHOTOGRAPHY,
Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.
For primary bibliographic entry see Field 4A.
W74-06635

FIRST LOOK ANALYSES OF FIVE CYCLES OF ERTS-1 IMAGERY OVER COUNTY OF LOS ANGELES: ASSESSMENT OF DATA UTILITY FOR URBAN DEVELOPMENT AND REGIONAL PLANNING,
General Electric Co., Philadelphia, Pa. Missile and Space Div.
For primary bibliographic entry see Field 4A.
W74-06636

PREPARATION OF URBAN LAND USE INVENTORIES BY MACHINE-PROCESSING OF ERTS MSS DATA,
Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
For primary bibliographic entry see Field 4A.
W74-06637

A COMPARISON OF LAND-USE DETERMINATIONS USING DATA FROM ERTS-1 AND HIGH ALTITUDE AIRCRAFT,
National Aeronautics and Space Administration, Houston, Tex. Lyndon B. Johnson Space Center.
For primary bibliographic entry see Field 4A.
W74-06638

DIGITAL LAND USE MAPPING IN OAKLAND COUNTY, MICHIGAN,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 4A.
W74-06639

MAPPING OF AGRICULTURAL LAND USE FROM ERTS-1 DIGITAL DATA,
Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.
For primary bibliographic entry see Field 4A.
W74-06640

THE USE OF THE TEMPORAL DIMENSION IN CLASSIFYING AND MAPPING ERTS-1 MSS DATA,
Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.
For primary bibliographic entry see Field 4A.
W74-06641

IDENTIFICATION AND MAPPING OF COAL REFUSE BANKS AND OTHER TARGETS IN THE ANTHRACITE REGION,
Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.
For primary bibliographic entry see Field 4A.
W74-06642

AUTOMATIC INTERPRETATION OF ERTS DATA FOR FOREST MANAGEMENT,
Honeywell, Inc., St. Paul, Minn. Systems and Research Center.
For primary bibliographic entry see Field 4A.
W74-06643

LAND RESOURCES SURVEY FOR THE STATE OF MICHIGAN,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 4A.
W74-06644

TERRAIN CLASSIFICATION MAPS OF YELLOWSTONE NATIONAL PARK,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 4A.
W74-06645

ATMOSPHERIC EFFECTS IN ERTS-1 DATA, AND ADVANCED INFORMATION EXTRACTION TECHNIQUES,
Environmental Research Inst. of Michigan, Ann Arbor.
W. A. Malila, and R. F. Nalepka.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1097-1104, 1973. 12 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, Data collections, Terrain analysis, Surveys, Mapping, Photogrammetry.
Identifiers: *ERTS.

Atmospheric effects in satellite multispectral scanner data can influence results obtained with either manual image interpretation or computer information extraction techniques. The atmosphere attenuates radiation arriving from the surface and adds an extraneous path radiance component. Empirical analyses of ERTS MSS data and simultaneous airborne MSS underflight data for one frame are compared. Theoretical calculations of atmospheric effects are discussed. The effect of limited spatial resolution on the accuracy of information extracted from ERTS data is important. Problems occur when individual resolution elements contain two or more materials. Results from an initial application of techniques for estimating proportions of materials within individual elements are presented and discussed. Very accurate determination of surface areas of small lakes is possible. (See also W74-06619) (Knapp-USGS)
W74-06646

DETERMINATION OF AEROSOL CONTENT IN THE ATMOSPHERE,
Science Applications, Inc., La Jolla, Calif.
M. Griggs.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1105-1113, 1973. 3 fig, 1 tab, 8 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Aerosols, *Data processing, *Climatology, Air pollution, Surveys, Pollutant identification.
Identifiers: *ERTS.

The feasibility of determining the aerosol content in the atmosphere from contrast measurements of ground features and from radiance measurements was studied using ERTS data. Theoretical relationships between aerosol content and contrast reduction and radiance were derived for ideal model atmospheres. Preliminary data analysis of the MSS transparencies is promising for determining the contrast-aerosol content relationship in the Salton Sea region. (See also W74-06619) (Knapp-USGS)
W74-06647

A TECHNIQUE FOR CORRECTING ERTS DATA FOR SOLAR AND ATMOSPHERIC EFFECTS,
Bendix Aerospace Systems Div. Ann Arbo, Mich.
R. H. Rogers, and K. Peacock.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1115-1122, 1973. 3 fig, 2 tab

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, *Solar radiation, *Albedo, Atmosphere, Surveys, Data collections.
Identifiers: *ERTS.

ERTS can be used to obtain absolute target reflectances by correcting spacecraft radiance measurements for variable target irradiance, atmospheric attenuation, and atmospheric backscatter. A simple measuring instrument and the necessary atmospheric measurements are described, and example demonstrate the nature and magnitude of the atmospheric corrections. (See also W74-06619) (Knapp-USGS)
W74-06648

EXPERIMENTAL MASKING OF RBV IMAGES TO REDUCE STATIONARY RESIDUAL INACCURACIES IN RADIOMETRIC CORRECTION,
International Imaging Systems, Mountain View, Calif.
D. S. Ross.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1123-1128, 1973. 2 fig, 1 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, *Calibrations, Photogrammetry, Mapping, Surveys, Data collections.
Identifiers: *ERTS.

ERTS-1 vidicon image scenes show stationary, repetitive residual inaccuracies in shading correction, large enough to affect qualitative and quantitative image analyses. Photographic masks designed to reduce residual shading were prepared from vidicon images of a relatively cloud-free ocean scene of uniform reflectance. When applied to other scenes, the masks enable more closely corrected RBV images to be printed. Illustrations are given of vidicon images before and after correction, compared with an equivalent MSS spectral image of the same scene. (See also W74-06619) (Knapp-USGS)
W74-06649

DIGITAL RECTIFICATION OF ERTS MULTISPECTRAL IMAGERY,
TRW Systems Group, Redondo Beach, Calif.
S. S. Rifman.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technology Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1131-1142, 1973. 8 fig, 2 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, *Calibrations, Surveys, Mapping, Photogrammetry, Terrain analysis, Digital computers, Data collections.
Identifiers: *ERTS, Image enhancement.

Rectified ERTS multispectral imagery is produced, utilizing all digital techniques, as the first step toward producing precision corrected imagery. The resultant image is mapped utilizing an intensity resampling technique. Negligible degradation of the photometric and resolution properties of the source data is caused by the geometric correction process. (See also W74-06619) (Knapp-USGS)
W74-06650

RESULTS OF PRECISION PROCESSING (SCENE CORRECTION) OF ERTS-1 IMAGES USING DIGITAL IMAGE PROCESSING TECHNIQUES,
IBM Federal Systems Div., Gaithersburg, Md
R. Bernstein
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1143-1150, 1973. 1 fig, 4 tab, 4 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, *Calibrations, Surveys, Mapping, Photogrammetry, Terrain analysis, Digital computers, Data collections.
Identifiers: *ERTS, Image enhancement.

ERTS-1 MSS and RBV data recorded on computer compatible tapes were analyzed and processed. No degradation of intensity (radiance) information occurred in implementing the geometric correction. The quality and resolution of the digitally processed images are very good, due primarily to the fact that the number of film generations and conversions is kept to a minimum. Processing times of digitally processed images are about equivalent to those of the electro-optical processor. (See also W74-06619) (Knapp-USGS)
W74-06651

SIGNIFICANT TECHNIQUES IN THE PROCESSING AND INTERPRETATION OF ERTS-1 DATA,
Lockheed Electronics Co., Inc., Houston, Tex. Houston Aerospace Systems Div.
S. B. Cousin, A. C. Anderson, J. F. Paris, and J. F. Potter.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1151-1158, 1973. 10 fig, 6 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, *Calibrations, Surveys, Mapping, Photogrammetry, Terrain analysis, Digital computers, Data collections.
Identifiers: *ERTS, Image enhancement.

Investigations using ERTS-1 data provide an appropriate framework for the systematic evaluation of a prototype multispectral data processing and analysis system. The system is the integration of (1) a preprocessing subsystem, (2) a spectral clustering a subsystem, (3) a correlation and classification subsystem, (4) mensuration subsystem, and (5) an information management subsystem. Aircraft, ERTS and EREP data are utilized to refine the subsystem elements for systems or system combinations that are optimally suited for a specific earth resources application. (See also W74-06619) (Knapp-USGS)
W74-06652

COMPUTER TECHNIQUES USED FOR SOME ENHANCEMENTS OF ERTS IMAGES,
Jet Propulsion Lab., Pasadena, Calif.
F. C. Billingsley, and A. F. H. Goetz.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1159-1167, 1973. 7 fig, 1 tab, 2 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, *Calibrations, Surveys, Mapping, Photogrammetry, Terrain analysis, Digital computers, Data collections.
Identifiers: *ERTS, Image enhancement.

The JPL VICAR Image Processing System was used for enhancement of images received from the ERTS for the Arizona geology mapping experiment. This system contains flexible capabilities for reading and repairing MSS digital tape images, for geometric corrections and interpicture registration, for various enhancements and analyses of the data, and for display of the images in black and white and color. (See also W74-06619) (Knapp-USGS)
W74-06653

DIGITAL ENHANCEMENT OF MULTISPECTRAL MSS DATA FOR MAXIMUM IMAGE VISIBILITY,
California Univ., Davis. Dept. of Electrical Engineering.
V. R. Algazi.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1169-1177, 1973. 8 fig, 11 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, *Calibrations, Surveys, Mapping, Photogrammetry, Terrain analysis, Digital computers, Data collections.
Identifiers: *ERTS, Image enhancement.

A systematic approach to the enhancement of ERTS images exploits two principal features involved in the observation of images: the properties of human vision and the statistics of the images being observed. The rationale of the enhancement procedure is: in the observation of some features of interest in an image, the range of objective luminance-chrominance values is generally limited and does not use the whole perceptual range of vision of the observer. The purpose of the enhancement technique is to expand and distort in a systematic way the grey scale values of each of the multispectral bands making up a color composite, to enhance the average visibility of the features being observed. (See also W74-06619) (Knapp-USGS)
W74-06654

ERTS-1 IMAGE ENHANCEMENT BY OPTICALLY COMBINING DENSITY SLICES,
California Univ., Riverside. Dept. of Geography.
G. O. Tapper, and R. W. Pease.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1179-1185, 1973. 4 fig, 5 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, *Calibrations, Surveys, Mapping, Photogrammetry, Terrain analysis, Data collections.
Identifiers: *ERTS, Image enhancement.

The technique of density slicing using a photographic film and its application to enhancement of ERTS-1 imagery is useful for mapping. Initial experiments conducted with this film were encouraging and indicated that this technique of density slicing using readily accessible darkroom facilities and simple darkroom procedures allows rapid, accurate, and facile interpretation of the imagery. The distribution of the Tree Yucca in the Eastern Mojave Desert of southern California and southern Nevada was used to test the accuracy of the technique for mapping purposes. The distribution was mapped at a relatively high level of accuracy. (See also W74-06619) (Knapp-USGS)
W74-06655

PSEUDOCOLOR TRANSFORMATION OF ERTS IMAGERY,
RAND Corp., Santa Monica, Calif.
J. Lamar, and P. M. Merifield.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1187-1198, 1973. 7 fig, 11 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, *Geologic mapping, Photogrammetry, Terrain analysis, *California, Faults(Geologic).
Identifiers: *ERTS, False color transformations.

Human vision was studied to increase the effectiveness of detection and recognition of ground features in ERTS imagery. In the course of this work, a number of image enhancement techniques were developed. One of the photographic techniques which shows great promise as an aid in interpreting ERTS imagery is pseudocolor transformation. It is a process where each shade of gray in an original black-and-white image is seen as a different color in the transformation. The ERTS-1 MSS image of the Monterey Bay-San Francisco area was transformed using a technique which requires only two intermediate separations. Possible faults were delineated on an overlay before comparing imagery to geologic maps. All large active or recently active faults shown on the latest geologic map of California were interpreted from the image for all, or much, of their length. Perhaps the most interesting result was the Reliz fault. The fault is mapped as covered; however, a lineation corresponding to the position of the fault is visible on the image. Although the faults are also visible in the unenhanced image, they are clearly accentuated and more easily mapped on the pseudocolor transformation. (See also W74-06619) (Knapp-USGS)
W74-06656

DIGITAL INTERACTIVE IMAGE ANALYSIS BY ARRAY PROCESSING,
Tetra Tech, Inc., Houston, Tex.
B. E. Sabels, and J. D. Jennings.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1199-1203, 1973. Append.

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, *Calibrations, Surveys, Mapping, Photogrammetry, Terrain analysis, Digital computers, Data collections.
Identifiers: *ERTS, Image enhancement.

A survey of ERTS-1 investigations discloses several categories of efforts which can be compared with seismic data processing categories. Optical and digital filtering and enhancement techniques attempt to eliminate noise or improve contrast in the resulting display. With improved processing algorithms, these lead to classification techniques, and to hybrid selection and suppression methods. Spectral and spatial detection efforts are aimed at low signal-to-noise contrasts, for the detection of subtle shades of grey or the respective color, which represent differences in soils, chlorophyll, stress, infestation, or other manifestations of resources conditions. Seismic and ERTS data can be interchanged in government and industrial processing facilities. The array processor is an instrument to free the investigator from data processing chores, so that he can use his time more efficiently for the interpretation and utilization of the data. The service, patterned after the commercial seismic data processing industry, will therefore increase the potential for the application and utilization of ERTS data. (See also W74-06619) (Knapp-USGS)
W74-06657

COMBINING HUMAN AND COMPUTER INTERPRETATION CAPABILITIES TO ANALYZE ERTS IMAGERY,
California Univ., Berkeley. Forestry Remote Sensing Lab.
J. D. Nichols.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1205-1210, 1973. 2 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, *Calibrations, Surveys, Mapping, Photogrammetry, Terrain analysis, Digital computers, Data collections.
Identifiers: *ERTS, Image enhancement.

The human photo interpreter and the computer have complementary capabilities that are exploited in a computer-based data analysis system designed to optimize the process of extracting resource information from ERTS images. The human has the ability to quickly delineate gross differences in land classes, and to further break these gross classes into meaningful subclasses. The computer can more efficiently analyze point-by-point spectral information and localized textural information, which can result in much more detailed agricultural or wildland classification based on species composition and plant association. These human and computer capabilities are integrated through the use of an inexpensive computer dedicated to the interactive preprocessing of the human inputs and the display of raw ERTS images and computer classified images. The small computer is linked to a large-scale computer system, where the statistical work and the automatic point-by-point classification is done. (See also W74-06619) (Knapp-USGS)
W74-06658

ANALYSIS OF ERTS IMAGERY USING SPECIAL ELECTRONIC VIEWING/MEASURING EQUIPMENT,
Stanford Research Inst., Menlo Park, Calif.
W. E. Evans, and S. M. Serebreny.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1211-1218, 1973. 5 fig, 1 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, *Calibrations, Surveys, Mapping, Photogrammetry, Terrain analysis, Digital computers, Data collections.
Identifiers: *ERTS, Image enhancement.

To process ERTS imagery, an Electronic Satellite Image Analysis Console (ESIAC) is being employed in studying dynamic hydrologic conditions. The ESIAC provides facilities for storing registered image sequences in a magnetic video disc memory for subsequent recall, enhancement, and animated display in monochrome or color. Quantitative measurements of distances, areas, and brightness profiles can be extracted digitally under operator supervision. Initial results are presented for the display and measurement of snowfield extent, glacier development, sediment plumes from estuary discharge, playa inventory, phreatophyte and other changes. (See also W74-06619) (Knapp-USGS)
W74-06659

COMBINED SPECTRAL AND SPATIAL PROCESSING OF ERTS IMAGERY DATA,
Kansas Univ., Lawrence. Space Technology Center.
R. M. Haralick, and K. S. Shanmugam.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentation, Sect B, Goddard

Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1219-1228, 1973. 3 fig, 1 tab, 7 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, *Calibrations, Surveys, Mapping, Photogrammetry, Terrain analysis, Digital computers, Data collections.
Identifiers: *ERTS, Image enhancement.

A procedure for extracting a set of textural features for ERTS MSS data is presented. The textural features were combined with a set of spectral features and were used to develop a classification algorithm for identifying the land use categories of blocks of digital MSS data. The classification algorithm was derived from a training set of 314 blocks and tested on a set of 310 blocks. The overall accuracy of the classifier was found to be 83.5% on seven land use categories. (See also W74-06619) (Knapp-USGS)
W74-06660

TERRAIN TYPE RECOGNITION USING ERTS-1 MSS IMAGES,
Itek Corp., Lexington, Mass. Optical Systems Div.
N. Gramenopoulos.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1229-1241, 1973. 4 fig, 1 tab.

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, *Calibrations, Surveys, Mapping, Photogrammetry, Terrain analysis, Digital computers, Data collections.
Identifiers: *ERTS, Image enhancement.

For the automatic recognition of earth resources from ERTS-1 digital tapes, both multispectral and spatial pattern recognition techniques are important. Recognition of terrain types is based on spatial signatures that become evident by processing small portions of an image through selected algorithms. Spatial signatures that are applicable to ERTS-1 MSS images were analyzed. Artifacts in the spatial signatures seem to be related to the multispectral scanner. A method for suppressing such artifacts is presented. The recognition of terrain types is accurate for desert (97%), farms (89%), and mountains (80%). The accuracy for urban areas is lower (74%), and poor for riverbeds (11%). Most of the errors in the urban category seem to occur in thinly populated areas associated with recent urban expansion into desert, farms, riverbeds, and hills. (See also W74-06619) (Knapp-USGS)
W74-06661

CLASSIFICATION OF ERTS-1 MSS DATA BY CANONICAL ANALYSIS,
Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.
H. M. Lachowski, and F. Y. Borden.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1243-1251, 1973. 4 fig, 3 tab, 2 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, *Calibrations, Surveys, Mapping, Photogrammetry, Terrain analysis, Digital computers, Data collections, Statistical methods.
Identifiers: *ERTS, Image enhancement, Canonical analysis.

The objective of canonical analysis is to obtain the maximum separability among a number of categories. The application of canonical analysis was investigated using MSS ERTS-1 data for one area viewed on two dates. The effect of threshold values on classification regions and confusion regions was investigated. The test area was chosen because it was familiar and had a variety of natural and cultural targets. The specific targets that were selected for study were river water, the railroad yard, two suburban targets, and two vegetation targets. The canonical analysis of the test data showed that essentially all of the separability (99.9%) among the six categories could be recovered in four canonical axes. The four axes accounted for 88.5, 11.1, 0.2, and 0.06%, respectively, of the separability. (See also W74-06619) (Knapp-USGS)
W74-06662

IN SITU SPECTRORADIOMETRIC QUANTIFICATION OF ERTS DATA,
Long Island Univ., Greenvale, N.Y. Science Engineering Research Group.
For primary bibliographic entry see Field 2G.
W74-06663

SEASONAL CHANGES OF LITTORAL TRANSPORT AND BEACH WIDTH AND RESULTING EFFECT ON PROTECTIVE STRUCTURES,
Maryland Geological Survey, Baltimore.
For primary bibliographic entry see Field 2L.
W74-06664

RECOGNITION OF BEACH AND NEARSHORE DEPOSITIONAL FEATURES OF CHESAPEAKE BAY,
Maryland Geological Survey, Baltimore.
For primary bibliographic entry see Field 2L.
W74-06665

APPLICABILITY OF ERTS-1 IMAGERY TO THE STUDY OF SUSPENDED SEDIMENT AND AQUATIC FRONTS,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 2L.
W74-06666

CORRELATION OF ERTS MULTISPECTRAL IMAGERY WITH SUSPENDED MATTER AND CHLOROPHYLL IN LOWER CHESAPEAKE BAY,
National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center.
For primary bibliographic entry see Field 2L.
W74-06667

PLUME DEVELOPMENT IN LONG ISLAND SOUND OBSERVED BY REMOTE SENSING (ERTS-1),
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 2L.
W74-06668

NEW INSIGHTS INTO THE INFLUENCE OF ICE ON THE COASTAL MARINE ENVIRONMENT OF THE BEAUFORT SEA, ALASKA,
Geological Survey, Menlo Park, Calif. Office of Marine Geology and Hydrology.
For primary bibliographic entry see Field 2C.
W74-06669

ERTS-1 OBSERVATIONS OF SEA SURFACE CIRCULATION AND SEDIMENT TRANSPORT, COOK INLET, ALASKA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 2L.
W74-06670

SEDIMENT DISTRIBUTION AND COASTAL PROCESSES IN COOK INLET, ALASKA,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2L.
W74-06671

DISTRIBUTION AND MOVEMENT OF SUSPENDED SEDIMENT IN THE GULF OF MEXICO OFF THE TEXAS COAST,
Geological Survey, Corpus Christi, Tex.
For primary bibliographic entry see Field 2L.
W74-06672

OCEANOGRAPHIC MAPPING OF STRUCTURE AND DYNAMICS OF THE NORTHERN GULF OF CALIFORNIA BY THE USE OF SPECTRAL MODELING AND ERTS-1,
Arizona Univ., Tucson
For primary bibliographic entry see Field 2L.
W74-06673

OCEANOGRAPHIC FEATURES IN THE LEE OF THE WINDWARD AND LEEWARD ISLANDS: ERTS AND SHIP DATA,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
For primary bibliographic entry see Field 2E.
W74-06674

REMOTE SENSING OF OCEAN CURRENTS USING ERTS IMAGERY,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
For primary bibliographic entry see Field 2L.
W74-06675

USE OF ERTS DATA FOR MAPPING ARCTIC SEA ICE,
Environmental Research and Technology, Inc., Lexington, Mass.
For primary bibliographic entry see Field 2C.
W74-06676

BIOMASS IN THE UPWELLING AREAS ALONG THE NORTHWEST COAST OF AFRICA AS VIEWED WITH ERTS-1,
Delaware Univ., Newark.
For primary bibliographic entry see Field 5A.
W74-06677

APPLICATION OF ERTS-1 IMAGERY TO THE HARVEST MODEL OF THE U.S. MENHADEN FISHERY,
Earth Satellite Corp., Washington, D.C.
For primary bibliographic entry see Field 2L.
W74-06678

COASTAL AND SUBMARINE FEATURES ON MSS IMAGERY OF SOUTHEASTERN MASSACHUSETTS: COMPARISON WITH CONVENTIONAL MAPS,
Geological Survey, Reston, Va. EROS Program Office.
For primary bibliographic entry see Field 2L.
W74-06679

WATER DEPTH ESTIMATION WITH ERTS-1 IMAGERY,
International Imaging Systems, Mountain View, Calif.
For primary bibliographic entry see Field 2L.
W74-06680

CALCULATIONS OF WATER DEPTH FROM ERTS-MSS DATA,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 2E.
W74-06681

MULTIDISCIPLINARY APPLICATION OF ERTS-1 DATA TO NORTH CAROLINA NATURAL RESOURCE MANAGEMENT,
North Carolina State Univ., Raleigh.
For primary bibliographic entry see Field 4C.
W74-06682

NATURAL RESOURCE INVENTORY AND MONITORING IN OREGON WITH ERTS IMAGERY,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 4A.
W74-06683

RESOURCE MANAGEMENT IMPLICATIONS OF ERTS-1 DATA TO OHIO,
Ohio Dept. of Economic and Community Development, Columbus.
For primary bibliographic entry see Field 4A.
W74-06684

ASSESSMENT OF SOUTHERN CALIFORNIA ENVIRONMENT FROM ERTS-1,
California Univ., Riverside. Dept. of Geography.
For primary bibliographic entry see Field 4A.
W74-06685

APPLICATIONS OF REMOTE SENSING (ERTS) TO RESOURCE MANAGEMENT AND DEVELOPMENT IN SAHELIEN AFRICA (REPUBLIC OF MALI),
American Univ., Washington, D.C. Dept. of Biology.
For primary bibliographic entry see Field 4A.
W74-06686

FIRST ERTS-1 RESULTS IN SOUTHEASTERN FRANCE: GEOLOGY, SEDIMENTOLOGY, POLLUTION AT SEA,
Institut Francais du Petrole, des Carburants et Lubrifiants, Rueil-Malmaison (France).
For primary bibliographic entry see Field 4A.
W74-06687

DCP-COLLECTED ABSOLUTE TARGET REFLECTANCE SIGNATURES ASSIST ACCURATE INTERPRETATION OF ERTS-1 IMAGERY,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
F. P. Weber.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1513-1522, 1973. 8 fig, 4 tab.

Descriptors: *Remote sensing, Satellites(Artificial), *Calibrations, *Radiation, *Albedo, Data collections, Data processing, *South Dakota, Forests, Telemetry, Grasslands, Mining.
Identifiers: *ERTS.

Data collection platforms are being used at a Black Hills, South Dakota, test site to record radiometric measurements needed to determine solar and atmospheric parameters that affect ERTS-1 multispectral scanner radiance measurements. A total of 72 channels of analog data are transmitted from an unattended ground truth site at least six times a day. The system has operated with only minor problems, sending forth daily measurements of biophysical responses and atmospheric conditions. Comparisons of scene radiance data calculated from ERTS images with those measured on the ground show the image-measured values to be 35% higher for the green channel and 20% higher for the red channel for the same scene targets. Radiance values for channels 6 and 7 are nearly the same from the ground data as from the imagery. (See also W74-06619) (Knapp-USGS)
W74-06688

UNIQUE CHARACTERISTICS OF ERTS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7B.
W74-06689

ERTS-1 APPLIED FOR STRUCTURAL AND MORPHOLOGICAL INVESTIGATIONS CASE STUDIES: (1) LOS ANGELES, CALIFORNIA AND (2) COASTAL PLAIN, NEW JERSEY,
William Paterson Coll. of New Jersey, Wayne. Dept. of Geography.
E. Y. Kedar.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1527-1538, 1973. 6 fig, 29 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Data collections, Radiation, Wavelengths, Mapping, Surveys, Monitoring, Geologic mapping, Coastal plains, New Jersey, California.
Identifiers: *ERTS, Los Angeles.

ERTS-1 image, which covers the area from South Los Angeles to the Mojave Desert and from Eastern San Gabriel Mts to Cuyama Valley and Central Santa Ynez Mts of the Transverse Ranges, California, was analyzed. This image was studied in conjunction with the following conventional sources: (1) the Los Angeles sheet of the geologic map of California; (2) the map of the geology of the Central Santa Ynez Mountains, Santa Barbara County, California; (3) the geologic map of Transverse Ranges, Southern California. ERTS-1 image, which covers the area from the Palisades, New York-New Jersey to Burlington, New Jersey, and from New Brunswick, New Jersey to the great Pecomic Bay, New York, was also analyzed. This image was compared with: (1) the geologic map of New Jersey 1:1,000,000; (2) the geologic map of New Jersey 1:250,000; and (3) selected maps as published in the geology of selected areas in New Jersey and Eastern Pennsylvania. Conventional sources, including field investigation, were found to be inadequate to supply all the required structural and paleohydrographic information needed. ERTS-1 was found to be an essential supplementary source of information for geologic explorations, much like and even better than space photography from manned spacecraft and SLR imagery. (See also W74-06619) (Knapp-USGS)
W74-06690

A PRELIMINARY EVALUATION OF ERTS-1 IMAGES ON THE VOLCANIC AREAS OF SOUTHERN ITALY (NASA CONTRACT FO-013),
Consiglio Nazionale delle Ricerche, Milan (Italy). Laboratorio per la Geofisica della Litosfera.
R. Cassinis, and G. M. Lechi.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1539-1548, 1973. 5 fig.

Descriptors: *Remote sensing, Satellites(Artifical), *Geologic mapping, *Volcanoes, Data collections, Structural geology, Geothermal studies.
Identifiers: *ERTS, *Italy, *Sicily.

ERTS data were evaluated in a test site including all the regions of active and quiescent volcanism in southern Italy. The three active European volcanoes (Etna, Stromboli and Vesuvius) were included. Good results were obtained particularly on the southeast of Sicily over the Ragusan plateau, where several faults are clearly observed. In some cases a better pattern recognition is reached by the synoptic power of the ERTS enhanced images. (See also W74-06619) (Knapp-USGS)
W74-06691

THERMAL SURVEILLANCE OF CASCADE RANGE VOLCANOES USING ERTS-1 MULTISPECTRAL SCANNER, AIRCRAFT IMAGING SYSTEMS, AND GROUND-BASED DATA COMMUNICATION PLATFORMS,
Geological Survey, Washington, D.C.
J. D. Friedman, D. G. Frank, D. Preble, and J. E. Painter.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1549-1560, 1973. 6 fig, 9 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Geologic mapping, *Volcanoes, Data collections, Structural geology, *Geothermal studies.
Identifiers: *ERTS, *Iceland(Cascade Range).

A combination of infrared images and ground calibration points is particularly useful in plotting changes in surface temperatues and radiance and in delimiting areas of predominantly convective heat flow to the earth's surface in the Cascade Range and on Surtsey Volcano, Iceland. ERTS-1 Multispectral Scanner (MSS) and aircraft infrared imaging systems were used in conjunction with multiple thermistor arrays to study volcano surface temperatures. The data are relayed daily to Washington via Data Communication Platform (DCP) transmitters and ERTS-1. ERTS-1 MSS imagery reveals curvilinear structures at Lassen, the full extent of which have not been previously mapped. Interestingly, the major surface thermal manifestations at Lassen are aligned along these structures, particularly in the Warner Valley. On Lassen Peak, and possibly at Mt. St. Helens, smaller thermal anomalies are controlled by the contact margins of silicic or intermediate extrusive plugs. (See also W74-06619) (Knapp-USGS)
W74-06692

INITIAL EVALUATION OF THE GEOLOGIC APPLICATIONS OF ERTS-1 IMAGERY FOR NEW MEXICO,
New Mexico Bureau of Mines and Mineral Resources, Socorro.
For primary bibliographic entry see Field 4A.
W74-06693

COMPUTED ATMOSPHERIC EFFECTS ON ERTS OBSERVATIONS,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 2B.
W74-06694

MAPPING OF SPOIL BANKS USING ERTS-1 PICTURES,
Ohio Univ., Athens. Dept. of Geology.
For primary bibliographic entry see Field 5A.
W74-06695

AIR QUALITY INDICES FROM ERTS-1 MSS INFORMATION, PR 568,
MITRE Corp., McLean, Va.
For primary bibliographic entry see Field 5A.
W74-06696

SNOW COVER SURVEYS IN ALASKA FROM ERTS-1 DATA,
Alaska Univ., College.
For primary bibliographic entry see Field 2C.
W74-06697

UTILIZATION OF ERTS-1 DATA TO MONITOR AND CLASSIFY EUTROPHICATION OF INLAND LAKES,
Bendix Corp., Ann Arbor, Mich.
For primary bibliographic entry see Field 5A.
W74-06698

ERTS-1 OBSERVES ALGAL BLOOM IN LAKE ERIE AND UTAH LAKE,
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 5A.
W74-06699

USE OF ERTS-1 DATA FOR REGIONAL PLANNING IN THE METROPOLITAN WASHINGTON COUNCIL OF GOVERNMENTS--A SHORT BRIEF,
Metropolitan Washington Council of Governments, D.C. Remote Sensing Project.
For primary bibliographic entry see Field 4A.
W74-06700

LAND USE MAPPING AND CHANGE DETECTION USING ERTS IMAGERY IN MONTGOMERY COUNTY, ALABAMA,
Alabama Univ., University. Dept. of Civil and Mineral Engineering.
For primary bibliographic entry see Field 4A.
W74-06701

DETERMINATION OF LAND USE IN MINNESOTA BY AUTOMATIC INTERPRETATION OF ERTS MSS DATA,
Honeywell, Inc., St. Paul, Minn. Systems and Research Center.
For primary bibliographic entry see Field 4A.
W74-06702

DIGITAL DATA PROCESSING OF ERTS-1 IMAGERY OF DELAWARE BAY,
Bendix Aerospace Systems Div., Ann Arbor, Mich.
For primary bibliographic entry see Field 2L.
W74-06703

THE USE OF PHOTOGRAPHIC METHODS IN CONTRAST ENHANCEMENT OF ERTS-1 IMAGES,
Geological Survey, Flagstaff, Ariz.
L. F. Harris.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1649-1659, 1973. 5 fig, 3 tab, 2 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, Photography, Data collections, Geomorphology.
Identifiers: *ERTS, *Photographic processing.

The contrast of ERTS 70 mm positive images can be enhanced to varying degrees by rephotographing the images with different types of negative films and by overdeveloping the films with different developers. A combination of high-contrast copy film and a high-energy developer yields high contrast. Still greater contrast may be obtained by using a film of higher contrast capability and a developer of higher energy capability. Contrast can also be enhanced in the printing process with the use of high-contrast photographic papers, or with the use of polycontrast photographic paper and filters. Contrast enhancement by photocopying delineates topographic boundaries and may aid in the objective measurement of topographic parameters. (See also W74-06619) (Knapp-USGS)
W74-06704

PRECISION ANNOTATION OF PREDETERMINED PRIMARY SAMPLING UNITS ON ERTS-1 MSS IMAGES,
Earth Satellite Corp., Berkeley, Calif.
For primary bibliographic entry see Field 4A.
W74-06705

UNSUPERVISED CLASSIFICATION AND AREAL MEASUREMENT OF LAND AND WATER COASTAL FEATURES ON THE TEXAS COAST,
Lockheed Electronics Co., Inc., Houston, Tex. Aerospace Systems Div.
For primary bibliographic entry see Field 2L.
W74-06706

USE OF ERTS-1 PICTURES IN COASTAL OCEANOGRAPHY IN BRITISH COLUMBIA,
Department of the Environment, Victoria (British Columbia). Marine Sciences Branch (Pacific Region).
For primary bibliographic entry see Field 2L.
W74-06707

RELATIONSHIPS BETWEEN REMOTELY SENSED FISHERIES DISTRIBUTION INFORMATION AND SELECTED OCEANOGRAPHIC PARAMETERS IN THE MISSISSIPPI SOUND,
National Marine Fisheries Service, Pascagoula, Miss. Southeast Fisheries Center.
For primary bibliographic entry see Field 7B.
W74-06708

APPLICATION OF ERTS-1 IMAGERY IN COASTAL STUDIES,
Army Engineer Div. South Pacific, San Francisco, Calif. Coastal Engineering Branch.
For primary bibliographic entry see Field 2L.
W74-06709

APPLICATION OF ERTS-1 IMAGERY IN THE FIELDS OF GEOLOGY, AGRICULTURE, FORESTRY, AND HYDROLOGY TO SELECTED TEST SITES IN IRAN,
Imperial Government of Iran, Tehran. Plan Organization.
For primary bibliographic entry see Field 4A.
W74-06710

DETECTION OF TURBIDITY DYNAMICS IN TAMPA BAY, FLORIDA USING MULTISPECTRAL IMAGERY FROM ERTS-1,
Geological Survey, Tampa, Fla.
For primary bibliographic entry see Field 2L.
W74-06711

ADVANCED SCANNERS AND IMAGING SYSTEMS FOR EARTH OBSERVATIONS.
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 7B.
W74-06712

HYDROLOGIC DATA FROM THE PICEANCE BASIN, COLORADO.
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4B.
W74-06714

AUTOMATIC PROCESSING AND VERIFICATION OF METEOROLOGICAL OBSERVATIONS.
Hydrometeorological Service of the USSR, Moscow.
For primary bibliographic entry see Field 2B.
W74-06722

MACHINE CONTROL OF THE QUALITY OF OBSERVATIONS IN AUTOMATED HYDROMETEOROLOGICAL-DATA PROCESSING,
For primary bibliographic entry see Field 2B.
W74-06723

FUNDAMENTALS OF AUTOMATIC CONTROL OF METEOROLOGICAL DATA,
For primary bibliographic entry see Field 2B.
W74-06724

AUTOMATIC CHECK AND CORRECTION OF METEOROLOGICAL DATA IN EAST GERMANY,
For primary bibliographic entry see Field 2B.
W74-06725

AUTOMATIC MONITORING OF DAILY RESULTS OF BASIC METEOROLOGICAL OBSERVATIONS,
For primary bibliographic entry see Field 2B.
W74-06727

AUTOMATIC METHOD OF MONITORING THE QUALITY OF MEAN MONTHLY METEOROLOGICAL DATA,
For primary bibliographic entry see Field 2B.
W74-06728

AUTOMATIC MONITORING OF PROCESSING OF DAILY RADIOSONDE DATA ON TEMPERATURE AND GEOPOTENTIAL,
For primary bibliographic entry see Field 2B.
W74-06729

AUTOMATIC MONITORING AND PROCESSING OF HOURLY HYDROMETEOROLOGICAL INFORMATION,
For primary bibliographic entry see Field 2B.
W74-06730

SOME PRINCIPLES OF OBJECTIVE CONTROL OF MARINE METEOROLOGICAL INFORMATION,
For primary bibliographic entry see Field 2B.
W74-06731

AUTOMATIC PROCESSING OF RAINFALL DATA,
For primary bibliographic entry see Field 2B.
W74-06732

AN ALGORITHM FOR MONITORING HYDROMETEOROLOGICAL INFORMATION,
For primary bibliographic entry see Field 2B.
W74-06733

SAMPLE SIZES REQUIRED FOR TWO-SIDED COMPARISONS OF TWO TREATMENTS WITH A CONTROL,
National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
F. E. Steffens, and R. de Villiers.
Technometrics, Vol 15, No 4, p 915-921, November 1973. 5 tab, 5 ref.

Descriptors: *Statistical methods, *Testing, Mathematical studies, Quality control, Probability, Control.
Identifiers: Comparison, Sample size, Bivariate t-test.

The two-sided bivariate t-test for simultaneous comparison of two treatments with a control is studies. The problem of allocating a given number of observations to the treatments and the control is discussed, and it is concluded that, in the absence

f preferences, a general purpose rule would be to hoose the sample sizes equal. A table is presented vhich gives the sample size required to ensure that he null hypothesis will be rejected with at least a prescribed probability, given the significance level nd the standardized differences between the reatments and the control. Similar tables are provided for use when the object is to ensure that oth treatment means will be found significantly ifferent from the control mean with at least a iven probability, or to ensure that a specified reatment will be found significant with at least a iven probability. (Mortland-Battelle)
V74-06746

IGITAL CONTROL ALGORITHMS. PART III. UNING PI AND PID CONTROLLERS,
ouisiana State Univ., Baton Rouge.
-C. Chiu, A. B. Corripio, and C. L. Smith.
nstruments and Control Systems, Vol 46, No 12, 41-43, December 1973. 2 fig, 5 tab, 2 ref.

escriptors: *Automatic control, *Algorithms, utomation.
dentifiers: *Process control, *Digital control, PID ontrollers, PI controllers, Digital feedback, Kalman algorithm.

ommon practice in the process industries is to se the discrete equivalent of the three-mode proportional-plus-integral-plus-derivative (PID) controller for digital feedback loops. A number of nique discrete algorithms have also been eveloped, but little industrial acceptance has een found except in cases such as basis weight nd moisture control on paper machines where ead time renders PID systems ineffective. This rticle is the third in a series comparing the performance of several discrete algorithms with three node control, for processes in which time constants rather than dead time dominate. Complete eneralization is not possible. However, comparisons will be based on a model of a jacketed ackmix reactor, which is representative of many eal processes. (Mortland-Battelle)
V74-06750

HE EXREM III COMPUTER CODE FOR ESTIMATING EXTERNAL RADIATION DOSES TO OPULATIONS FROM ENVIRONMENTAL ELEASES,
ak Ridge National Lab., Tenn. Radiation Shielding Information Center.
or primary bibliographic entry see Field 5B.
V74-06818

NVIRONMENTAL SCIENCES DIVISION ANUAL PROGRESS REPORT FOR PERIOD ENDNG SEPTEMBER 30, 1973,
ak Ridge National Lab., Tenn.
or primary bibliographic entry see Field 5B.
V74-06826

ANCELLATION OF SPECTROPHOTOMETER YSTEM CHARACTERISTICS USING AN NALOG COMPUTER,
epartment of Agriculture, Ottawa (Ontario). Engineering Research Service.
or primary bibliographic entry see Field 2K.
V74-06874

UANTITATIVE METHODS FOR PRELIMINARY DESIGN OF WATER QUALITY SURVEILANCE SYSTEMS,
aytheon Co., Portsmouth, R. I. Oceanographic nd Environmental Services.
or primary bibliographic entry see Field 5A.
V74-06885

SSESSING SYSTEMATIC ERRORS IN RAINALL-RUNOFF MODELS,
nowy Mountains Engineering Corp., Cooma Australia).
or primary bibliographic entry see Field 2A.
W74-06893

DETERMINATION OF THE CONFIDENCE INTERVALS OF THE PEARSON III LAW USING ORDER STATISTICS (DETERMINATION DES INTERVALLES DE CONFIANCE DE LA LOI PEARSON III PAR LES STATISTIQUES D'ORDRE),
National Inst. of Scientific Research, Quebec.
For primary bibliographic entry see Field 2E.
W74-06906

ON FLOOD PROBABILITIES OF EAST ALPINE RIVERS,
Zentralanstalt fuer Meteorologie und Geodynamik, Vienna (Austria).
For primary bibliographic entry see Field 2E.
W74-06909

EFFECTS OF GROUND-WATER DEVELOPMENT ON THE PROPOSED PALMETTO BEND DAM AND RESERVOIR IN SOUTHEAST TEXAS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 4B.
W74-06920

EIGHT YEARS OF OBSERVATIONS ON THE WATER LEVEL AT QUEBEC AND GRONDINES 1962-1969: PART I--ANALYSIS OF THE TIDAL SIGNAL,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
For primary bibliographic entry see Field 2E.
W74-06926

METROMEX TEMPERATURE AND AEROSOL DATA REDUCTION: ANALYSIS OF THE URBAN ANOMALY,
Chicago Univ., Ill. Dept. of the Geophysical Sciences.
For primary bibliographic entry see Field 2B.
W74-06941

FLOOD OF OCTOBER 1972 AT PETERSBURG AND COLONIAL HEIGHTS, VIRGINIA,
Geological Survey, Washington, D. C.
E. M. Miller, and P. N. Walker.
For sale by USGS, Washington, D. C. 20242, Price $0.75. Hydrologic Investigations Atlas HA-505, 1973. 1 sheet, 2 fig, 1 photo, 3 ref. NSF Grant GA 28190XI.

Descriptors: *Historic floods, Floods, *Virginia, *Flood data, *Flood discharge, Peak discharge, Flood frequency, Flood recurrence interval, Flood profiles, *Maps.
Identifiers: Petersburg(Va), *Appomattox River(Va).

The areas inundated by the Appomattox River at Petersburg, Va., and by Swift Creek at Colonial Heights, Va., during the flood of October 1972 are shown on a topographic base map. The flood, the highest known on the Appomattox River, was caused by heavy rains which accompanied a low-pressure system that stagnated off the Virginia-North Carolina Coast. The flood of October 1972 reached an elevation of 86.69 feet above mean sea level (msl) at the gaging station on the Appomattox River at Matoaca, Va., (drainage area, 1,344 sq mi) and was the highest since records began in October 1969. The peak discharge on October 7, 1972, was 40,800 cfs at Matoaca as compared with a peak discharge of 28,000 cfs on August 20, 1940, the second highest flood of record. The stage-frequency relation derived from the record of annual floods for period 1927-66 at the U.S. Geological Survey gaging station near Petersburg and for period 1970-72 at the Virginia Bureau of Water Resources gaging station at Matoaca is shown. The 1972 flood had a recurrence interval of about 80 years, whereas the 1940 flood had a recurrence interval of about 30 years. Profiles of the water surface of the Appomattox River during the floods of October 1972 and August 1940 are shown. (Knapp-USGS)
W74-06957

HYDROLOGY AND WATER RESOURCES OF THE HOOSIC RIVER BASIN, MASSACHUSETTS,
Geological Survey, Washington, D.C.
B. P. Hansen, L. G. Toler, and F. B. Gay.
For sale by USGS, Washington, D.C. 20244 Price $1.00 per set. Hydrologic Investigations Atlas HA-481, 2 sheets, 1973. 23 fig, 1 map, 28 ref.

Descriptors: *Water resources, *Massachusetts, *Surface waters, *Groundwater, Floods, Water quality, *Maps, Flood profiles, Hydrogeology, Water yield, Hydrologic data, Runoff, Streamflow.
Identifiers: *Hoosic River basin(Mass).

Information is provided on the quantity, quality, and availability of water in that part of the Hoosic River basin located in Massachusetts. Deep bedrock valleys along the main stem have been filled with more than 300 feet, in places, of glacial lake sediments and outwash deposits, which form the main groundwater reservoirs in the basin. Higher elevations expose the bedrock or are covered with varying thicknesses of glacial till. Drainage is in well-defined channels. The regimen along the main stem has been altered by Cheshire Reservoir and construction of flood control structures in Adams and North Adams. The main valley of the Hoosic River is underlain by stratified unconsolidated material, which is over 300 feet thick locally. Most of this material is fine-grained and will yield very little water to wells. Dposits of sand and gravel within the fine-grained material yield large volumes of water. Some unconsolidated deposits may be hydraulically connected to the carbonate bedrock aquifer that underlies most of the valley, which may result in artesian conditions. The magnitude of a flood at selected frequencies can be estimated from regional flood frequency formulas. The concentration of suspended sediment varies with discharge and is highest during periods of spring runoff. Lower water temperature and less biochemical activity results in higher concentrations of dissolved oxygen and less diurnal variation in December. Regional draft-storage frequency analyses are given. (Knapp-USGS)
W74-06958

AVAILABILITY OF GROUND WATER IN THE GRANTS PASS AREA, JOSEPHINE COUNTY, OREGON,
Geological Survey, Washington, D. C.
J. H. Robison.
For Sale by USGS, Washington, D. C. 20242, Price $1.00 per set. Hydrologic Investigations Atlas HA-480, 1973. 2 sheets, 7 fig, 1 map, 1 tab, 11 ref.

Descriptors: *Groundwater, *Hydrogeology, *Oregon, *Maps, Hydrologic data, Water yield, Water quality.
Identifiers: *Grants Pass(Oreg), *Josephine County(Oreg).

Groundwater information is presented in a form that will enable water users near Grants Pass, Oregon to estimate the likelihood of obtaining groundwater in adequate quantity and suitable quality. The Grants Pass area is located in southwestern Oregon and has an area of about 270 square miles entirely within the Rogue River drainage basin and Josephine County. Alluvium is the major aquifer near the city of Grants Pass and along the Rogue River. Few yields are less than 5 gpm with 50 ft of drawdown; yields of 40 gpm with less than 40 ft of drawdown are not uncommon. Yields to wells drilled into conglomerate appear to

average somewhat less than yields from granitic rocks in the area. Granitic intrusive rocks of the Grants Pass batholith serve as aquifers in areas underlain by these rocks; a substantial part of the recent residential development has been in granitic areas. Well yields depend largely on the depth and degree of weathering and the extent of fracturing of the rocks--characteristics that have wide local variation. Well yields range from less than 1 gpm with several hundred feet of drawdown in some wells completed in 'tombstone granite' to at least 60 gpm with 50 ft of drawdown in a few wells where weathered or fractured zones are exceptionally well developed. Iron is excessive in some groundwater from the upper, weathered zone in granitic rocks or from alluvium that was derived mostly from granitic rocks. (Knapp-USGS)
W74-06959

QUALITY OF GROUND WATER IN THE LOWER COLORADO RIVER REGION, ARIZONA, NEVADA, NEW MEXICO, AND UTAH,
Geological Survey, Washington, D. C.
L. R. Kister.
For Sale by USGS, Washington, D. C. 20242, Price $1.00 per set. Hydrologic Investigations Atlas HA-478, 2 sheets, 1973. 3 fig, 2 map, 17 ref.

Descriptors: *Water quality, *Colorado River basin, Water chemistry, Salinity, *Maps, Hydrologic data, Hydrogeology.

Data are presented on the areal and vertical distribution of the dissolved-solids and fluoride concentrations in groundwater for the lower Colorado River region, an area of about 140,000 square miles in parts of Arizona, Nevada, New Mexico, and Utah. The basin and range province is characterized by isolated north to northwest-trending mountain ranges separated by broad alluvial-floored basins. The water in the mountains generally contains less than 1,000 milligrams per liter dissolved solids, except where water issues from saline springs. The dissolved-solids concentrations in the groundwater in the alluvium range from less than 100 to more than 100,000 mg/liter and generally are less than 1,000 mg/liter. The plateau uplands province includes a variety of landforms--canyons, buttes, mesas, and mountains. Although igneous and metamorphic rocks are the main rock types in the uplands, the sedimentary rocks form the most important aquifers. The dissolved-solids concentrations in groundwater vary areally and with depth and range from 90 to more than 60,000 mg/liter in about 1,500 samples analyzed. The principal constituents in the groundwater in the uplands are bicarbonate, sulfate, calcium, sodium, and chloride. The central highlands province forms a topographic high that separates the Plateau uplands from the Basin and Range lowlands in most of the lower Colorado River region. Volcanic rocks crop out in much of the area, are permeable, and water moves readily through them and recharges the underlying groundwater reservoir. Thin alluvial deposits in a few small valleys also store groundwater. Springs along the Mogollon Rim and elsewhere in the Central highlands are the source of the perennial flow in the Gila, Salt, and Verde Rivers. The groundwater generally contains less than 1,000 mg/liter of dissolved solids. However, several springs yield saline water to streams. (Knapp-USGS)
W74-06960

WATER RESOURCES OF NORTHWESTERN MISSOURI,
Geological Survey, Washington, D.C.
E. E. Gann, E. J. Harvey, and J. H. Barks.
For Sale by USGS, Washington, D.C. 20242, Price $1.50 per set. Hydrologic Investigations Atlas HA-444, 4 sheets, 1973. 26 fig, 7 tab, 48 ref.

Descriptors: *Water resources, *Missouri, Surface waters, Groundwater, Streamflow, Water yield, Water quality, Hydrogeology, Hydrologic data, *Maps.

A general summary is presented of information concerning the occurrence, availability, use, and quality of water in northwestern Missouri. Also included is a definition of problems and potentials which should be considered in the development of the water resources of the area. This atlas covers an area of approximately 13,000 square miles. The principal sources of fresh groundwater are the alluvium of the Missouri River valley, the alluvium of tributary valleys, and the outwash deposits in buried bedrock valleys. The existing drainage network has been developed on the unconsolidated materials overlying the buried bedrock valleys. Hydraulic connection between the alluvium of tributary valleys and the buried valleys is poor in most areas owing to relatively impermeable silt and clay deposits separating the two aquifers. However, toward the lower end of the Grand River valley the two aquifers may be connected. Artesian conditions exist in most of the buried valleys and in some areas in the Missouri River valley and tributary valleys. Water from bedrock aquifers in northwestern Missouri is generally too highly mineralized for most uses. The flow of streams in northwestern Missouri is highly variable. The average flow for a particular month may vary from year to year by a factor of 1,000. Minimum monthly mean flows of most streams in the area occurred during the severe droughts of the 1930's and mid-1950's. Maximum monthly mean flows generally occurred during the late-1920's, mid-1940's, and early-1960's. Flow-duration curves present general streamflow characteristics of streams in northwestern Missouri. Generalized estimates of average annual sediment yield are useful in the preliminary design of water resources projects. (Knapp-USGS)
W74-06961

STREAM TEMPERATURES IN WASHINGTON STATE,
Geological Survey, Washington, D.C.
M. R. Collings, and G. T. Higgins.
For sale by USGS, Washington, D.C. 20242, Price $1.00 per set. Hydrologic Investigations Atlas HA-385, 2 sheets, 1973. 11 fig, 1 tab, 7 ref.

Descriptors: *Water temperature, *Streams, *Washington, *Maps, Hydrologic data, Springs, Streamflow, Water quality, Urbanization.

Stream temperatures in Washington State are shown in this 2-sheet hydrologic atlas. The purpose of this study was to gain an understanding of the magnitudes, geographic distribution, and time variations in temperatures of streams in Washington, as defined by major drainage areas. The information provides a basis for evaluating the streams relative to their use for fish propagation, and for municipal, industrial, and agricultural supply. Data used included those from thermographs, once-daily observations, and intermittent temperature measurements. Of the data from intermittent temperature measuring sites, only those sites with at least 8 well-spaced measurements throughout the year (most sites had a greater number) were used. For the analysis all data for the period from January 1, 1960, through December 31, 1967, were used. Several streams have anomalous temperature patterns. Many of these temperature patterns are due to natural influx of hot or cold water from springs--flow from a warm spring affects temperatures at station 1123 in the Lower Columbia River drainage and a cold spring affects temperatures at station 1073 in the Puget Sound drainage. The influence of large groundwater inflow and the effect of urbanization are shown. (Knapp-USGS)
W74-06962

8. ENGINEERING WORKS

8A. Structures

COMPARISON OF STRENGTH TEST METHODS FOR CORRUGATED PLASTIC DRAINAGE TUBING,
Ohio State Univ., Columbus. Dept. of Agricultural Engineering
F. T. Scribe, J. L. Fouss, and G. O. Schwab
Transactions of the ASAE (American Society of Agricultural Engineers) Vol 15, No 3, p 445-447, May-June, 1972. 8 fig, 8 ref

Descriptors: *Plastic deformation, *Plastic pipes, Closed conduits, Tile drains, Tiles, Subsurface drains, Pipes, *Strength

The sand box and parallel plate methods for measuring the load deflection of corrugated plastic drainage tile were evaluated. Twelve-inch lengths of unslotted plastic tubing at a temperature of 72F and 50% relative humidity were tested using both methods. Deflection of the tubing was not allowed to exceed 5%. The load is linearly related to the deformation for deflections less than 5% in both test methods. Both methods give similarly accurate results. The parallel plate method is preferred because it is much faster to perform. (Skogerboe-Colorado State)
W74-06602

WOODCOCK CREEK LAKE, FRENCH CREEK BASIN, PENNSYLVANIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Pittsburgh, Pa.
Available from the National Technical Information Service as EIS-PA-73-0623-F $5.00 in paper copy, $1.45 in microfiche. January 1973. 49 p, 2 map.

Descriptors: *Environmental effects, *Reservoir construction, *Flood protection, *Dams, Flood control, Streamflow, Natural flow, Reservoir silting, Wildlife, *Pennsylvania, Turbidity, Impoundments, Surface waters.
Identifiers: *Environmental Impact Statement, Saeger Town and Meadville(Pa), *French Creek(Pa).

This project involves the further development of the coordinated French Creek Basin reservoir system by construction of a retention type dam on Woodcock Creek in Pennsylvania. The environmental impacts of the project include providing a higher degree of flood protection thereby creating an environment more favorable to economic stability; loss of part of the natural stream section, inundating several acres; providing a degree of stream flow management; and encouraging development of recreation in the project area. The major adverse environmental effects will be increased stream turbidity and siltation during construction. In addition, increased flood protection could encourage more extensive agricultural usage and development, thereby reducing the amount of land available for propagation of wildlife. (Daniels-Florida)
W74-06986

HURRICANE CREEK WATERSHED PROJECT, HUMPHREYS AND DICKSON COUNTIES, TENNESSEE (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 4D.
W74-06988

NUTWOOD WATERSHED, ILLINOIS (FINAL ENVIRONMENTAL STATEMENT).
Soil Conservation Service, Washington, D. C.
For primary bibliographic entry see Field 4A.
W74-06990

8B. Hydraulics

HYDRAULICS OF A CENTER PIVOT SYSTEM,
South Dakota State Univ., Brookings. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W74-06583

DESIGN CRITERIA FOR IRRIGATION SYSTEMS WITH COMPLEX PIPE LOOPS,
Nebraska Univ., Lincoln. Coll. of Engineering and Architecture.
For primary bibliographic entry see Field 3F.
W74-06585

HYDRAULIC ROUGHNESS OF CORRUGATED PLASTIC TUBING,
Guelph Univ. (Ontario). School of Engineering.
R. W. Irwin, and G. Tsang.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 2, p 290-291, 295, March-April, 1972. 3 fig, 1 tab, 10 ref.

Descriptors: *Plastic pipes, *Tile drains, *Subsurface drains, Hydraulic conduits, Closed conduits, Fluid friction, Hydraulic design, *Reynolds number, *Roughness(Hydraulic), Turbulence, Drainage.
Identifiers: *Corrugated plastic tubing.

The functional relationships between frictional factor, Reynolds number, and relative roughness are determined for corrugated plastic drainage tubing. All tubing used was unperforated 4-inch diameter. The test section was 50 feet in length minus 10 feet at the inlet and 5 feet at the outlet allowed for end effects. The tubing was maintained full at all flow rates. Friction factors for corrugated tubing are about twice as great for well laid tile. A single value to indicate pipe roughness for hydraulic design cannot be used for corrugated plastic tubing. A value specific to the tubing must be chosen. Plots of data obtained are included. (Skogerboe-Colorado State)
W74-06589

EFFECT OF ROUGHNESS ELEMENTS ON HYDRAULIC RESISTANCE FOR OVERLAND FLOW,
Soil Testing Services, Inc., Northbrook, Ill.
T. S. Kowobari, C. E. Rice, and J. E. Garton.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 5, p 979-984, September-October, 1972. 4 fig, 4 tab, 8 ref.

Descriptors: Hydraulics, *Open channel flow, *Manning's equation, Fluid mechanics, Open channels, *Hydraulic models, Head loss, *Roughness(Hydraulic).

Gradually-varied flow experiments were conducted in a 1.32 foot by 24 foot long test section of a 44 foot long WF steel beam channel. The bottom was lined with aluminum sheet material which was fitted with round aluminum pegs of sizes 3/32 in. and 9/32 in. diameters. The pegs, which served as roughness elements, were placed in the channel bed at definite longitudinal and transverse patterns and spacings. Under the bare channel lining condition, a maximum flow of 0.885 cfs was introduced into the channel. Test slopes for the adjustable slope channel were restricted to approximate values of 0.0025, 0.0050 and 0.010. The objective was to determine the relationship of Manning's resistance coefficient to size of roughness elements, pattern of arrangement, density of spacing, slope, and discharge in a smooth artificial channel using dimensional analysis and gradually-varied flow. High correlations between calculated and observed values of the resistance coefficient were obtained for all of the model equations. (Skogerboe-Colorado State)
W74-06594

SEASONAL CHANGES OF LITTORAL TRANSPORT AND BEACH WIDTH AND RESULTING EFFECT ON PROTECTIVE STRUCTURES,
Maryland Geological Survey, Baltimore.
For primary bibliographic entry see Field 2L.
W74-06664

DEVELOPING REGION IN SELF-AERATED FLOWS,
Karlsruhe Univ. (West Germany). Institut fuer Hydromechanik, Staunanlagen und Wasserversorgung.
K. K. Lai, and I. R. Wood.
Journal of the Hydraulics Division, American Society of Civil Engineers Vol 100, No HY4, Paper 10501, p 553-568, April 1974. 16 fig, 12 ref, append.

Descriptors: *Aeration, *Spillways, Reaeration, Open channel flow, Turbulent flow, Hydraulic models, Mixing.
Identifiers: Self-aerated flows.

A stuey of the effect of aeration on the spillway flow of a large dam was combined with a study of the region of developing self-aerated flow in a model flume. Using the model data as a basis, an analysis of the developing region treats the aerated layer independently of the underlying water layer and the physical conditions upstream of the critical point where aeration commences. On the basis of a comparison with the prototype data, a design method is presented for a portion of the developing, partially aerated region of spillway flows. (Knapp-USGS)
W74-06739

ON SQUIRE'S THEOREM IN THE STUDY OF HYDRODYNAMIC STABILITY OF PLANE-PARALLEL FLOWS OF INCOMPRESSIBLE FLUIDS ABOUT DEFORMING BOUNDARIES,
V. V. Skripachev.
Fluid Mechanics--Soviet Research, Vol 2, No 6, p 171-174, November-December 1973. 3 ref. (Originally published in Gidromekhanika, No 21, p 75-79, 1972.).

Descriptors: *Fluid mechanics, *Hydrodynamics, *Flow, *Stability, Boundary processes, *Boundaries(Surfaces), Boundary layers, Equations.
Identifiers: USSR, *Squire's theorem.

To determine the point of stability loss of a flow of a viscous incompressible fluid about deforming boundaries, three-dimensional disturbances must be calculated. The Squire theorem was found to be inapplicable for flow about deforming boundaries. (Josefson-USGS)
W74-06911

STRUCTURE OF THE VELOCITY PROFILE OF A SUSPENSION-BEARING FLOW,
Yu. K. Vitoshkin.
Fluid Mechanics--Soviet Research, Vol 2, No 6, p 27-32, November-December 1973. 2 fig, 11 ref. (Originally published in Gidromekhanika, No 18, p 72-76, 1971.).

Descriptors: *Fluid mechanics, *Flow, *Velocity, *Suspension, Mixing, Density, Equations.
Identifiers: USSR.

A formula is derived for constructing the velocity profile in a suspension-bearing flow by integrating the initial equation of the theory of turbulent mixing and by considering the nonuniform distribution of density of the mixture over the depth of flow. The method proposed for constructing the velocity profile of a suspension-bearing fluid yields satisfactory agreement with test data for various solid materials up to 2 mm in size. The method is substantiated by a comparison of the calculations with about 100 test plots. A comparison of some computed velocity profiles with test data is graphed. (Josefson-USGS)
W74-06912

DEGREE OF LOCAL SATURATION OF A FLOW BY SUSPENDED MATTER AND ITS RELATION TO THE VOLUME CONCENTRATION,
S. I. Kril', and E. L. Belilovskiy.
Fluid Mechanics--Soviet Research, Vol 2, No 6, p 6-11, November-December 1973. 3 fig, 10 ref. (Originally published in Gidromekhanika, No 18, p 54-59, 1971).

Descriptors: *Fluid mechanics, *Flow, *Suspended solids, *Saturation, Statistical models, Probability, Equations.
Identifiers: USSR.

The usefulness of setting up a statistical model of suspension-bearing flows on the basis of a discrete interpretation of concentration is demonstrated. An effective approximate method is considered for finding the distribution of the probabilistic content of suspended matter with height for the simple case of a plane-parallel, quasi-steady, and uniform suspension-bearing flow. A differential equation is obtained for determining the probabilistic concentration provided the volume concentration is known. A specific solution of the equation is found for two specific flow modes. (Josefson-USGS)
W74-06913

THE INFLUENCE OF CLAY FRACTION ON THE BASIC PARAMETERS OF THE HYDROTRANSPORT OF FINE FREE-FLOWING MATERIALS,
N. A. Silin, V. M. Karasik, and V. N. Kondakov.
Fluid Mechanics--Soviet Research, Vol 2, No 6, p 1-5, November-December 1973. 4 fig, 5 ref. (Originally published in Gidromekhanika, No 18, p 51-54, 1971.).

Descriptors: *Fluid mechanics, *Flow, *Sediment transport, *Suspension, *Clays, Sands, Particle size, Velocity, Friction, Density, Hydraulic gradient, Curves.
Identifiers: USSR.

The transport of fine sand was investigated in tailings from the Verkhnedneprovsk Metallurgical Combine (GOK). The tailings consisted of fine quartz sand (average diameter=0.25 mm) containing up to 7% of a clay fraction with an average diameter less than 0.0062 mm. The investigation was divided into two test series. In the first series, the hydraulic gradients and the velocities of the suspension-bearing flow at various average consistencies (densities) were measured during the motion of mixtures containing washed solid material (minus the finest fractions). In the second series, similar measurements were made with hydromixtures containing fixed amounts of an added fine fraction. Tests were initially run with the addition of clay particles to the suspension-bearing flow or additives from the GOK tailings. Later the same tests were run with additives of spondyloid clay (average diameter=0.06 mm). In all cases, the amount of clay particles in the flow at any hydromixture concentration was about 7% of the total amount of solid material. The coefficient of internal friction for washed sand was larger by a factor of 1.6 than that for sand containing 7% of clay particles. (Josefson-USGS)
W74-06914

DISTRIBUTION OF AVERAGE LONGITUDINAL VELOCITIES IN FLOWS WITH COARSE-GRAINED MATERIALS,
Yu. N. Krivenko.
Fluid Mechanics--Soviet Research, Vol 2, No 6, p 20-26, November-December 1973. 6 fig. (Originally published in Gidromekhanika, No 18, p 66-72, 1971.).

Descriptors: *Fluid mechanics, *Flow, *Velocity, *Coarse sediments, Particle size, Sediment transport, Pressure, Pipes, Cross-sections, Instrumentation, Measurement, Equations.
Identifiers: USSR.

Flows containing rolled material of fixed coarseness were investigated for distribution of average longitudinal velocities over the total area of a pressure flow containing particulate material. Materials measuring 0.5-1, 1-2, 1-3, 2-3, 3-5, 3-10, 5-10, and 7-25 mm were transported in a pipe 106 mm in diameter, and materials measuring 10-20 mm and 20-40 mm were transported in a pipe 206 mm in diameter. The ratio of soil volume in a compact body to volume of the hydromixture varied between 0.03 and 0.24. The instrument used to measure average longitudinal velocities and consistencies of hydromixtures over the total cross-sectional area of flow is diagrammed, and graphs show distribution of average longitudinal velocities over the vertical diameter of the flow cross-section and change in dynamic flow radius as a function of coarseness of flow of the material transported. (Josefson-USGS)
W74-06915

ENERGY LOSSES IN A TWO-PHASE FLOW CONTAINING COARSE-GRAIN MATERIAL,
Yu. N. Krivenko.
Fluid Mechanics--Soviet Research, Vol 2, No 6, p 12-19, November-December 1973. 4 fig, 3 ref. (Originally published in Gidromekhanika, No 18, p 59-66, 1971.).

Descriptors: *Fluid mechanics, *Flow, *Energy loss, *Sediment transport, *Coarse sediments, Particle size, Suspension, Resistance, Friction, Velocity, Pipes, Pipe flow, Equations.
Identifiers: USSR.

Energy losses in overcoming friction between solid particles and solid pipe-wall material are determined. The difference between total energy losses and work against these frictional forces is shown to be close to the energy losses in the flow of a pure fluid. A physical basis is presented for the method of calculating hydraulic resistances. (Josefson-USGS)
W74-06916

EFFECTS OF GROUND-WATER DEVELOPMENT ON THE PROPOSED PALMETTO BEND DAM AND RESERVOIR IN SOUTHEAST TEXAS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 4B.
W74-06920

8D. Soil Mechanics

QUASI-CONTINUOUS EXPLOSIVE CONCEPTS FOR HARD ROCK EXCAVATIONS,
Shock Hydrodynamics. Sherman Oaks, Calif.
For primary bibliographic entry see Field 8H.
W74-06860

LOWER KLAMATH RIVER FLOOD CONTROL PROJECT, DEL NORTE COUNTY, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATMENT).
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W74-06989

8H. Rapid Excavation

THE CHALLENGE OF MILITARY NUCLEAR CONSTRUCTION,
Army War Coll., Pa. Carlisle Barracks, Pa.
B. C. Hughes.
Aval: NTIS, Springfield, Va., as AD-764 601. $5.45 per copy, $1.45 microfiche. March 8, 1972. 75 p, 16 fig, 3 tab, 1 bib. of 14 ref.

Descriptors: *Nuclear explosions, Civil defense, *Construction, Craters, Excavations, Nuclear engineering, Seismic waves, *Radioactivity, Fallout, Reserach and development, Economics, Technology, Testing, Safety, *Safety factors, Canal construction, Dam construction, Road construction, Harbors, Beneficial use, Cost-benefit theory, *Military aspects.

Rationale is provided to support the initiation of a comprehensive program for the development of the capability to use nuclear construction techniques in support of military operations. This military capability which has the potential for providing significant savings in manpower, time, and funds could be developed as a follow-on of the research and development accomplished to date for civil applications. The nuclear construction research programs of both the US and USSR are described in detail with emphasis on the nuclear and chemical cratering experiments that have been conducted and the technology which has been developed. A discussion of the hazardous safety effects resulting from a nuclear cratering detonation is included together with a description of the techniques which have been developed to control these effects and preclude personnel injuries. Potential military construction applications include nuclear quarries, harbors, roadway cuts, and inland canals. It is recommended that the Department of the Army develop and incorporate in its doctrine the use of nuclear construction techniques in support of military operations. The foregoing embodies a broad concept of peaceful uses of atomic energy, many of which have been developed through the plowshare program by the USAEC. (Houser-ORNL)
W74-06859

QUASI-CONTINUOUS EXPLOSIVE CONCEPTS FOR HARD ROCK EXCAVATIONS,
Shock Hydrodynamics. Sherman Oaks, Calif.
N. A. Louie.
Available from the National Technical Information Service as AD-765 792 $3.50 in paper copy, $1.45 in microfiche. Final Report, June 1973. 57 p, 18 fig, 9 tab, 6 ref, append. ARPA Contract H0220026.

Descriptors: *Excavation, *Rock excavation, *Explosions, Explosives, Project feasibility, Craters, *Rock mechanics, Granites, Concretes, Engineering, Geology, Apparatus, Machinery, Engineering structures, Hydrodynamics.
Identifiers: *Projectiles, Pulsed explosions.

The use of continuous or quasi-continuous systems for pulsed explosion rock excavation, can have major advantages over conventional methods. The feasibility and applicability of such an explosive system concept are discussed. The optimum properties of the explosive system, the effectiveness of the explosive-rock interactions, and the interactions between successive explosions were determined in tests on granite and concrete. A prototype multiple charge launcher was designed, built and tested to demonstrate the feasibility of a multiple feed system. The quasi-continuous explosive projectile launcher appears to be capable of unusually high drilling rates into hard rock. Recommendations are made for application of the launcher system to actual hard rock excavation conditions. An appendix gives details of apparatus and machinery. (Houser-ORNL)
W74-06860

8I. Fisheries Engineering

OXYGEN IN ESTUARIES: REQUIREMENTS FOR FISHERIES,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 5C.
W74-06542

THE EFFECTS OF ECOLOGICAL CHANGES ON BUCKEYE LAKE, OHIO, WITH EMPHASIS ON LARGEMOUTH BASS AND AQUATIC VASCULAR PLANTS,
Bureau of Sport Fisheries and Wildlife, Washington, D.C.
For primary bibliographic entry see Field 5C.
W74-06546

MACROBENTHOS OF PONDS WITH SUGAR FACTORY WASTES,
Polish Academy of Science, Krakow Zaklad Biologii Wod
For primary bibliographic entry see Field 5C.
W74-06553

RELATIVE RECOVERIES OF HATCHERY-REARED LANDLOCKED SALMON PLANTED AT DIFFERENT AGES AT SCHOODIC LAKE, MAINE,
Maine Dept. of Inland Fisheries and Game, Machias.
K. A. Havey.
Trans Am Fish Soc. Vol 102, No 1, p 121-124. 1973.
Identifiers: Ages(Fish), Lakes, *Maine(Schoodic Lake), Salmo-salar, *Salmon, *Fish hatcheries.

Relative recoveries of landlocked salmon Salmo salar planted at ages 0+ (fall), I (spring) and I+ (fall) were compared by analysis of variance and a multiple range test. Data were collected from angler catches (1963-1969) and from trap net catches (1963-70). Sample sizes were 987 salmon from angling and 1018 salmon from netting. The analysis of variance revealed a significant difference in recoveries of salmon of different ages at planting, and the Student-Newman-Keuls multiple range test showed that the significant difference was between age 0+ and age I+ salmon. At Schoodic Lake, Maine, comparable sport fisheries could be provided by stocking either 1000 age I+ salmon or 2800 age 0+ salmon. The smaller salmon would cost only 70% as much as the larger.--Copyright 1973, Biological Abstracts, Inc.
W74-06865

LEGAL IMPEDIMENTS TO THE USE OF INTERSTATE AGREEMENTS IN COORDINATED FISHERIES MANAGEMENT PROGRAMS: STATES IN THE N.M.F.S. SOUTHEAST REGION,
Louisiana State Univ., Baton Rouge. Law School.
For primary bibliographic entry see Field 6E.
W74-06991

AN EVALUATION OF STRIPED BASS FINGERLING CULTURE,
Wayne Community Coll., Goldsboro, N.C.
E. T. Humphries, and K. B. Cumming.
Trans Am Fish Soc. Vol 102, No 1, p 13-20, 1973. Illus.
Identifiers: *Bass(Striped), Cladocerans, Copepods, *Cultures, Diet, Fingerlings, Insects, Morone-Saxatilis, Predation, *Fish hatcheries.

A synopsis of investigations concerned with culture of striped bass (Morone saxatilis, Walbaum) fingerlings is presented. An historical review of significant events includes the development of hatcheries and rearing techniques. Changes in food habits and feeding occur with early development of the fish. Early instars of copepods and cladocerans are preferred natural foods until the fish are about 10 mm in total length. The diet of fish in the 10-30 mm size group consists mainly of adult copepods supplemented with some caldocerans and insect larvae. Fish in the 30-80 mm size group utilize fewer copepods while cladocerans and insect larvae make up the major

portion of the diet. Insect larvae are the most important foods of fish in the 80-100 mm size group. A comparison of first yr growth rates of pond-reared striped bass with those sampled from natural waters on the mid-Atlantic Coast indicates that both groups of the fish grow at approximately the same rate for the first 30 days, after which the pond-reared fish grow much faster. Striped bass reared in ponds are approximately 170 mm in length at the end of the first yr while those in natural waters are about 110 mm long. Factors affecting growth and survival of young striped bass include predation, handling, stress, and various water quality factors. The future outlook for fingerlings culture includes the development of hatcheries, nursery ponds, and intensive culture techniques.--Copyright 1973, Biological Abstracts, Inc.
W74-07002

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

NINTH ANNUAL REPORT OF THE OKLAHOMA WATER RESOURCES RESEARCH INSTITUTE, FISCAL YEAR 1974.
Oklahoma Water Resources Research Inst., Stillwater.
Available from the National Technical Information Service as PB-231 271; $8.00 in paper copy, $1.45 in microfiche. Institute Annual Report, Part 1, 1973. 91 p.

Descriptors: *Water resources institute, *Oklahoma, Water resources research act, Universities, Contracts, Grants, Eutrophication, Thermal stratification, Groundwater.

This is the 9th annual report of the Oklahoma Water Resources Research Institute. The most pressing water problems of the State continue to be in water resources planning. Oklahoma is mining water from the Ogallala Aquifer at a rate far in excess of natural recharge. The irrigated farming of Oklahoma's high plains is dependent upon a diminishing supply of groundwater. This and other groundwater problems (surface subsidence and groundwater pollution) are currently being discussed at a series of regional conferences sponsored by the OWRR and the regional Institute directors. For the past several years, the Institute and affiliated university researchers have been studying the effect of eutrophication and summer stratification on the water quality and ecosystems of lakes and reservoirs. A reliable method of lake destratification can be developed economically and be used effectively on the largest of lakes. While large reservoirs can be prevented from undergoing the usual summer stratification, the ecological advisability of doing so must be determined. The rewards of destratification (or the prevention of stratification) include enhanced water quality and the slowing or even the reversal of the eutrophic process. (Knapp-USGS)
W74-06515

INVENTORY OF ACTIVE WATER RESOURCES RESEARCH PROJECTS IN NORTH CAROLINA.
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 9D.
W74-06615

WATER RESOURCES RESEARCH INTERESTS IN THE COLLEGES AND UNIVERSITIES OF NORTH CAROLINA.
North Carolina Water Resources Research Inst., Raleigh.
Available from the National Technical Information Service as PB-231 346, $3.75 in paper copy, $1.45 in microfiche. Report No. 3 (Revised), (UNC-WRRI-73-03), Jan. 1, 1974, 59 p. OWRR A-999-NC(36).

Descriptors: *North Carolina, *Universities, *Colleges, Research and development, *Education, Research priorities, Census.
Identifiers: *Research interests(Education).

An inventory is presented of water-related research interests in the following North Carolina colleges and universities: North Carolina State University at Raleigh; University of North Carolina at Asheville; University of North Carolina at Chapel Hill; University of North Carolina at Charlotte; University of North Carolina at Greensboro; University of North Carolina at Wilmington; Appalachian State University; North Carolina Agricultural and Technical State University; North Carolina Central University; Pembroke State University; Western Carolina University; Campbell College; Duke University; Guilford College; Livingstone College; Mars Hill College; St. Andrews Presbyterian College; St. Augustine's College; and Warren Wilson College. (Howells-North Carolina State)
W74-06616

ANNUAL REPORT, FY 1973.
North Carolina Water Resources Research Inst., Raleigh.
Available from the National Technical Information Service as PB-231 308, $4.00 in paper copy, $1.45 in microfiche. Report WRRI-UNC-73-00, (1973), 74 p. OWRR A-999-NC(38). 14-31-0001-3833.

Descriptors: *Water Resources Research Act, *Education, *Water Resources Institute, *Universities, Colleges, Training, *North Carolina, Projects, *Research and Development, Grants, Contracts.

The Water Resources Research Institute is The University of North Carolina's water research center. Located at N.C. State University at Raleigh, the Institute serves all sixteen campuses of The University of North Carolina System. It works closely with the Department of Natural and Economic Resources and other agencies in the formulation of a research program responsive to State water resource problems. A 27-man Advisory Committee representative of State and federal water agencies, industry, conservation, agriculture, local government, and the general public provides program guidance and review. The Institute's research program for FY 1972-73 was supported by an annual allotment and 10 matching grants from OWRR, USDI; a grant from the EPA; matching State appropriations; matching funds from Texas Gulf Sulphur Corp.; a grant from Z. Smith Reynolds Fdn.; and a grant from the Office of Water and Air Resources, NCDNER. All senior colleges and universities in North Carolina are eligible to participate in the Institute's program. During FY 1972-73, projects were conducted at N.C. State University, University of North Carolina at Chapel Hill, University of North Carolina at Charlotte, Duke University, and East Carolina University. (Howells-North Carolina State)
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SUBJECT INDEX

ABSORPTION
Nitrogen Turnover in Impoundments,
W74-06505 5C

Oxidation of Organic Matter in Sediments,
W74-06528 5C

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W74-06534 5C

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W74-06814 5C

Soil Moisture Distribution During Two-Dimensional Absorption from a Cylindrical Source,
W74-07042 2G

ABSTRACTS
Information Resource: Final Report Water Pollution Control in Water Utilities,
W74-06527 5F

ACETYLENE REDUCTION
Nitrogen-Fixing Activity in Upland and Flooded Rice Fields,
W74-07024 5B

ACID-BASE EQUILIBRIUM
Buffer Capacity in Aquatic Ecosystems,
W74-06829 5B

ACID MINE WATER
Micro-Ecosystems Simulation of Primary Production in Thermal and Acid Mine Water Loadings Related to Water Use of the Monongahela River,
W74-06507 5C

ACIDS
The Effects of Waste Disposal in the New York Bight. Section 3: Zooplankton Studies.
W74-06866 5C

ACTIVATED SLUDGE
Packinghouse Waste Treatment.
W74-06511 5D

Nitrogen Elimination by Bogus Alternation of Aerobic/'Anoxic' Conditions in 'Orbal' Activated Sludge Plants,
W74-06605 5D

Efficient Pricing for Urban Waste Water Renovation,
W74-06828 5D

Activated Sludge Treatment Systems with Oxygen,
W74-06839 5D

Biological Treatment of Feedlot Runoff,
W74-06847 5D

ADMINISTRATIVE DECISIONS
Start-Up of Municipal Wastewater Treatment Facilities,
W74-06578 5D

ADMINISTRATIVE REGULATIONS
Conservationists Go to Court--Part 1,
W74-06971 4D

Drainage Districts.
W74-06972 6E

Division of Water: Powers and Duties.
W74-06974 6E

Powers of the Water Pollution Control Board: Powers of Director of Environmental Protection.
W74-06975 6E

Regional Water and Sewer Districts: Rights, Powers and Duties.
W74-06981 6E

ADSORPTION
Physical-Chemical Treatment of Raw Municipal Wastewater,
W74-06509 5D

Kinetics of the Phosphate Interaction with Calcite,
W74-06895 5B

A Comparison of Hydraulic Conductivities Calculated with Morphometric and Physical Methods,
W74-06899 2G

ADVECTION
Sources of Oxygen in Estuaries,
W74-06539 5C

AEQUIDENS-RIVULATUS
The Laguna de Vegueta on the Mid-Peruvian Coast and Its Fishes, Particularly Aequidens rivulatus (Guenther 1859), (In German),
W74-07007 2H

AERATION
Packinghouse Waste Treatment.
W74-06511 5D

Treatment of Domestic Wastewater and NSSC Pulp and Paper Mill Wastes,
W74-06513 5D

Hypolimnion Aeration with Commercial Oxygen - Vol. I - Dynamics of Bubble Plume,
W74-06525 5D

Hypolimnion Aeration with Commercial Oxygen - Vol. II - Bubble Plume Gas Transfer,
W74-06526 5D

Nitrogen Elimination by Bogus Alternation of Aerobic/'Anoxic' Conditions in 'Orbal' Activated Sludge Plants,
W74-06605 5D

Developing Region in Self-Aerated Flows,
W74-06739 8B

AERIAL PHOTOGRAPHY
Origin of Circular Beds of Thalassia (Spermatophyta:Hydrocharitaceae) in South Biscayne Bay, Florida, and Their Relationship to Mangrove Hammocks,
W74-07022 5A

AEROSOLS
Determination of Aerosol Content in the Atmosphere,
W74-06647 7C

AERSOLS
Computed Atmospheric Effects on ERTS Observations,
W74-06694 2B

AESTHETICS
Conservationists Go to Court--Part 1,
W74-06971 4D

AGENCIES
The National Environmental Policy Act and the Licensing Process: Environmentalist Magna Carta or Agency Coup de Grace,
W74-06963 5G

AGRICULTURAL CHEMICALS
Sources of Mercury in the Environment,
W74-06771 5B

AGRICULTURE
Bibliography of Water Management.
W74-06854 3F

Drainage.
W74-06983 6E

AIR POLLUTION
Air Quality Indices from ERTS-1 MSS Information, PR 568,
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W74-06818 5B

The Stack Monitoring System at the Idaho Chemical Processing Plant,
W74-06824 5A

Analysis of the Feasibility of an Experiment to Measure Carbon Monoxide in the Atmosphere,
W74-06917 5A

Industrial Development--Pollution.
W74-06976 6E

Dynamics of Changes in the Concentration of Fluorine Compounds Emitted by the Phosphorus Fertilizer Manufacturing Establishment in Pozan, and Their Influence on Surface and Underground Waters and on the Atmosphere Within th e Limits of the City of Poznan, (In Polish),
W74-07021 5B

AIR POLLUTION EFFECTS
Dose-Response Relationship Associated with Known Mercury Absorption at Low Dose Levels of Inorganic Mercury,
W74-06800 5C

AIR POLLUTION SOURCES
Mercury in the Environment,
W74-06523 5B

AIR STRIPPING
Nitrogen Removal by Ammonia Stripping,
W74-06842 5D

ALABAMA
Land Use Mapping and Change Detection Using ERTS Imagery in Montgomery County, Alabama,
W74-06701 4A

ALASKA

A Multidisciplinary Survey for the Management of Alaskan Resources Utilizing ERTS Imagery,
W74-06633 4A

New Insights into the Influence of Ice on the Coastal Marine Environment of the Beaufort Sea, Alaska,
W74-06669 2C

ERTS-1 Observations of Sea Surface Circulation and Sediment Transport, Cook Inlet, Alaska,
W74-06670 2L

Sediment Distribution and Coastal Processes in Cook Inlet, Alaska,
W74-06671 2L

Snow Cover Surveys in Alaska From ERTS-1 Data,
W74-06697 2C

ALBEDO

A Technique for Correcting ERTS Data for Solar and Atmospheric Effects,
W74-06648 7C

DCP-Collected Absolute Target Reflectance Signatures Assist Accurate Interpretation of ERTS-1 Imagery,
W74-06688 7C

ALEWIVES

Effects of Alewives (Alosa pseudoharengus) on the Zooplankton of Lake Wononskopomus, Connecticut,
W74-07033 2H

ALGAE

Tertiary Treatment with a Controlled Ecological System.
W74-06524 5D

The Influence of Environmental Factors on the Distribution of Freshwater Algae: An Experimental Study. III. Effects of Temperature, Vitamin Requirements and Inorganic Nitrogen Compounds on Growth,
W74-06549 5C

Epiphytic Microphytes in a Pond Polluted with Beet Sugar Factory Wastes,
W74-06551 5C

Utilization of Phosphorus by Phytoplankton in Phosphorus-Rich Environments,
W74-06611 5C

Correlation of ERTS Multispectral Imagery with Suspended Matter and Chlorophyll in Lower Chesapeake Bay,
W74-06667 2L

Benthic Algae in Water of the Neouvielle Massif (Hautes-Pyrenees),
W74-07013 2H

Growth Comparisons of Oysters, Mussels and Scallops Cultivated on Algae Growth With Artificial Medium and Treated Sewage Effluent,
W74-07035 5C

ALGAE REMOVAL

Intermittent Sand Filtration to Upgrade Existing Wastewater Treatment Facilities,
W74-06506 5D

ALGAL GROWTH

Multi-Nutrient Dynamic Models of Algal Growth and Species Competition in Eutrophic Lakes,
W74-06568 5C

ALGICIDES

The Mercury Pollution Problem in Michigan,
W74-06773 5B

ALGORITHMS

Network Analysis of Conjunctively Operated Ground Water-Surface Water Systems,
W74-06504 4B

An Algorithm for Monitoring Hydrometeorological Information,
W74-06733 2B

Digital Control Algorithms. Part III. Tuning PI and PID Controllers,
W74-06750 7C

ALKALIS (BASES)

Organic Functional Group Analysis Via Gas Chromatograpy. III. Determination of Carbamates by Reaction with Alkali,
W74-06872 5A

ALKANES

Oxidation of n-Alkanes by Cladosporium resinae,
W74-06763 5C

ALPINE

On Flood Probabilities of East Alpine Rivers,
W74-06909 2E

ALPS

First ERTS-1 Results in Southeastern France: Geology, Sedimentology, Pollution at Sea,
W74-06687 4A

On Flood Probabilities of East Alpine Rivers,
W74-06909 2E

ALTERNATIVE PLANNING

Water Supply Management Alternatives for Rhode Island,
W74-06827 6D

Area Financing of Water Resource Development in West Minnesota,
W74-06846 6B

Techniques for Identifying and Evaluating Market and Nonmarket Benefits and Costs of Water Resource Systems.
W74-06852 6B

ALTERNATIVE WATER USE

Network Analysis of Conjunctively Operated Ground Water-Surface Water Systems,
W74-06504 4B

AMMONIA

Ammonia-Nitrogen Removal by Breakpoint Chlorination,
W74-06838 5D

AMMONIA REMOVAL

Nitrogen Removal by Ammonia Stripping,
W74-06842 5D

AMMONIUM WATER

Search for a Method for Sanitizing Sewage from Helminth Eggs Using Agrochemical Means. (Preliminary Communication), (In Russian),
W74-07018 5D

ANABAENA FLOS-AQUAE

Biological Response to Detergent and Nondetergent Phosphorus in Sewage - Part II,
W74-06873 5C

ANAEROBIC BACTERIA

Denitrification as a Pathway for Nitrate Removal in Aquatic Systems,
W74-06612 5B

Method of Preparing Washed Suspensions of Anaerobic Bacteria for Metabolic Studies,
W74-06875 5A

ANAEROBIC CONDITIONS

Oxidation of Organic Matter in Sediments,
W74-06528 5C

Buffer Capacity in Aquatic Ecosystems,
W74-06829 5B

Correlation Between CO2 and O2 Concentrations in Lake Erie, USA,
W74-07025 5C

ANALOG COMPUTERS

Cancellation of Spectrophotometer System Characteristics Using an Analog Computer,
W74-06874 2K

ANALYSIS

Component Description and Analysis of Environmental Systems: Oxygen Utilization in Aquatic Microcosms,
W74-06575 5C

Investigation of Mercury Contamination in the Tennessee Valley Region,
W74-06780 5B

ANALYTICAL TECHNIQUES

Synopsis of Workshop on Modeling of the Eutrophication Process,
W74-06561 5C

Environmental Mercury Contamination.
W74-06770 5B

Methods of Analysis for Mercury and its Compounds: A Review,
W74-06785 5A

Mercury Content of Canadian Foods and Cereals Determined by Different Methods,
W74-06787 5A

Determination of Mercury in Biological Tissues,
W74-06790 5A

The Determination of Ethylmercury in Blood,
W74-06791 5A

The Determination of Mono- and Dimethylmercury Compounds by Gas Chromatography,
W74-06792 5A

Evaluation of a Microwave-Induced Plasma Spectrometer for Trace Analysis,
W74-06841 5A

ANIMAL PATHOLOGY

Biological Reactions and Pathological Changes in Human Beings and Animals Caused by Organic Mercury Contamination,
W74-06804 5C

ANIMAL WASTES (PIGS)

Balantidiasis Outbreak in Truk,
W74-07031 5C

ANTARCTIC
Chemical Profile of the Ross Ice Shelf at Little America V, Antarctica,
W74-06921 2C

Folding of Cold Ice,
W74-06928 2C

Analysis of Iodine in Antarctic Snow,
W74-06929 5B

Silver Concentrations in Antarctic Snow and Firn,
W74-06930 5A

Analysis of the Concentration of Microparticles in the Long Ice Core from Byrd Station,
W74-06931 2C

PB-210 Concentration in Ice Measured at South Pole Station,
W74-06932 5A

APPOMATTOX RIVER (VA)
Flood of October 1972 at Petersburg and Colonial Heights, Virginia,
W74-06957 7C

AQUATIC ALGAE
The Genus Neochloris Starr (Chlorophyceae, Chlorococcales),
W74-06760 5A

AQUATIC ENVIRONMENT
Freshwater Biology and Pollution Ecology: Training Manual.
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AQUATIC HABITATS
Choctawhatchee River and Holmes Creek, Florida, Permit Application by Florida Game and Fresh Water Fish Commission (Final Environmental Impact Statement).
W74-06985 4A

AQUATIC INSECTS
Observations on Comparative Propensities for Carp Fry Destruction by Adults and Last Instar Preimaginal Stages of Predatory Aquatic Insects,
W74-07044 2I

AQUATIC LIFE
Freshwater Biology and Pollution Ecology: Training Manual.
W74-06558 5A

AQUATIC PLANTS
The Effects of Ecological Changes on Buckeye Lake, Ohio, with Emphasis on Largemouth Bass and Aquatic Vascular Plants,
W74-06546 5C

Aquatic Vegetation of the Ottowa River Near Chalk River Nuclear Laboratories (CRNL),
W74-06819 5C

AQUATIC POPULATIONS
Uptake of Natural Radioisotopes by Aquatic Organisms,
W74-06534 5C

AQUATIC PROCESS SIMULATOR
A Physical Model for Simulation of Aquatic Ecosystems,
W74-06573 5C

AQUATIC WEED CONTROL
Basic Research in the Aquatic Environment: Effects of Eutrophication on Phytoplankton Populations and Selected Species of Aquatic Vascular Plants,
W74-06835 5C

AQUATIC WEEDS
Processing, Chemical Composition and Nutritive Value of Aquatic Weeds,
W74-06502 4A

AQUEOUS SOLUTIONS
Complexim etric Determination of Phosphate,
W74-06757 5A

Selectrode - the Universal Ion-Selective Electrode. Part VII. A Valinomycin-Based Potassium Electrode with Nonporous Polymer Membrane and Solid-State Inner Reference System,
W74-06765 5A

New Spot Tests for Nitrates and Nitrites,
W74-06878 5A

AQUICULTURE
Legal and Administrative Aspects of an Aquaculture Policy for Hawaii, An Assessment,
W74-06992 6E

AQUIFER CHARACTERISTICS
Ground-Water Hydrology of Northern Napa Valley, California,
W74-06880 2F

ARCTIC
An Expanding Role for Subarctic Watershed Research,
W74-06884 4D

ARID LANDS
Applications of Remote Sensing (ERTS) to Resource Management and Development in Sahelien Africa (Republic of Mali),
W74-06686 4A

ARIZONA
Change in Land Use in the Phoenix (1:250,000) Quadrangle, Arizona between 1970 and 1972: Successful Use of a Proposed Land Use Classification System,
W74-06622 4A

ARSENIC
Distribution and Circulation of Arsenic Through Water, Organisms and Sediments of Lake Michigan,
W74-07046 5B

ARTEMIA
Using Artemia to Assay Oil Dispersant Toxicities,
W74-06877 5A

ARTESIAN AQUIFERS
A Discrete Space Continuous Time Modeling Approach to Nonsteady Flow in a Leaky Aquifer System of Finite Configuration,
W74-06887 2F

On the Leakage Assumption Applied to Equations of Groundwater Flow,
W74-06888 2F

ARTIFICIAL RECHARGE
A Physical Model for Prediction and Control of Saltwater Intrusion in the Floridan Aquifer,
W74-06609 2F

Ground-Water Recharge Strip Basin-Experiments,
W74-06740 4B

ASPHALT
Development of Asphalt Moisture Barrier Equipment,
W74-06586 3F

ASSAY
(Radiation Data, Section II. Water).
W74-06856 5A

Using Artemia to Assay Oil Dispersant Toxicities,
W74-06877 5A

ATLANTIC OCEAN
Oceanographic Features in the Lee of the Windward and Leeward Islands: ERTS and Ship Data,
W74-06674 2E

ATOMIC ABSORPTION
Atomic Absorption Detector for Liquid-Liquid Chromatography,
W74-06998 5A

An Atomic Absorption Analysis Method for Cyanide,
W74-06999 5A

ATOMIC ABSORPTION SPECTROPHOTOMETRY
Determination of Mercury in Biological Tissues,
W74-06790 5A

ATTITUDES
Intergovernmental Relations as seen by Florida State Legislators: Land Use and Water Resource Problems,
W74-06845 6B

AUSTRALIA
Effect of Plant Growth and Form of Nitrogen Fertilizer on Dentrification from Four South Australian Soils,
W74-07039 2G

AUSTRALIA (MACLEAY RIVER)
Seasonal and Stratigraphic Controls in Coastal Floodplain Soils,
W74-07030 2G

AUTOMATIC CONTROL
Automatic Processing and Verification of Meteorological Observations.
W74-06722 2B

Fundamentals of Automatic Control of Meteorological Data,
W74-06724 2B

Automatic Monitoring of Daily Results of Basic Meteorological Observations,
W74-06727 2B

Automatic Method of Monitoring the Quality of Mean Monthly Meteorological Data,
W74-06728 2B

Automatic Monitoring of Processing of Daily Radiosonde Data on Temperature and Geopotential,
W74-06729 2B

Automatic Monitoring and Processing of Hourly Hydrometeorological Information,
W74-06730 2B

Automatic Processing of Rainfall Data,
W74-06732 2B

Digital Control Algorithms. Part III. Tuning PI and PID Controllers,
W74-06750 7C

AUTOMATIC EQUIPMENT
A Simple Automatic Soil Percolator,
W74-06531 7B

BACKWATER
Annual Cycle of Zooplankton in Backwaters of the Flood Area of the Dyje,
W74-06536 5C

BALANCE OF NATURE
Three-Year Evolution,
W74-06970 6G

BALANTIDIASIS
Balantidiasis Outbreak in Truk,
W74-07031 5C

BALTIMORE HARBOR
Distribution of Metals in Baltimore Harbor Sediments,
W74-06924 5B

BASELINE STUDIES
Effects of Ground-Water Development on the Proposed Palmetto Bend Dam and Reservoir in Southeast Texas,
W74-06920 4B

BASS
The Effects of Ecological Changes on Buckeye Lake, Ohio, with Emphasis on Largemouth Bass and Aquatic Vascular Plants,
W74-06546 5C

BASS (STRIPED)
An Evaluation of Striped Bass Fingerling Culture,
W74-07002 8I

BATHYMETRY
Water Depth Estimation with ERTS-1 Imagery,
W74-06680 2L

Calculations of Water Depth From ERTS-MSS Data,
W74-06681 2E

BEACH EROSION
Seasonal Changes of Littoral Transport and Beach Width and Resulting Effect on Protective Structures,
W74-06664 2L

Recognition of Beach and Nearshore Depositional Features of Chesapeake Bay,
W74-06665 2L

BEAUFORT SEA
Investigations Performed on the Arctic Ice Dynamics Joint Experiment, March 1971,
W74-06716 2C

Mesoscale Strain Measurements on the Beaufort Sea Pack Ice,
W74-06717 2C

Structure of a Multiyear Pressure Ridge,
W74-06718 2C

Top and Bottom Roughness of a Multiyear Ice Floe,
W74-06719 2C

Airphoto Analysis of Ice Deformation in the Beaufort Sea,
W74-06720 2C

Data on Morphological and Physical Characteristics of Sea Ice in the Beaufort Sea,
W74-06721 2C

BENEFICIAL USE
Use of Waste Heat for Soil Warming in North Carolina,
W74-07000 5D

BENEFITS
A Review of Soviet Data on the Peaceful Uses of Nuclear Explosions,
W74-06823 6B

BENTHIC FAUNA
Macrobenthos of Ponds with Sugar Factory Wastes,
W74-06553 5C

Stream Pollution and a Simplified Diversity Index,
W74-06876 5A

BENTHOS
The Effects of Waste Disposal in the New York Bight. Sections 7, 8, and 9.
W74-06868 5C

BENTONITE
Electro-Osmotic Effects in a Bentonite-Water System,
W74-06910 2K

BIBLIOGRAPHIES
Evaporation Suppression, A Bibliography.
W74-06501 3D

Cyanophages - Viruses Attacking Blue-Green Algae,
W74-06754 5C

Methods of Analysis for Mercury and its Compounds: A Review,
W74-06785 5A

Bibliography of Water Management.
W74-06854 3F

Environmental Aspects of Plutonium and Other Elements, a Selected Annotated Bibliography.
W74-06857 5C

The Effects of Waste Disposal in the New York Bight. Sections 7, 8, and 9.
W74-06868 5C

BIOASSAY
Effects of Oil Dispersants and Oil Emulsions on Marine Animals,
W74-06745 5C

Chemical Aspects of Bioassay Techniques for Establishing Water Quality Criteria,
W74-06747 5A

Temperature Control of Reproduction and Productivity in a Subarctic Coralline Alga,
W74-06751 5C

Lead Inhibition of Hormotila blennista (Chlorophyceae, Chlorococcales),
W74-06761 5C

Mercury as a Hydrospheric Pollutant II. Biological Half-Time of Methyl Mercury in Four Mediterranean Species: A Fish, a Crab, and Two Molluscs,
W74-06767 5C

Biological Response to Detergent and Nondetergent Phosphorus in Sewage - Part II,
W74-06873 5C

Using Artemia to Assay Oil Dispersant Toxicities,
W74-06877 5A

BIOCHEMICAL OXYGEN DEMAND
Unrecorded Pollution and Dynamics of Biochemical Oxygen Demand,
W74-06613 5B

BIOCHEMISTRY
Detection and Appraisal of Subchronical Intoxications,
W74-06810 5C

BIOGENIC ACTIVITY
Production and Biogenic Activity of Distillates, Filtrates and Extracts from the Pomorie and Atanasovo Lagoon Mud, (In Bulgarian),
W74-07003 2H

BIOINDICATORS
Mercury in Wild Animals, Lake St Clair, 1970,
W74-06776 5B

Stream Pollution and a Simplified Diversity Index,
W74-06876 5A

BIOLOGICAL COMMUNITIES
The Role of Food Chains in Environmental Mercury Contamination,
W74-06795 5B

BIOLOGICAL SAMPLES
Preparation of Biological Samples for Neutron Activation Analysis of Mercury,
W74-06786 5A

BIOLOGICAL TREATMENT
Biological Treatment of Feedlot Runoff,
W74-06847 5D

BIOLOGY
Water Pollution and Biology, (In Polish),
W74-07020 5B

BIOOXIDATION
Oxidation of n-Alkanes by Cladosporium resinae,
W74-06763 5C

BIORTHYMS
Endogenous and Photoperiodic Diurnal Rhythms of in Vivo Light Absorption and Scattering in the Green Alga Ulva Lactuca L.,
W74-06547 5C

BIOSPHERE
Energy Flows in the Biosphere: The Impact of Man,
W74-07043 2B

BIOTA
Phytoplankton Population Changes and Nutrient Fluctuations in a Simple Aquatic Ecosystem Model,
W74-06571 5C

An Ecological Account of the Past and Future of South African Rivers,
W74-06606 5C

Stream Pollution and a Simplified Diversity Index,
W74-06876 5A

BIOTRANSFORMATION
Biotransformation of Organo-Mercurials in Mammals,
W74-06802 5C

BIRDS
Mercury and Food Chains,
W74-06796 5B

Survival and Reproduction of Ring-Necked Pheasants Consuming Two Mercurial Fungicides,
W74-06808 5C

BISCAYNE BAY (FLA)
Origin of Circular Beds of Thalassia (Spermatophyta:Hydrocharitaceae) in South Biscayne Bay, Florida, and Their Relationship to Mangrove Hammocks,
W74-07022 5A

BLACK SEA
Atlantic Sturgeon (Acipenser sturio) in Waters of Georgia, (In Russian),
W74-07016 2H

BLOOD ANALYSIS
The Determination of Ethylmercury in Blood,
W74-06791 5A

BOG MATS
Preliminary Report of the Role of Sphagnum in the Cycling of Phosphorus in a Bog-Lake System,
W74-06743 5C

BOGS
Organic Phosphorus Compounds of a Northern Michigan Bog, Bog-Lake System,
W74-06742 5C

Ionic State and Coordination of Iron in Bog Lakes,
W74-06744 5C

BOHEMIA (CZECHOSLOVAKIA)
Survey of Reservoirs in Bohemia and Their Water Quality,
W74-06537 5C

BORDER IRRIGATION
Mathematical Model of Water Advance in Border Irrigation,
W74-06582 3F

Hydrodynamics of Border Irrigation Advance,
W74-06592 3F

BORON
Phosphorimetric Determination of Traces of Boron,
W74-06755 5A

BOTTOM SEDIMENTS
Some Comments on Seagrasses and Sedimentary Processes,
W74-06922 2J

The CBI Pogo Stick Corer,
W74-06923 7B

BOUNDARIES (PROPERTY)
Establishment of Mean High Water Lines in Florida Lakes,
W74-06610 2H

BOUNDARIES (SURFACES)
On Squire's Theorem in the Study of Hydrodynamic Stability of Plane-Parallel Flows of Incompressible Fluids about Deforming Boundaries,
W74-06911 8B

BREAKPOINT CHLORINATION
Ammonia-Nitrogen Removal by Breakpoint Chlorination,
W74-06838 5D

BREEDING (MOSQUITOES)
Control of Mosquitoes Breeding in Rice-Fields,
W74-07041 5G

BREWING WATERS (TREATMENT)
Investigation of Brewing Water Treatment,
W74-07023 5A

BRINE EVAPORATION
Evaporation from Brine Storage Reservoirs,
W74-06517 2D

BRINE SHRIMP
Using Artemia to Assay Oil Dispersant Toxicities,
W74-06877 5A

BRINE STORAGE RESERVOIRS
Evaporation from Brine Storage Reservoirs,
W74-06517 2D

BRITISH COLUMBIA
Use of ERTS-1 Pictures in Coastal Oceanography in British Columbia,
W74-06707 2L

BROMEGRASS
Quality Improvement of Feedlot Lagoon Water by Percolation Through Soil Under Native Pasture,
W74-06830 5D

BROMINE
Groundwater Tracing with Post Sampling Activation Analysis,
W74-06889 2F

BUBBLES
Hypolimnion Aeration with Commercial Oxygen - Vol. I - Dynamics of Bubble Plume,
W74-06525 5D

Hypolimnion Aeration with Commercial Oxygen - Vol. II - Bubble Plume Gas Transfer,
W74-06526 5D

BUCKEYE LAKE (OHIO)
The Effects of Ecological Changes on Buckeye Lake, Ohio, with Emphasis on Largemouth Bass and Aquatic Vascular Plants,
W74-06546 5C

BUFFER CAPACITY
Buffer Capacity in Aquatic Ecosystems,
W74-06829 5B

BUFFERING (PH)
Buffer Intensities and Equilibrium pH of Minerals and Soils: 1. The Contribution of Minerals and Aqueous Carbonate to pH Buffering,
W74-06904 2G

Buffer Intensities and Equilibrium pH of Minerals and Soils: II. Theoretical and Actual pH of Minerals and Soils,
W74-06905 2G

BULGARIA
Production and Biogenic Activity of Distillates, Filtrates and Extracts from the Pomorie and Atanasovo Lagoon Mud, (In Bulgarian),
W74-07003 2H

BULK COMMODITIES
U.S. Deepwater Port Study, Vol. 2. Commodity Studies and Projections,
W74-06863 6D

U.S. Deepwater Port Study, Vol 3. Physical Coast and Port Characteristics, and Selected Deepwater Port Alternatives,
W74-06864 6D

BULK DENSITY
Gamma Radiation Measurements of Bulk Density Changes in a Soil Pedon Following Irrigation,
W74-06715 2G

BYPRODUCTS
Recovery of Fatty Materials from Edible Oil Refinery Effluents,
W74-06514 5D

CALCITE
Kinetics of the Phosphate Interaction with Calcite,
W74-06895 5B

CALCIUM
A Universal Ion-Selective Electrode Based on Graphite Paste,
W74-06758 2K

CALCIUM ELECTRODES
Selectrode - the Universal Ion-Selective Electrode. Part VI. The Calcium (II) Selectrode Employing a New Ion Exchanger in a Nonporous Membrane and a Solid-State Reference System,
W74-06764 5A

CALIBRATIONS
Experimental Masking of RBV Images to Reduce Stationary Residual Inaccuracies in Radiometric Correction,
W74-06649 7C

Digital Rectification of ERTS Multispectral Imagery,
W74-06650 7C

Results of Precision Processing (Scene Correction) of ERTS-1 Images Using Digital Image Processing Techniques,
W74-06651 7C

Significant Techniques in the Processing and Interpretation of ERTS-1 Data,
W74-06652 7C

Computer Techniques Used for Some Enhancements of ERTS Images,
W74-06653 7C

Digital Enhancement of Multispectral MSS Data for Maximum Image Visibility,
W74-06654 7C

ERTS-1 Image Enhancement by Optically Combining Density Slices,
W74-06655 7C

Digital Interactive Image Analysis by Array Processing,
W74-06657 7C

Combining Human and Computer Interpretation Capabilities to Analyze ERTS Imagery,
W74-06658 7C

Analysis of ERTS Imagery Using Special Electronic Viewing/Measuring Equipment,
W74-06659 7C

Combined Spectral and Spatial Processing of ERTS Imagery Data,
W74-06660 7C

Terrain Type Recognition Using ERTS-1 MSS Images,
W74-06661 7C

Classification of ERTS-1 MSS Data by Canonical Analysis,
W74-06662 7C

DCP-Collected Absolute Target Reflectance Signatures Assist Accurate Interpretation of ERTS-1 Imagery,
W74-06688 7C

CALIBRATIONS

Computed Atmospheric Effects on ERTS Observations,
W74-06694 2B

The Evaporation from a Water Pan--Its Limited Significance (L'evaporation d'un bac d'eau libre--sa signification restreinte),
W74-06908 2D

CALIFORNIA
Ecological and Physiological Implications of Greenbelt Irrigation,
W74-06608 5D

Land Use Investigations in the Central Valley and Central Coastal Test Sites, California,
W74-06623 4A

Land Use in Northern Coachella Valley,
W74-06624 4A

First Look Analyses of Five Cycles of ERTS-1 Imagery Over County of Los Angeles: Assessment of Data Utility for Urban Development and Regional Planning,
W74-06636 4A

Pseudocolor Transformation of ERTS Imagery,
W74-06656 7C

Assessment of Southern California Environment From ERTS-1,
W74-06685 4A

The Environmental Impulse and its Competitors: Attitudes, Interests, and Institutions at Lake Tahoe,
W74-06843 6E

Ground-Water Hydrology of Northern Napa Valley, California,
W74-06880 2F

Procedings Ninth Biennial Conference on Ground Water.
W74-06942 5B

Conjunctive Operation of Southern California Ground Water Basins with the State Water Project,
W74-06943 4B

Protecting Ground Water Quality--Some Problems and Solutions,
W74-06946 5B

Ground Water Quality Data for Planning, Monitoring and Surveillance,
W74-06947 5A

Effects of Sewage Disposal and Reclamation on Ground Water Quality,
W74-06948 5D

Agricultural Wastes and Ground Water Quality,
W74-06951 5B

The Federal Role and Legislative Trends in Control of Ground Water Quality,
W74-06952 5G

Current State Board Activities in Ground Water Quality Management,
W74-06953 5G

Impact of Water Pollution Control Legislation on Meeting Future Water Needs in California,
W74-06954 5G

Patterson Watershed Project, Stanislaus County, California (Final Environmental Impact Statement).
W74-06987 4A

Lower Klamath River Flood Control Project, Del Norte County, California (Final Environmental Impact Statment).
W74-06989 4A

A Simulation Approach to Recreation Planning (A Case of Changing Quality),
W74-06996 6B

CALORIC CONTENT
The Effect of Season and Animal Size on the Caloric Content of Daphnia pulicaria Forbes,
W74-07038 2H

CANADA
Use of ERTS-1 Pictures in Coastal Oceanography in British Columbia,
W74-06707 2L

Mercury Content of Canadian Foods and Cereals Determined by Different Methods,
W74-06787 5A

Aquatic Vegetation of the Ottowa River Near Chalk River Nuclear Laboratories (CRNL),
W74-06819 5C

Eight Years of Observations on the Water Level at Quebec and Grondines 1962-1969: Part I--Analysis of the Tidal Signal,
W74-06926 2E

Estimates of Prairie Provincial Wheat Yields Based on Precipitation and Potential Evapotranspiration,
W74-07027 3F

CANADA (MARION LAKE-B
Systems Analysis in the Marion Lake IBP Project,
W74-07010 5C

CANADA (WEST BLUE LAKE-MANITOBA)
The Effect of Season and Animal Size on the Caloric Content of Daphnia pulicaria Forbes,
W74-07038 2H

CANALS
Proposal for Oklawaha River, Ocala National Forest, Florida, (Final Environmental Impact Statement).
W74-06993 4A

CANOPY
Studies of the Forest Energy Budget,
W74-06518 2D

CAPILLARY ACTION
Capillary Properties of Soils - Influence upon Specific Yield,
W74-06584 2F

CAPILLARY CONDUCTIVITY
Unsteady Radial Flow in Partially Saturated Soils,
W74-06587 2G

CARBAMATE PESTICIDES
Organic Functional Group Analysis Via Gas Chromatograpy. III. Determination of Carbamates by Reaction with Alkali,
W74-06872 5A

CARBON DIOXIDE
Correlation Between CO2 and O2 Concentrations in Lake Erie, USA,
W74-07025 5C

CARBON MONOXIDE
Analysis of the Feasibility of an Experiment to Measure Carbon Monoxide in the Atmosphere,
W74-06917 5A

CAROLINE ISLANDS (TRUK)
Balantidiasis Outbreak in Truk,
W74-07031 5C

CARP FRY
Observations on Comparative Propensities for Carp Fry Destruction by Adults and Last Instar Preimaginal Stages of Predatory Aquatic Insects,
W74-07044 2I

CATALYTIC OXIDATION
A Design and Economic Evaluation of Catalytic Oxidation of Phenols in Wastewater,
W74-06516 5D

CATFISH
The Mercury Content of Prehistoric Fish,
W74-07026 5A

CATIONS
Chemical Profile of the Ross Ice Shelf at Little America V, Antarctica,
W74-06921 2C

CAYUGA LAKE (NEW YORK)
The Runoff of Water and Nutrients from Watersheds Tributary to Cayuga Lake, New York,
W74-06848 5B

Water and Nutrient Budgets for Cayuga Lake, New York,
W74-06849 5B

CEDAR RIVER (WASH)
Studies of the Forest Energy Budget,
W74-06518 2D

CENTER-PIVOT SPRINKLERS
Pasture Irrigation with a Center-Pivot Sprinkler System,
W74-06601 3F

CENTER PIVOT SYSTEM
Hydraulics of a Center Pivot System,
W74-06583 3F

CENTRIFUGATION
Recovery of Fatty Materials from Edible Oil Refinery Effluents,
W74-06514 5D

Method of Preparing Washed Suspensions of Anaerobic Bacteria for Metabolic Studies,
W74-06875 5A

CERATOPHYLLUM
Nitrogen Turnover in Impoundments,
W74-06505 5C

CESIUM
Estimating Soil Erosion from the Redistribution of Fallout Cs-137,
W74-06901 2J

CHAIN PICKEREL
Spring Food of Chain Pickerel (Esox niger) in Maine Lakes,
W74-07032 2H

CHARTS
A Chart of New York Water Law,
W74-06614 6E

CHELATING AGENTS
Atomic Absorption Detector for Liquid-Liquid Chromatography,
W74-06998 5A

CHELATION
Atomic Absorption Detector for Liquid-Liquid Chromatography,
W74-06998 5A

CHEMICAL ANALYSIS
Chemical Aspects of Bioassay Techniques for Establishing Water Quality Criteria,
W74-06747 5A

New Spot Tests for Nitrates and Nitrites,
W74-06878 5A

CHEMICAL PROCESSING
The Stack Monitoring System at the Idaho Chemical Processing Plant,
W74-06824 5A

CHEMICAL PROPERTIES
Studies on the Phytoplankton Ecology of the Trondheimsfjord. I. The Chemical Composition of Phytoplankton Populations,
W74-06545 5C

CHEMICAL REACTIONS
Factors in the Transformation of Mercury to Methylmercury,
W74-06794 5B

Buffer Capacity in Aquatic Ecosystems,
W74-06829 5B

CHEMICAL TREATMENT
Demonstration of a Non-Aqueous Sewage Disposal System,
W74-06519 5D

CHEMICAL WASTES
Sources of Mercury in the Environment,
W74-06771 5B

The Effects of Waste Disposal in the New York Bight. Section 3: Zooplankton Studies.
W74-06866 5C

CHEMISTRY OF PRECIPITATION
University of Chicago Contribution to Project Metromex-I.
W74-06937 2B

Radar Studies of Urban Precipitation Anomaly,
W74-06938 2B

Observations of the Cloud Nucleus Concentration Around the St. Louis Urban Complex,
W74-06939 2B

Upwind and Downwind Cloud-Base Microstructure,
W74-06940 2B

Metromex Temperature and Aerosol Data Reduction: Analysis of the Urban Anomaly,
W74-06941 2B

CHESAPEAKE BAY
Seasonal Changes of Littoral Transport and Beach Width and Resulting Effect on Protective Structures,
W74-06664 2L

Recognition of Beach and Nearshore Depositional Features of Chesapeake Bay,
W74-06665 2L

Correlation of ERTS Multispectral Imagery with Suspended Matter and Chlorophyll in Lower Chesapeake Bay,
W74-06667 2L

Distribution of Metals in Baltimore Harbor Sediments,
W74-06924 5B

CHINOOK SALMON
Social Interaction Between Juvenile Coho (Oncorhynchus kisutch) and Fall Chinook Salmon (O. tshawytscha) in Sixes River, Oregon,
W74-07040 2I

CHLORELLA
Absence of Oxygen-Evolving Capacity in Dark-Grown Chlorella: The Photoactivation of Oxygen-Evolving Centers,
W74-06544 5C

CHLORIDES
A Universal Ion-Selective Electrode Based on Graphite Paste,
W74-06758 2K

CHLORINATION
Coliform Bacteria Growth and Control in Aerated Stabilization Basins,
W74-06520 5D

Ammonia-Nitrogen Removal by Breakpoint Chlorination,
W74-06838 5D

CHLORINE
Chlorine Production Drops as Demand Lags.
W74-06766 5B

CHLOROPHYLL
Correlation of ERTS Multispectral Imagery with Suspended Matter and Chlorophyll in Lower Chesapeake Bay,
W74-06667 2L

Studies on the Photosynthetic Pigments and Their Decomposition in the Sediment of Lake Balaton and Lake Belso,
W74-06741 5C

CHLOROPHYTA
Micro-Ecosystems Simulation of Primary Production in Thermal and Acid Mine Water Loadings Related to Water Use of the Monongahela River,
W74-06507 5C

Culture Studies of Enteromorpha Linza (L.) J.AG. and Ulvaria Oxysperma (Kutzing) Bliding (Chlorophyceae, Ulvales) From Central America,
W74-06749 5C

Horizontal Phytoplankton Studies in Lake Balaton Based on Scooped Samples and Filtrates Taken in 1967,
W74-06756 5C

The Genus Neochloris Starr (Chlorophyceae, Chlorococcales),
W74-06760 5A

CHOCTAWHATCHEE RIVER (FLA)
Choctawhatchee River and Holmes Creek, Florida, Permit Application by Florida Game and Fresh Water Fish Commission (Final Environmental Impact Statement).
W74-06985 4A

CHROMATOGRAPHY
Electron-Donor-Acceptor Complexing Reagents in the Analysis of Pesticides. VI. Influence of Structure in Detection and Identification,
W74-06871 5A

Azide and Ethylenethiourea Mobility in Soils,
W74-06896 5B

Atomic Absorption Detector for Liquid-Liquid Chromatography,
W74-06998 5A

CHRYSOPHYTA
Horizontal Phytoplankton Studies in Lake Balaton Based on Scooped Samples and Filtrates Taken in 1967,
W74-06756 5C

CITIES
Land Use of Northern Megalopolis,
W74-06630 4A

Investigations of an Urban Area and its Locale Using ERTS-1 Data Supported by U-Photography,
W74-06635 4A

First Look Analyses of Five Cycles of ERTS-1 Imagery Over County of Los Angeles: Assessment of Data Utility for Urban Development and Regional Planning,
W74-06636 4A

Preparation of Urban Land Use Inventories by Machine-Processing of ERTS MSS Data,
W74-06637 4A

A Comparison of Land-Use Determinations Using Data from ERTS-1 and High Altitude Aircraft,
W74-06638 4A

University of Chicago Contribution to Project Metromex-I.
W74-06937 2B

Radar Studies of Urban Precipitation Anomaly,
W74-06938 2B

Observations of the Cloud Nucleus Concentration Around the St. Louis Urban Complex,
W74-06939 2B

Upwind and Downwind Cloud-Base Microstructure,
W74-06940 2B

Metromex Temperature and Aerosol Data Reduction: Analysis of the Urban Anomaly,
W74-06941 2B

An Epidemiological Study on Clonorchiasis in Kyoto City, (In Japanese),
W74-07050 5C

CITY PLANNING
Use of ERTS-1 Data for Regional Planning in the Metropolitan Washington Council of Governments--A Short Brief,
W74-06700 4A

CLADOSPORIUM RESINAE
Oxidation of n-Alkanes by Cladosporium resinae,
W74-06763 5C

CLARIFICATION
Activated Sludge Treatment Systems with Oxygen,
W74-06839 5D

CLATHROMORPHUM CIRCUMSCRIPTUM
Temperature Control of Reproduction and Productivity in a Subarctic Coralline Alga,
W74-06751 5C

CLAYS
The Influence of Clay Fraction on the Basic Parameters of the Hydro-Transport of Fine Free-Flowing Materials,
W74-06914 8B

Thermodynamics of Ion Exchange,
W74-06936 2G

CLEAR-CUTTING
Multidisciplinary Application of ERTS-1 Data to North Carolina Natural Resource Management,
W74-06682 4C

CLIMATES
Physical Microclimates of Erosion-Control Structures in a Salt Desert Area,
W74-07029 2G

CLIMATIC DATA
Climatic Data of the High Altitude Meteorological Stations of the Geneva Region For 1970, (In French),
W74-06532 7C

Automatic Processing and Verification of Meteorological Observations.
W74-06722 2B

Computer Monitoring of Precipitation in Hungary,
W74-06726 2B

CLIMATOLOGY
Determination of Aerosol Content in the Atmosphere,
W74-06647 7C

Analysis of the Concentration of Microparticles in the Long Ice Core from Byrd Station,
W74-06931 2C

CLONORCHIASIS
An Epidemiological Study on Clonorchiasis in Kyoto City, (In Japanese),
W74-07050 5C

COACHELLA VALLEY (CALIF)
Land Use in Northern Coachella Valley,
W74-06624 4A

COAL MINE ACIDS
An Appraisal of Neutralization Processes to Treat Coal Mine Drainage,
W74-06512 5D

COAL MINE WASTES
The Impact of Slimes-Dam Formation on Water Quality and Pollution,
W74-06604 5B

COAL MINES
Identification and Mapping of Coal Refuse Banks and Other Targets in the Anthracite Region,
W74-06642 4A

COARSE SEDIMENTS
Distribution of Average Longitudinal Velocities in Flows with Coarse-Grained Materials,
W74-06915 8B

Energy Losses in a Two-Phase Flow Containing Coarse-Grain Material,
W74-06916 8B

COASTAL MARSHES
The Present and Future Status of Eastern North Carolina Wetlands,
W74-06850 2L

Coastal Wetlands in New England,
W74-06967 5G

COASTAL WATERS
Recent Developments in the Law of the Sea IV: A Synopsis,
W74-06965 6E

Ratification of Proposed Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (Final Environmental Impact Statement).
W74-06994 6E

COASTS
Coastal and Submarine Features on MSS Imagery of Southeastern Massachusetts: Comparison with Conventional Maps,
W74-06679 2L

Cooperative Gulf of Mexico Estuarine Inventory and Study, Florida: Phase I Area Description,
W74-06995 2L

COHO SALMON
Social Interaction Between Juvenile Coho (Oncorhynchus kisutch) and Fall Chinook Salmon (O. tshawytscha) in Sixes River, Oregon,
W74-07040 2I

COLD RESISTANCE
Growth of Streptococcus cremoris and Streptococcus lactis in a Chemostat. Production of Cells and Survival of Bacteria during Frozen Storage,
W74-06762 5C

COLIFORMS
Coliform Bacteria Growth and Control in Aerated Stabilization Basins,
W74-06520 5D

COLLEGES
Water Resources Research Interests in the Colleges and Universities of North Carolina.
W74-06616 9A

COLOR REMOVAL
Color Removal from Kraft Mill Effluents by Ultrafiltration,
W74-06521 5D

COLORADO
A Large Undisturbed, Weighing Lysimeter for Grassland Studies,
W74-06581 2G

Hydrologic Data from the Piceance Basin, Colorado.
W74-06714 4B

COLORADO RIVER BASIN
Quality of Ground Water in the Lower Colorado River Region, Arizona, Nevada, New Mexico, and Utah,
W74-06960 7C

COLUMBIA
Culture Studies of Enteromorpha Linza (L.) J.AG. and Ulvaria Oxysperma (Kutzing) Bliding (Chlorophyceae, Ulvales) From Central America,
W74-06749 5C

COMMERCIAL FISHING
Recent Developments in the Law of the Sea IV: A Synopsis,
W74-06965 6E

COMPARATIVE STUDIES
Observations on Comparative Propensities for Carp Fry Destruction by Adults and Last Instar Preimaginal Stages of Predatory Aquatic Insects,
W74-07044 2I

COMPLEXATION
An Atomic Absorption Analysis Method for Cyanide,
W74-06999 5A

COMPLEXIMETRIC TITRATION
Complexiметric Determination of Phosphate,
W74-06757 5A

COMPONENT ANALYSIS
Component Description and Analysis of Environmental Systems: Oxygen Utilization in Aquatic Microcosms,
W74-06575 5C

COMPONENT DESCRIPTION
Component Description and Analysis of Environmental Systems: Oxygen Utilization in Aquatic Microcosms,
W74-06575 5C

COMPREHENSIVE PLANNING
Final Environmental Statement Related to the Proposed Alvin W. Vogtle Nuclear Plant Units 1, 2, 3, and 4.
W74-06821 5B

COMPUTER MODELS
A Simulated Environmental Model of Temperature, Evaporation, Rainfall, and Soil Moisture,
W74-06591 3F

COMPUTER PROGRAMS
Aquatic Modeling in the Eastern Deciduous Forest Biome, U.S.-International Biological Program,
W74-06572 5C

A Computerized Solution for Bench Leveling Design,
W74-06600 4A

The EXREM III Computer Code for Estimating External Radiation Doses to Populations from Environmental Releases,
W74-06818 5B

Environmental Sciences Division Annual Progress Report for Period Ending September 30, 1973,
W74-06826 5B

CONJUNCTIVE USE
Network Analysis of Conjunctively Operated Ground Water-Surface Water Systems,
W74-06504 4B

Conjunctive Operation of Southern California Ground Water Basins with the State Water Project,
W74-06943 4B

CONNECTICUT
Plume Development in Long Island Sound Observed by Remote Sensing (ERTS-1),
W74-06668 2L

CONNECTICUT (LAKE WONONSKOPOMUS)
Effects of Alewives (Alosa pseudoharengus) on the Zooplankton of Lake Wononskopomus, Connecticut,
W74-07033 2H

CONSTRUCTION
The Challenge of Military Nuclear Construction,
W74-06859 8H

CONTROL SYSTEMS
Technical and Economic Evaluation of Cooling System Blowdown Control Techniques,
W74-06510 5D

The Stack Monitoring System at the Idaho Chemical Processing Plant,
W74-06824 5A

COOK INLET (ALAS)
ERTS-1 Observations of Sea Surface Circulation and Sediment Transport, Cook Inlet, Alaska,
W74-06670 2L

Sediment Distribution and Coastal Processes in Cook Inlet, Alaska,
W74-06671 2L

COOLING SYSTEM BLOWDOWN
Technical and Economic Evaluation of Cooling System Blowdown Control Techniques,
W74-06510 5D

COOLING TOWERS
Technical and Economic Evaluation of Cooling System Blowdown Control Techniques,
W74-06510 5D

COORDINATION
Legal Impediments to the Use of Interstate Agreements in Coordinated Fisheries Management Programs: States in the N.M.F.S. Southeast Region,
W74-06991 6E

COPEPODS
The Effects of Waste Disposal in the New York Bight. Section 3: Zooplankton Studies.
W74-06866 5C

COPPER
Interaction of Temperature and Copper Ions as Orienting Stimuli in the Locomotor Behavior of the Goldfish (Carassius auratus),
W74-06769 5C

Efficient Pricing for Urban Waste Water Renovation,
W74-06828 5D

CORE DRILLING
The CBI Pogo Stick Corer,
W74-06923 7B

CORRUGATED PLASTIC TUBING
Hydraulic Roughness of Corrugated Plastic Tubing,
W74-06589 8B

COST ALLOCATION
Efficient Pricing for Urban Waste Water Renovation,
W74-06828 5D

COST ANALYSIS
A Design and Economic Evaluation of Catalytic Oxidation of Phenols in Wastewater,
W74-06516 5D

COST-BENEFIT ANALYSIS
Activity Analysis and the Management of Resources: A Model for Control of Eutrophication,
W74-06574 5C

Deep Plowing - An Engineering Appraisal,
W74-06590 3F

Techniques for Identifying and Evaluating Market and Nonmarket Benefits and Costs of Water Resource Systems.
W74-06852 6B

COST FUNCTIONS
Production Function Theory and the Optimal Design of Waste Treatment Facilities,
W74-06997 6D

COSTA RICA
Culture Studies of Enteromorpha Linza (L.) J.AG. and Ulvaria Oxysperma (Kutzing) Blid-ing (Chlorophyceae, Ulvales) From Central America,
W74-06749 5C

CRABS
Mercury as a Hydrospheric Pollutant II. Biological Half-Time of Methyl Mercury in Four Mediterranean Species: A Fish, a Crab, and Two Molluscs,
W74-06767 5C

CRACKS
Field Measurement of Evaporation from Soil Shrinkage Cracks,
W74-06900 2D

CROP PRODUCTION
A Simulated Environmental Model of Temperature, Evaporation, Rainfall, and Soil Moisture,
W74-06591 3F

Dry and Wet, July-August Rainfall Areas in Iowa,
W74-07045 2B

CRUDE OIL
Effects of Oil Dispersants and Oil Emulsions on Marine Animals,
W74-06745 5C

CRYOLOGY
Investigations Performed on the Arctic Ice Dynamics Joint Experiment, March 1971,
W74-06716 2C

Mesoscale Strain Measurements on the Beaufort Sea Pack Ice,
W74-06717 2C

Structure of a Multiyear Pressure Ridge,
W74-06718 2C

Top and Bottom Roughness of a Multiyear Ice Floe,
W74-06719 2C

Airphoto Analysis of Ice Deformation in the Beaufort Sea,
W74-06720 2C

Data on Morphological and Physical Characteristics of Sea Ice in the Beaufort Sea,
W74-06721 2C

CULTIVATION
Evaluation of a Furrow Modifying Device,
W74-06588 3F

Deep Plowing - An Engineering Appraisal,
W74-06590 3F

Soil and Water Losses as Affected by Tillage Practices,
W74-06595 3F

CULTURE MEDIA
Growth of Streptococcus cremoris and Streptococcus lactis in a Chemostat. Production of Cells and Survival of Bacteria during Frozen Storage,
W74-06762 5C

CULTURES
Culture Studies of Enteromorpha Linza (L.) J.AG. and Ulvaria Oxysperma (Kutzing) Blid-ing (Chlorophyceae, Ulvales) From Central America,
W74-06749 5C

An Examination of Three Strains of the Blue-Green Algal Genus, Fremyella,
W74-06759 5C

Oxidation of n-Alkanes by Cladosporium resinae,
W74-06763 5C

An Evaluation of Striped Bass Fingerling Culture,
W74-07002 8I

CYANIDE
Investigation of Treating Electroplaters Cyanide Waste by Electrodialysis,
W74-06522 5D

An Atomic Absorption Analysis Method for Cyanide,
W74-06999 5A

CYANOPHAGES
Cyanophages - Viruses Attacking Blue-Green Algae,
W74-06754 5C

CYANOPHYTA
Cyanophages - Viruses Attacking Blue-Green Algae,
W74-06754 5C

An Examination of Three Strains of the Blue-Green Algal Genus, Fremyella,
W74-06759 5C

CYCLES
Annual Cycle of Zooplankton in Backwaters of the Flood Area of the Dyje,
W74-06536 5C

CYCLING NUTRIENTS
Some Aspects of Phosphorus Dynamics of the Twin Lakes Watershed,
W74-06565 5C

The Role of Thermocline Migration in Regulating Algal Blooms,
W74-06566 5C

Rates of Carbon, Oxygen, Nitrogen, and Phosphorus Cycling Through Microbial Populations in Stratified Lakes,
W74-06569 5C

Preliminary Report of the Role of Sphagnum in the Cycling of Phosphorus in a Bog-Lake System,
W74-06743 5C

CYTOLOGICAL STUDIES
Culture Studies of Enteromorpha Linza (L.) J.AG. and Ulvaria Oxysperma (Kutzing) Blid-ing (Chlorophyceae, Ulvales) From Central America,
W74-06749 5C

Growth of Streptococcus cremoris and Streptococcus lactis in a Chemostat. Production of Cells and Survival of Bacteria during Frozen Storage,
W74-06762 5C

CZECHOSLOVAKIA (HRON RIVER)
Natural Phytocenoses of the River Littoral in the Lower Reaches of the River Hron,
W74-06550 2I

DAMS
Woodcock Creek Lake, French Creek Basin, Pennsylvania (Final Environmental Impact Statement).
W74-06986 8A

DAPHNIA
Tertiary Treatment with a Controlled Ecological System.
W74-06524 5D

Energetics of Daphnia Ambigua,
W74-06831 5C

DAPHNIA-PULICARIA
The Effect of Season and Animal Size on the Caloric Content of Daphnia pulicaria Forbes,
W74-07038 2H

DARK GROWN
Absence of Oxygen-Evolving Capacity in Dark-Grown Chlorella: The Photoactivation of Oxygen-Evolving Centers,
W74-06544 5C

DATA
Investigation of Mercury Contamination in the Tennessee Valley Region,
W74-06780 5B

DATA COLLECTIONS
Multidisciplinary Application of ERTS-1 Data to North Carolina Natural Resource Management,
W74-06682 4C

Unique Characteristics of ERTS,
W74-06689 7B

ERTS-1 Applied for Structural and Morphological Investigations Case Studies: (1) Los Angeles, California and (2) Coastal Plain, New Jersey,
W74-06690 7C

Detection of Turbidity Dynamics in Tampa Bay, Florida Using Multispectral Imagery from ERTS-1,
W74-06711 2L

DATA PROCESSING
Automatic Interpretation of ERTS Data for Forest Management,
W74-06643 4A

Atmospheric Effects in ERTS-1 Data, and Advanced Information Extraction Techniques,
W74-06646 7C

Determination of Aerosol Content in the Atmosphere,
W74-06647 7C

A Technique for Correcting ERTS Data for Solar and Atmospheric Effects,
W74-06648 7C

Experimental Masking of RBV Images to Reduce Stationary Residual Inaccuracies in Radiometric Correction,
W74-06649 7C

Digital Rectification of ERTS Multispectral Imagery,
W74-06650 7C

Results of Precision Processing (Scene Correction) of ERTS-1 Images Using Digital Image Processing Techniques,
W74-06651 7C

Significant Techniques in the Processing and Interpretation of ERTS-1 Data,
W74-06652 7C

Computer Techniques Used for Some Enhancements of ERTS Images,
W74-06653 7C

Digital Enhancement of Multispectral MSS Data for Maximum Image Visibility,
W74-06654 7C

ERTS-1 Image Enhancement by Optically Combining Density Slices,
W74-06655 7C

Pseudocolor Transformation of ERTS Imagery,
W74-06656 7C

Digital Interactive Image Analysis by Array Processing,
W74-06657 7C

Combining Human and Computer Interpretation Capabilities to Analyze ERTS Imagery,
W74-06658 7C

Analysis of ERTS Imagery Using Special Electronic Viewing/Measuring Equipment,
W74-06659 7C

Combined Spectral and Spatial Processing of ERTS Imagery Data,
W74-06660 7C

Terrain Type Recognition Using ERTS-1 MSS Images,
W74-06661 7C

Classification of ERTS-1 MSS Data by Canonical Analysis,
W74-06662 7C

In Situ Spectroradiometric Quantification of ERTS Data,
W74-06663 2G

Digital Data Processing of ERTS-1 Imagery of Delaware Bay,
W74-06703 2L

The Use of Photographic Methods in Contrast Enhancement of ERTS-1 Images,
W74-06704 7C

Precision Annotation of Predetermined Primary Sampling Units on ERTS-1 MSS Images,
W74-06705 4A

Unsupervised Classification and Areal Measurement of Land and Water Coastal Features on the Texas Coast,
W74-06706 2L

Automatic Processing and Verification of Meteorological Observations.
W74-06722 2B

Machine Control of the Quality of Observations in Automated Hydrometeorological-Data Processing,
W74-06723 2B

Fundamentals of Automatic Control of Meteorological Data,
W74-06724 2B

Automatic Check and Correction of Meteorological Data in East Germany,
W74-06725 2B

Computer Monitoring of Precipitation in Hungary,
W74-06726 2B

Automatic Monitoring of Daily Results of Basic Meteorological Observations,
W74-06727 2B

Automatic Method of Monitoring the Quality of Mean Monthly Meteorological Data,
W74-06728 2B

Automatic Monitoring of Processing of Daily Radiosonde Data on Temperature and Geopotential,
W74-06729 2B

Automatic Monitoring and Processing of Hourly Hydrometeorological Information,
W74-06730 2B

Some Principles of Objective Control of Marine Meteorological Information,
W74-06731 2B

Automatic Processing of Rainfall Data,
W74-06732 2B

An Algorithm for Monitoring Hydrometeorological Information,
W74-06733 2B

DATING
Establishment of Mean High Water Lines in Florida Lakes,
W74-06610 2H

DECAY
Behavior of Radioiodine in the Environment and in Man,
W74-06862 5B

DECISION MAKING
The Environmental Impulse and its Competitors: Attitudes, Interests, and Institutions at Lake Tahoe,
W74-06843 6E

Production Function Theory and the Optimal Design of Waste Treatment Facilities,
W74-06997 6D

DEEP PLOWING
Deep Plowing - An Engineering Appraisal,
W74-06590 3F

DEEP TILLAGE
Deep Plowing - An Engineering Appraisal,
W74-06590 3F

Deep Plowing and Chemical Amendment Effect on a Sodic Claypan Soil,
W74-06598 3F

DEEPWATER PORTS
U.S. Deepwater Port Study, Vol. 2. Commodity Studies and Projections,
W74-06863 6D

U.S. Deepwater Port Study, Vol 3. Physical Coast and Port Characteristics, and Selected Deepwater Port Alternatives,
W74-06864 6D

DEFICIENCY SYMPTOMS
Qualitative Requirements of Young Eels Anguilla japonica for Water-Soluble Vitamins and Their Deficiency Symptoms,
W74-07006 5C

DELAWARE BAY
Applicability of ERTS-1 Imagery to the Study of Suspended Sediment and Aquatic Fronts,
W74-06666 2L

Digital Data Processing of ERTS-1 Imagery of Delaware Bay,
W74-06703 2L

DEMAND
Chlorine Production Drops as Demand Lags.
W74-06766 5B

DEMONSTRATION WATERSHEDS
Some Aspects of Phosphorus Dynamics of the Twin Lakes Watershed,
W74-06565 5C

DENDROCHRONOLOGY
Establishment of Mean High Water Lines in Florida Lakes,
W74-06610 2H

Recent Activity of Glaciers of Mount Rainier, Washington,
W74-06713 2C

DENITRIFICATION
Nitrogen Elimination by Bogus Alternation of Aerobic/'Anoxic' Conditions in 'Orbal' Activated Sludge Plants,
W74-06605 5D

Denitrification as a Pathway for Nitrate Removal in Aquatic Systems,
W74-06612 5B

DENITRIFICATION (SOILS)
Effect of Plant Growth and Form of Nitrogen Fertilizer on Dentrification from Four South Australian Soils,
W74-07039 2G

DEPTH
Water Depth Estimation with ERTS-1 Imagery,
W74-06680 2L

Calculations of Water Depth From ERTS-MSS Data,
W74-06681 2E

DESIGN
Component Description and Analysis of Environmental Systems: Oxygen Utilization in Aquatic Microcosms,
W74-06575 5C

DESIGN CRITERIA
Design Criteria for Irrigation Systems with Complex Pipe Loops,
W74-06585 3F

A Universal Ion-Selective Electrode Based on Graphite Paste,
W74-06758 2K

DETERGENTS
Report of the Expert Group on Detergents.
W74-06554 5C

DETROIT
Digital Land Use Mapping in Oakland County, Michigan,
W74-06639 4A

DEW
The Role of Dew in the Seasonal Moisture Balance of a Summer-Dry Climate,
W74-07037 2B

DIALYSIS
Investigation of Treating Electroplaters Cyanide Waste by Electrodialysis,
W74-06522 5D

DIATOMS
Benthic Algae in Water of the Neouvielle Massif (Hautes-Pyrenees),
W74-07013 2H

DIETS
The Occurrence of Mercury in the Environment and Man, Discussion Paper,
W74-06784 5B

The Dose-Response Relationship Resulting from Exposure to Alkyl Mercury Compounds,
W74-06805 5C

Mercury Concentrations in Human Tissues Among Heavy Fish Eaters,
W74-06812 5B

DIGITAL CONTROL
Digital Control Algorithms. Part III. Tuning PI and PID Controllers,
W74-06750 7C

DISASTERS
Emergency Planning for Municipal Wastewater Treatment Facilities,
W74-06577 5D

DISCHARGE (WATER)
The Problem of Direct Groundwater Discharge to the Seas,
W74-06881 2F

DISCRETE DIFFERENTIAL DYNAMIC PROGRAMMING
Application of DDDP in Water Resources Planning,
W74-06503 6A

DISINFECTION
Coliform Bacteria Growth and Control in Aerated Stabilization Basins,
W74-06520 5D

DISPERSION
Distribution and Mixing of Inflow into Stratified Lakes: A Hydraulic Model Study, (Phase I),
W74-06618 2H

Mathematical Model for Barged Ocean Disposal of Wastes,
W74-06837 5B

On the Selection of a Ground Disposal Site by Sensitivity Analysis,
W74-06858 5B

DISSOLVED OXYGEN
Utilization of Oxygen in Estuaries,
W74-06540 5C

DISTRIBUTION
Distribution of Mercury in the Environment of Minamata Bay and the Inland Ariake Sea,
W74-06781 5B

Distribution of Mercury in Residual Soils,
W74-06797 5B

Biological Effects of Mercury Compounds, Discussion Paper,
W74-06814 5C

Distribution and Seasonal Variations of the Plankton in 'Riviere de Morlaix,' (In French),
W74-07012 5C

Soil Moisture Distribution During Two-Dimensional Absorption from a Cylindrical Source,
W74-07042 2G

DISTRIBUTION PATTERNS
Distribution and Mixing of Inflow into Stratified Lakes: A Hydraulic Model Study, (Phase I),
W74-06618 2H

Some Estimates of Natural Levels of Mercury in the Environment,
W74-06772 5B

Survey of Mercury Concentrations in Fishes of Lakes St. Clair, Erie, and Huron,
W74-06775 5B

Mercury Contents of Bottom Sediments from Wisconsin Rivers and Lakes,
W74-06777 5B

Mercury in the Lake Michigan Environment,
W74-06779 5B

Distribution of Metals in Baltimore Harbor Sediments,
W74-06924 5B

DISTRICT OF COLUMBIA
Physical-Chemical Treatment of Raw Municipal Wastewater,
W74-06509 5D

Use of ERTS-1 Data for Regional Planning in the Metropolitan Washington Council of Governments--A Short Brief,
W74-06700 4A

Ammonia-Nitrogen Removal by Breakpoint Chlorination,
W74-06838 5D

Activated Sludge Treatment Systems with Oxygen,
W74-06839 5D

Laboratory Ozonation of Muncipal Wastewaters,
W74-06840 5D

Nitrogen Removal by Ammonia Stripping,
W74-06842 5D

DIVERSION
Predicting the Effects of Nutrient Diversion on Lake Recovery,
W74-06576 5C

DOMESTIC WASTES
Treatment of Domestic Wastewater and NSSC Pulp and Paper Mill Wastes,
W74-06513 5D

Sewage Collection Facilities.
W74-06980 6E

DOSE CALCULATIONS
On the Selection of a Ground Disposal Site by Sensitivity Analysis,
W74-06858 5B

DOSE RATE (RADIATION)
The EXREM III Computer Code for Estimating External Radiation Doses to Populations from Environmental Releases,
W74-06818 5B

DOUGLAS FIR TREES
Studies of the Forest Energy Budget,
W74-06518 2D

DRAINAGE
Performance of a Tile Drainage System: An Evaluation of a Tile Design and Management,
W74-06596 3F

Application of Monte Carlo Method to Soil Water Movement,
W74-06599 2G

Drainage.
W74-06983 6E

Patterson Watershed Project, Stanislaus County, California (Final Environmental Impact Statement).
W74-06987 4A

DRAINAGE DISTRICTS
Drainage Districts.
W74-06972 6E

Drainage.
W74-06983 6E

DRAINAGE EFFECTS
Performance of a Tile Drainage System: An Evaluation of a Tile Design and Management,
W74-06596 3F

DRAINAGE PRACTICES
Performance of a Tile Drainage System: An Evaluation of a Tile Design and Management,
W74-06596 3F

DRAWDOWN
A Physical Model for Prediction and Control of Saltwater Intrusion in the Floridan Aquifer,
W74-06609 2F

DREDGE SPOILS
Mathematical Model for Barged Ocean Disposal of Wastes,
W74-06837 5B

DROUGHT RESPONSE (PLANTS)
An Ecological Study of Vellozia schnitzleinia, a Drought-Enduring Plant of Northern Nigeria,
W74-06768 2I

DRUGS
Survival in Maturation Ponds of Coliform Bacteria With Transferable Drug Resistance,
W74-06748 5C

DRY CLIMATES
The Role of Dew in the Seasonal Moisture Balance of a Summer-Dry Climate,
W74-07037 2B

DRY RESIDUE
Influence of Some Hydrological Parameters on Changes in the Radioactivity of the Waters of the Rivers Czarna Przemsza and Przemsza,
W74-07019 5B

DUAL TREATMENT
Utilization of Trickling Filters for Dual Treatment of Dry and Wet Weather Flows,
W74-06508 5D

DUPUIT-FORCHHEIMER THEORY
Ground-Water Recharge Strip Basin-Experiments,
W74-06740 4B

DUSTS
Analysis of the Concentration of Microparticles in the Long Ice Core from Byrd Station,
W74-06931 2C

DYJE RIVER (CZECHOSLOVAKIA)
Annual Cycle of Zooplankton in Backwaters of the Flood Area of the Dyje,
W74-06536 5C

DYNAMIC PROGRAMMING
Application of DDDP in Water Resources Planning,
W74-06503 6A

DYNAMICS
Modeling Algal Growth Dynamics in Shagawa Lake, Minnesota, with Comments Concerning Projected Restoration of the Lake,
W74-06563 5C

DYSTROPHY
Organic Phosphorus Compounds of a Northern Michigan Bog, Bog-Lake System,
W74-06742 5C

E
Survival in Maturation Ponds of Coliform Bacteria With Transferable Drug Resistance,
W74-06748 5C

EASTERN DECIDUOUS FOREST BIOME
Aquatic Modeling in the Eastern Deciduous Forest Biome, U.S.-International Biological Program,
W74-06572 5C

ECOLOGY
The Effects of Ecological Changes on Buckeye Lake, Ohio, with Emphasis on Largemouth Bass and Aquatic Vascular Plants,
W74-06546 5C

Freshwater Biology and Pollution Ecology: Training Manual.
W74-06558 5A

An Ecological Account of the Past and Future of South African Rivers,
W74-06606 5C

Environmental Sciences Division Annual Progress Report for Period Ending September 30, 1973,
W74-06826 5B

Environmental Aspects of Plutonium and Other Elements, a Selected Annotated Bibliography.
W74-06857 5C

Atlantic Sturgeon (Acipenser sturio) in Waters of Georgia, (In Russian),
W74-07016 2H

Urbanization and Human Health,
W74-07017 5G

ECONOMIC IMPACT
Techniques for Identifying and Evaluating Market and Nonmarket Benefits and Costs of Water Resource Systems.
W74-06852 6B

ECOSYSTEMS
Simulation of Urban Runoff, Nutrient Loading, and Biotic Response of a Shallow Eutrophic Lake,
W74-06564 5C

Need for an Ecosystem Perspective in Eutrophication Modeling,
W74-06567 5C

Aquatic Modeling in the Eastern Deciduous Forest Biome, U.S.-International Biological Program,
W74-06572 5C

Environmental Sciences Division Annual Progress Report for Period Ending September 30, 1973,
W74-06826 5B

Environmental Aspects of Plutonium and Other Elements, a Selected Annotated Bibliography.
W74-06857 5C

Energy Flows in the Biosphere: The Impact of Man,
W74-07043 2B

ECTOCARPUS SILICULOSUS
Influence of Iodine on Growth and Development of the Brown Alga Ectocarpus Siliculosus in Axenic Cultures,
W74-06752 5C

EDUCATION
Water Resources Research Interests in the Colleges and Universities of North Carolina.
W74-06616 9A

Annual Report, FY 1973.
W74-06617 9A

EELS
Qualitative Requirements of Young Eels Anguilla japonica for Water-Soluble Vitamins and Their Deficiency Symptoms,
W74-07006 5C

EFFLUENTS
Final Environmental Statement Related to the Proposed Alvin W. Vogtle Nuclear Plant Units 1, 2, 3, and 4.
W74-06821 5B

ELECTRIC POWER
The National Environmental Policy Act and the Licensing Process: Environmentalist Magna Carta or Agency Coup de Grace,
W74-06963 5G

ELECTRO-OSMOSIS
Investigation of Treating Electroplaters Cyanide Waste by Electrodialysis,
W74-06522 5D

Electro-Osmotic Effects in a Bentonite-Water System,
W74-06910 2K

ELECTROCHEMISTRY
Electro-Osmotic Effects in a Bentonite-Water System,
W74-06910 2K

ELECTRODES
A Universal Ion-Selective Electrode Based on Graphite Paste,
W74-06758 2K

Selectrode - the Universal Ion-Selective Electrode. Part VI. The Calcium (II) Selectrode Employing a New Ion Exchanger in a Nonporous Membrane and a Solid-State Reference System,
W74-06764 5A

Selectrode - the Universal Ion-Selective Electrode. Part VII. A Valinomycin-Based Potassium Electrode with Nonporous Polymer Membrane and Solid-State Inner Reference System,
W74-06765 5A

On the Reaction Between Iodide and Mercury(II),
W74-06870 5A

ELECTRODIALYSIS
Investigation of Treating Electroplaters Cyanide Waste by Electrodialysis,
W74-06522 5D

ELECTROMYOGRAPHY
Surface Electromyography in Chronic Inorganic Mercury Intoxication,
W74-06801 5C

ELECTROPLATING
Investigation of Treating Electroplaters Cyanide Waste by Electrodialysis,
W74-06522 5D

ENERGY
Exploring Energy Choices.
W74-06879 6D

ENERGY BALANCE
Energy Flows in the Biosphere: The Impact of Man,
W74-07043 2B

ENERGY BUDGET
Studies of the Forest Energy Budget,
W74-06518 2D

ENERGY FLOWS
Energy Flows in the Biosphere: The Impact of Man,
W74-07043 2B

ENERGY LOSS
Energy Losses in a Two-Phase Flow Containing Coarse-Grain Material,
W74-06916 8B

ENERGY SUPPLY AND DEMAND
Exploring Energy Choices.
W74-06879 6D

ENERGY TRANSFER
Component Description and Analysis of Environmental Systems: Oxygen Utilization in Aquatic Microcosms,
W74-06575 5C

ENGINEERING GEOLOGY
The Law to Govern Deepsea Mining Until Superseded by International Agreement,
W74-06964 6E

Seamounts and Guyots: A Unique Resource,
W74-06966 6E

ENTEROMORPHA LINZA
Culture Studies of Enteromorpha Linza (L.) J.AG. and Ulvaria Oxysperma (Kutzing) Bliding (Chlorophyceae, Ulvales) From Central America,
W74-06749 5C

ENVIRONMENT
A Simulated Environmental Model of Temperature, Evaporation, Rainfall, and Soil Moisture,
W74-06591 3F

Assessment of Southern California Environment From ERTS-1,
W74-06685 4A

Environmental Sciences Division Annual Progress Report for Period Ending September 30, 1973,
W74-06826 5B

Environmental Aspects of Plutonium and Other Elements, a Selected Annotated Bibliography.
W74-06857 5C

Behavior of Radioiodine in the Environment and in Man,
W74-06862 5B

An Expanding Role for Subarctic Watershed Research,
W74-06884 4D

ENVIRONMENTAL CONTROL
Whatever Happened to TVA,
W74-06968 6E

ENVIRONMENTAL EFFECTS
Environmental Mercury Contamination.
W74-06770 5B

Research Needs: Study of the Environmental Dynamics of Mercury,
W74-06798 5B

The Environmental Impulse and its Competitors: Attitudes, Interests, and Institutions at Lake Tahoe,
W74-06843 6E

The National Environmental Policy Act and the Licensing Process: Environmentalist Magna Carta or Agency Coup de Grace,
W74-06963 5G

Three-Year Evolution,
W74-06970 6G

River V. Richmond Metropolitan Authority.
W74-06984 6E

Choctawhatchee River and Holmes Creek, Florida, Permit Application by Florida Game and Fresh Water Fish Commission (Final Environmental Impact Statement).
W74-06985 4A

Woodcock Creek Lake, French Creek Basin, Pennsylvania (Final Environmental Impact Statement).
W74-06986 8A

Patterson Watershed Project, Stanislaus County, California (Final Environmental Impact Statement).
W74-06987 4A

Proposal for Oklawaha River, Ocala National Forest, Florida, (Final Environmental Impact Statement).
W74-06993 4A

Ratification of Proposed Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (Final Environmental Impact Statement).
W74-06994 6E

ENVIRONMENTAL ENGINEERING
Three-Year Evolution,
W74-06970 6G

ENVIRONMENTAL IMPACT STATEMENT
Three-Year Evolution,
W74-06970 6G

Conservationists Go to Court--Part 1,
W74-06971 4D

Choctawhatchee River and Holmes Creek, Florida, Permit Application by Florida Game and Fresh Water Fish Commission (Final Environmental Impact Statement).
W74-06985 4A

Woodcock Creek Lake, French Creek Basin, Pennsylvania (Final Environmental Impact Statement).
W74-06986 8A

ENVIRONMENTAL IMPACT STATEMENTS
Final Environmental Statement Related to the Proposed Alvin W. Vogtle Nuclear Plant Units 1, 2, 3, and 4.
W74-06821 5B

Patterson Watershed Project, Stanislaus County, California (Final Environmental Impact Statement).
W74-06987 4A

Hurricane Creek Watershed Project, Humphreys and Dickson Counties, Tennessee (Final Environmental Impact Statement).
W74-06988 4D

Lower Klamath River Flood Control Project, Del Norte County, California (Final Environmental Impact Statment).
W74-06989 4A

Nutwood Watershed, Illinois (Final Environmental Statement).
W74-06990 4A

Proposal for Oklawaha River, Ocala National Forest, Florida, (Final Environmental Impact Statement).
W74-06993 4A

Ratification of Proposed Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (Final Environmental Impact Statement).
W74-06994 6E

EPIDEMICS (HUMAN)
Balantidiasis Outbreak in Truk,
W74-07031 5C

EPIDEMIOLOGY
Epidemiological Approaches to the Study of Subclinical Effects of Mercury Intoxication,
W74-06813 5B

An Epidemiological Study on Clonorchiasis in Kyoto City, (In Japanese),
W74-07050 5C

EROSION
Hydrogeomorphology,
W74-06891 2A

EROSION CONTROL
Soil and Water Losses as Affected by Tillage Practices,
W74-06595 3F

Hurricane Creek Watershed Project, Humphreys and Dickson Counties, Tennessee (Final Environmental Impact Statement).
W74-06988 4D

ERROR ANALYSIS
Assessing Systematic Errors in Rainfall-Runoff Models,
W74-06893 2A

ERRORS
Fundamentals of Automatic Control of Meteorological Data,
W74-06724 2B

ERTS
Symposium on Significant Results Obtained From the Earth Resources Technology Satellite-1, Volume I: Technical Presentations, Section B.
W74-06619 7C

Cartographic Quality of ERTS-1 Images,
W74-06620 7C

Progress in Cartography, Eros Program,
W74-06621 7C

Change in Land Use in the Phoenix (1:250,000) Quadrangle, Arizona between 1970 and 1972: Successful Use of a Proposed Land Use Classification System,
W74-06622 4A

Land Use Investigations in the Central Valley and Central Coastal Test Sites, California,
W74-06623 4A

Land Use in Northern Coachella Valley,
W74-06624 4A

Land Use Classification and Change Analysis Using ERTS-1 Imagery in Carets,
W74-06625 4A

ERTS Regional-Scale Overview Linking Land Use and Environmental Processes in Carets,
W74-06626 4A

Evaluation of Land Use Mapping from ERTS in the Shore Zone of Carets,
W74-06627 4A

Geographic Applications of ERTS-1 Data to Landscape Change,
W74-06628 4A

Identification of Soil Associations in Western South Dakota on ERTS-1 Imagery,
W74-06629 2G

Land Use of Northern Megalopolis,
W74-06630 4A

Remote Sensing Applied to Land-Use Studies in Wyoming,
W74-06631 4A

ERTS-1 Applications to Minnesota Land Use Mapping,
W74-06632 4A

A Multidisciplinary Survey for the Management of Alaskan Resources Utilizing ERTS Imagery,
W74-06633 4A

The Use of ERTS-1 Data for the Inventory of Critical Land Resources for Regional Land Use Planning,
W74-06634 4A

Investigations of an Urban Area and its Locale Using ERTS-1 Data Supported by U-Photography,
W74-06635 4A

First Look Analyses of Five Cycles of ERTS-1 Imagery Over County of Los Angeles: Assessment of Data Utility for Urban Development and Regional Planning,
W74-06636 4A

Preparation of Urban Land Use Inventories by Machine-Processing of ERTS MSS Data,
W74-06637 4A

A Comparison of Land-Use Determinations Using Data from ERTS-1 and High Altitude Aircraft,
W74-06638 4A

Digital Land Use Mapping in Oakland County, Michigan,
W74-06639 4A

Mapping of Agricultural Land Use from ERTS-1 Digital Data,
W74-06640 4A

The Use of the Temporal Dimension in Classifying and Mapping ERTS-1 Mss Data,
W74-06641 4A

Identification and Mapping of Coal Refuse Banks and Other Targets in the Anthracite Region,
W74-06642 4A

Automatic Interpretation of ERTS Data for Forest Management,
W74-06643 4A

Land Resources Survey for the State of Michigan,
W74-06644 4A

Terrain Classification Maps of Yellowstone National Park,
W74-06645 4A

Atmospheric Effects in ERTS-1 Data, and Advanced Information Extraction Techniques,
W74-06646 7C

Determination of Aerosol Content in the Atmosphere,
W74-06647 7C

A Technique for Correcting ERTS Data for Solar and Atmospheric Effects,
W74-06648 7C

Experimental Masking of RBV Images to Reduce Stationary Residual Inaccuracies in Radiometric Correction,
W74-06649 7C

Digital Rectification of ERTS Multispectral Imagery,
W74-06650 7C

Results of Precision Processing (Scene Correction) of ERTS-1 Images Using Digital Image Processing Techniques,
W74-06651 7C

Significant Techniques in the Processing and Interpretation of ERTS-1 Data,
W74-06652 7C

Computer Techniques Used for Some Enhancements of ERTS Images,
W74-06653 7C

Digital Enhancement of Multispectral MSS Data for Maximum Image Visibility,
W74-06654 7C

ERTS-1 Image Enhancement by Optically Combining Density Slices,
W74-06655 7C

Pseudocolor Transformation of ERTS Imagery,
W74-06656 7C

Digital Interactive Image Analysis by Array Processing,
W74-06657 7C

Combining Human and Computer Interpretation Capabilities to Analyze ERTS Imagery,
W74-06658 7C

Analysis of ERTS Imagery Using Special Electronic Viewing/Measuring Equipment,
W74-06659 7C

Combined Spectral and Spatial Processing of ERTS Imagery Data,
W74-06660 7C

Terrain Type Recognition Using ERTS-1 MSS Images,
W74-06661 7C

Classification of ERTS-1 MSS Data by Canonical Analysis,
W74-06662 7C

In Situ Spectroradiometric Quantification of ERTS Data,
W74-06663 2G

Seasonal Changes of Littoral Transport and Beach Width and Resulting Effect on Protective Structures,
W74-06664 2L

Recognition of Beach and Nearshore Depositional Features of Chesapeake Bay,
W74-06665 2L

Applicability of ERTS-1 Imagery to the Study of Suspended Sediment and Aquatic Fronts,
W74-06666 2L

Correlation of ERTS Multispectral Imagery with Suspended Matter and Chlorophyll in Lower Chesapeake Bay,
W74-06667 2L

Plume Development in Long Island Sound Observed by Remote Sensing (ERTS-1),
W74-06668 2L

New Insights into the Influence of Ice on the Coastal Marine Environment of the Beaufort Sea, Alaska,
W74-06669 2C

ERTS-1 Observations of Sea Surface Circulation and Sediment Transport, Cook Inlet, Alaska,
W74-06670 2L

Sediment Distribution and Coastal Processes in Cook Inlet, Alaska,
W74-06671 2L

Distribution and Movement of Suspended Sediment in the Gulf of Mexico off the Texas Coast,
W74-06672 2L

Oceanographic Mapping of Structure and Dynamics of the Northern Gulf of California by the Use of Spectral Modeling and ERTS-1,
W74-06673 2L

Oceanographic Features in the Lee of the Windward and Leeward Islands: ERTS and Ship Data,
W74-06674 2E

Remote Sensing of Ocean Currents using ERTS Imagery,
W74-06675 2L

Use of ERTS Data for Mapping Arctic Sea Ice,
W74-06676 2C

Biomass in the Upwelling Areas Along the Northwest Coast of Africa as Viewed with ERTS-1,
W74-06677 5A

Application of ERTS-1 Imagery to the Harvest Model of the U.S. Menhaden Fishery,
W74-06678 2L

Coastal and Submarine Features on MSS Imagery of Southeastern Massachusetts: Comparison with Conventional Maps,
W74-06679 2L

Water Depth Estimation with ERTS-1 Imagery,
W74-06680 2L

Calculations of Water Depth From ERTS-MSS Data,
W74-06681 2E

Multidisciplinary Application of ERTS-1 Data to North Carolina Natural Resource Management,
W74-06682 4C

Natural Resource Inventory and Monitoring in Oregon With ERTS Imagery,
W74-06683 4A

Resource Management Implications of ERTS-1 Data to Ohio,
W74-06684 4A

Assessment of Southern California Environment From ERTS-1,
W74-06685 4A

Applications of Remote Sensing (ERTS) to Resource Management and Development in Sahelien Africa (Republic of Mali),
W74-06686 4A

First ERTS-1 Results in Southeastern France: Geology, Sedimentology, Pollution at Sea,
W74-06687 4A

DCP-Collected Absolute Target Reflectance Signatures Assist Accurate Interpretation of ERTS-1 Imagery,
W74-06688 7C

Unique Characteristics of ERTS,
W74-06689 7B

ERTS-1 Applied for Structural and Morphological Investigations Case Studies: (1) Los Angeles, California and (2) Coastal Plain, New Jersey,
W74-06690 7C

A Preliminary Evaluation of ERTS-1 Images on the Volcanic Areas of Southern Italy (NASA Contract FO-013),
W74-06691 7C

Thermal Surveillance of Cascade Range Volcanoes Using ERTS-1 Multispectral Scanner, Aircraft Imaging Systems, and Ground-Based Data Communication Platforms,
W74-06692 7C

Initial Evaluation of the Geologic Applications of ERTS-1 Imagery for New Mexico,
W74-06693 4A

Computed Atmospheric Effects on ERTS Observations,
W74-06694 2B

Mapping of Spoil Banks Using ERTS-1 Pictures,
W74-06695 5A

Air Quality Indices from ERTS-1 MSS Information, PR 568,
W74-06696 5A

Snow Cover Surveys in Alaska From ERTS-1 Data,
W74-06697 2C

Utilization of ERTS-1 Data to Monitor and Classify Eutrophication of Inland Lakes,
W74-06698 5A

ERTS-1 Observes Algal Bloom in Lake Erie and Utah Lake,
W74-06699 5A

Use of ERTS-1 Data for Regional Planning in the Metropolitan Washington Council of Governments--A Short Brief,
W74-06700 4A

Land Use Mapping and Change Detection Using ERTS Imagery in Montgomery County, Alabama,
W74-06701 4A

Determination of Land Use in Minnesota by Automatic Interpretation of ERTS MSS Data,
W74-06702 4A

Digital Data Processing of ERTS-1 Imagery of Delaware Bay,
W74-06703 2L

The Use of Photographic Methods in Contrast Enhancement of ERTS-1 Images,
W74-06704 7C

Precision Annotation of Predetermined Primary Sampling Units on ERTS-1 MSS Images,
W74-06705 4A

Unsupervised Classification and Areal Measurement of Land and Water Coastal Features on the Texas Coast,
W74-06706 2L

Use of ERTS-1 Pictures in Coastal Oceanography in British Columbia,
W74-06707 2L

Relationships Between Remotely Sensed Fisheries Distribution Information and Selected Oceanographic Parameters in the Mississippi Sound,
W74-06708 7B

Application of ERTS-1 Imagery in Coastal Studies,
W74-06709 2L

Application of ERTS-1 Imagery in the Fields of Geology, Agriculture, Forestry, and Hydrology to Selected Test Sites in Iran,
W74-06710 4A

Detection of Turbidity Dynamics in Tampa Bay, Florida Using Multispectral Imagery from ERTS-1,
W74-06711 2L

ESSENTIAL NUTRIENTS

Influence of Iodine on Growth and Development of the Brown Alga Ectocarpus Siliculosus in Axenic Cultures,
W74-06752 5C

ESTIMATING

Some Estimates of Natural Levels of Mercury in the Environment,
W74-06772 5B

ESTUARIES

Sources of Oxygen in Estuaries,
W74-06539 5C

Utilization of Oxygen in Estuaries,
W74-06540 5C

Oxygen in Estuaries: Requirements for Fisheries,
W74-06542 5C

ERTS-1 Observations of Sea Surface Circulation and Sediment Transport, Cook Inlet, Alaska,
W74-06670 2L

Sediment Distribution and Coastal Processes in Cook Inlet, Alaska,
W74-06671 2L

Digital Data Processing of ERTS-1 Imagery of Delaware Bay,
W74-06703 2L

Numerical Model of St. Lawrence River Estuary,
W74-06738 2L

Wando River Environmental Quality Studies, An Interim Report.
W74-06919 5B

Cooperative Gulf of Mexico Estuarine Inventory and Study, Florida: Phase 1 Area Description,
W74-06995 2L

Ecological Aspects Along the Shores of the Burabalanga Tidal Estuary Balasore District, Orissa State,
W74-07049 2L

ESTUARINE ENVIRONMENT

The Present and Future Status of Eastern North Carolina Wetlands,
W74-06850 2L

ESTUARY

Distribution and Seasonal Variations of the Plankton in 'Riviere de Morlaix,' (In French),
W74-07012 5C

ETHYLMERCURY

The Determination of Ethylmercury in Blood,
W74-06791 5A

EUTROPHICATION

Changes in Water Chemistry Accompanying Summer Fish Kills in Shallow Eutrophic Lakes of Southwest Manitoba,
W74-06541 5C

Co-operation for Water Protection: Eutrophication Control,
W74-06543 5C

Report of the Expert Group on Detergents.
W74-06554 5C

Modeling the Eutrophication Process.
W74-06560 5C

Synopsis of Workshop on Modeling of the Eutrophication Process,
W74-06561 5C

Modeling Algal Growth Dynamics in Shagawa Lake, Minnesota, with Comments Concerning Projected Restoration of the Lake,
W74-06563 5C

Some Aspects of Phosphorus Dynamics of the Twin Lakes Watershed,
W74-06565 5C

The Role of Thermocline Migration in Regulating Algal Blooms,
W74-06566 5C

Need for an Ecosystem Perspective in Eutrophication Modeling,
W74-06567 5C

Rates of Carbon, Oxygen, Nitrogen, and Phosphorus Cycling Through Microbial Populations in Stratified Lakes,
W74-06569 5C

Capabilities and Limitations of Nutrient-Plankton Model,
W74-06570 5C

Aquatic Modeling in the Eastern Deciduous Forest Biome, U.S.-International Biological Program,
W74-06572 5C

A Physical Model for Simulation of Aquatic Ecosystems,
W74-06573 5C

Activity Analysis and the Management of Resources: A Model for Control of Eutrophication,
W74-06574 5C

Utilization of Phosphorus by Phytoplankton in Phosphorus-Rich Environments,
W74-06611 5C

Utilization of ERTS-1 Data to Monitor and Classify Eutrophication of Inland Lakes,
W74-06698 5A

EUTROPHICATION

ERTS-1 Observes Algal Bloom in Lake Erie and Utah Lake,
W74-06699 5A

Basic Research in the Aquatic Environment: Effects of Eutrophication on Phytoplankton Populations and Selected Species of Aquatic Vascular Plants,
W74-06835 5C

EVAPORATION

Evaporation from Brine Storage Reservoirs,
W74-06517 2D

Upward Flow from Shallow Water Tables,
W74-06844 2F

Field Measurement of Evaporation from Soil Shrinkage Cracks,
W74-06900 2D

The Evaporation from a Water Pan--Its Limited Significance (L'evaporation d'un bac d'eau libre--sa signification restreinte),
W74-06908 2D

Interception Loss in the Humid Forested Areas (With Special Reference to Sungai Lui Catchment, West Malaysia),
W74-07015 2D

Physical Microclimates of Erosion-Control Structures in a Salt Desert Area,
W74-07029 2G

EVAPORATION CONTROL

Evaporation Suppression, A Bibliography.
W74-06501 3D

Sprinkler Precipitation Gage Errors,
W74-06593 3F

EVAPORATION PANS

The Evaporation from a Water Pan--Its Limited Significance (L'evaporation d'un bac d'eau libre--sa signification restreinte),
W74-06908 2D

EVAPORIMETERS

The Evaporation from a Water Pan--Its Limited Significance (L'evaporation d'un bac d'eau libre--sa signification restreinte),
W74-06908 2D

EVAPOTRANSPIRATION

Evaporation Suppression, A Bibliography.
W74-06501 3D

A Large Undisturbed, Weighing Lysimeter for Grassland Studies,
W74-06581 2G

The Evaporation from a Water Pan--Its Limited Significance (L'evaporation d'un bac d'eau libre--sa signification restreinte),
W74-06908 2D

Estimates of Prairie Provincial Wheat Yields Based on Precipitation and Potential Evapotranspiration,
W74-07027 3F

EXCAVATION

Quasi-Continuous Explosive Concepts for Hard Rock Excavations,
W74-06860 8H

EXPANSIVE SOILS

Gamma Radiation Measurements of Bulk Density Changes in a Soil Pedon Following Irrigation,
W74-06715 2G

EXPLOSIONS

Quasi-Continuous Explosive Concepts for Hard Rock Excavations,
W74-06860 8H

EXPORT

U.S. Deepwater Port Study, Vol. 2. Commodity Studies and Projections,
W74-06863 6D

FABRICATION

Selectrode - the Universal Ion-Selective Electrode. Part VI. The Calcium (II) Selectrode Employing a New Ion Exchanger in a Nonporous Membrane and a Solid-State Reference System,
W74-06764 5A

FALLOUT

Estimating Soil Erosion from the Redistribution of Fallout Cs-137,
W74-06901 2J

FARM MANAGEMENT

Bibliography of Water Management.
W74-06854 3F

FARM WASTES

Biological Treatment of Feedlot Runoff,
W74-06847 5D

Agricultural Wastes and Ground Water Quality,
W74-06951 5B

Search for a Method for Sanitizing Sewage from Helminth Eggs Using Agrochemical Means. (Preliminary Communication), (In Russian),
W74-07018 5D

FARMS

Mapping of Agricultural Land Use from ERTS-1 Digital Data,
W74-06640 4A

FATTY WASTES

Recovery of Fatty Materials from Edible Oil Refinery Effluents,
W74-06514 5D

FAUNA (VERTEBRATES)

An Annotated List of the Summer Vertebrate Fauna of Upper Lusk Creek, Pope County, Illinois,
W74-07036 2I

FEDERAL GOVERNMENT

Conservationists Go to Court--Part 1,
W74-06971 4D

FEDERAL PROJECT POLICY

Three-Year Evolution,
W74-06970 6G

FEDERAL WATER POLLUTION CONTROL ACT

The Federal Role and Legislative Trends in Control of Ground Water Quality,
W74-06952 5G

Current State Board Activities in Ground Water Quality Management,
W74-06953 5G

Impact of Water Pollution Control Legislation on Meeting Future Water Needs in California,
W74-06954 5G

Ground Water Pollution--From the Waste Discharger's Viewpoint,
W74-06955 5G

Environmental Quality As an Objective of Ground Water Management,
W74-06956 5B

Will Municipal Sewage Continue to Threaten Primary Water-Contact Recreation: An Appraisal of the 1972 Water Pollution Control Act,
W74-06969 5G

FEED LOTS

Biological Treatment of Feedlot Runoff,
W74-06847 5D

FEEDLOT RUNOFF

Biological Treatment of Feedlot Runoff,
W74-06847 5D

FEEDLOTS

Quality Improvement of Feedlot Lagoon Water by Percolation Through Soil Under Native Pasture,
W74-06830 5D

FERTILIZATION

The Effect of Mineral Fertilization and of Carp Fry on the Composition and Dynamics of Plankton,
W74-06535 5C

FERTILIZER MANUFACTURE

Dynamics of Changes in the Concentration of Fluorine Compounds Emitted by the Phosphorus Fertilizer Manufacturing Establishment in Pozan, and Their Influence on Surface and Underground Waters and on the Atmosphere Within th e Limits of the City of Poznan, (In Polish),
W74-07021 5B

FERTILIZERS

Mineral Nitrogen Movement into Subsoils Following Continued Annual Fertilization for Corn,
W74-06898 5B

Sludge Disposal to Land,
W74-06950 5B

FILTERING RATE (DAPHNIA)

Energetics of Daphnia Ambigua,
W74-06831 5C

FILTRATION

Intermittent Sand Filtration to Upgrade Existing Wastewater Treatment Facilities,
W74-06506 5D

Utilization of Trickling Filters for Dual Treatment of Dry and Wet Weather Flows,
W74-06508 5D

Physical-Chemical Treatment of Raw Municipal Wastewater,
W74-06509 5D

Treatment of Domestic Wastewater and NSSC Pulp and Paper Mill Wastes,
W74-06513 5D

Color Removal from Kraft Mill Effluents by Ultrafiltration,
W74-06521 5D

FINANCING

Area Financing of Water Resource Development in West Minnesota,
W74-06846 6B

Industrial Development--Pollution.
W74-06976 6E

Water Pollution--Summer Intern Program.
W74-06982 6E

FINITE ELEMENT ANALYSIS
Solution of Equation for Vertical Unsaturated Flow of Soil Water,
W74-06736 2G

On the Solution of Transient Free-Surface Flow Problems in Porous Media by the Finite Element Method,
W74-06890 2F

FISH
The Effect of Mineral Fertilization and of Carp Fry on the Composition and Dynamics of Plankton,
W74-06535 5C

Mercury in Fish in the Great Lakes,
W74-06774 5B

Survey of Mercury Concentrations in Fishes of Lakes St. Clair, Erie, and Huron,
W74-06775 5B

Mercury Levels in Wisconsin Fish,
W74-06778 5B

Investigation of Mercury Contamination in the Tennessee Valley Region,
W74-06780 5B

Mercury in Humans in the Great Lakes Region,
W74-06783 5B

A Simple, Rapid Method for the Determination of Trace Mercury in Fish Via Neutron Activation Analysis,
W74-06788 5A

Mercury and Food Chains,
W74-06796 5B

Mercury Concentrations in Human Tissues Among Heavy Fish Eaters,
W74-06812 5B

The Mercury Content of Prehistoric Fish,
W74-07026 5A

FISH BEHAVIOR
Interaction of Temperature and Copper Ions as Orienting Stimuli in the Locomotor Behavior of the Goldfish (Carassius auratus),
W74-06769 5C

FISH CONSERVATION
Recent Developments in the Law of the Sea IV: A Synopsis,
W74-06965 6E

FISH FOODS
Spring Food of Chain Pickerel (Esox niger) in Maine Lakes,
W74-07032 2H

FISH HATCHERIES
Relative Recoveries of Hatchery-Reared Landlocked Salmon Planted at Different Ages at Schoodic Lake, Maine,
W74-06865 8I

An Evaluation of Striped Bass Fingerling Culture,
W74-07002 8I

FISH POPULATIONS
Oxygen in Estuaries: Requirements for Fisheries,
W74-06542 5C

FISHERIES
Application of ERTS-1 Imagery to the Harvest Model of the U.S. Menhaden Fishery,
W74-06678 2L

Relationships Between Remotely Sensed Fisheries Distribution Information and Selected Oceanographic Parameters in the Mississippi Sound,
W74-06708 7B

FISHES
The Laguna de Vegueta on the Mid-Peruvian Coast and Its Fishes, Particularly Aequidens rivulatus (Guenther 1859), (In German),
W74-07007 2H

FISHKILL
Changes in Water Chemistry Accompanying Summer Fish Kills in Shallow Eutrophic Lakes of Southwest Manitoba,
W74-06541 5C

FLAME PHOTOMETRY
Investigation of Brewing Water Treatment,
W74-07023 5A

FLOCCULATION
Physical-Chemical Treatment of Raw Municipal Wastewater,
W74-06509 5D

Recovery of Fatty Materials from Edible Oil Refinery Effluents,
W74-06514 5D

FLOOD DATA
Flood of October 1972 at Petersburg and Colonial Heights, Virginia,
W74-06957 7C

FLOOD DISCHARGE
Flood of October 1972 at Petersburg and Colonial Heights, Virginia,
W74-06957 7C

FLOOD FREQUENCY
On Flood Probabilities of East Alpine Rivers,
W74-06909 2E

FLOOD PEAK
Sensitivity of Surface Runoff to Variations of Watershed Parameters in Small Urban Areas-A Kinematic Model,
W74-06853 4C

FLOOD PLAINS
Annual Cycle of Zooplankton in Backwaters of the Flood Area of the Dyje,
W74-06536 5C

Seasonal and Stratigraphic Controls in Coastal Floodplain Soils,
W74-07030 2G

FLOOD PROTECTION
Woodcock Creek Lake, French Creek Basin, Pennsylvania (Final Environmental Impact Statement).
W74-06986 8A

Lower Klamath River Flood Control Project, Del Norte County, California (Final Environmental Impact Statment).
W74-06989 4A

FLORIDA
A Physical Model for Prediction and Control of Saltwater Intrusion in the Floridan Aquifer,
W74-06609 2F

Establishment of Mean High Water Lines in Florida Lakes,
W74-06610 2H

Detection of Turbidity Dynamics in Tampa Bay, Florida Using Multispectral Imagery from ERTS-1,
W74-06711 2L

Choctawhatchee River and Holmes Creek, Florida, Permit Application by Florida Game and Fresh Water Fish Commission (Final Environmental Impact Statement).
W74-06985 4A

Proposal for Oklawaha River, Ocala National Forest, Florida, (Final Environmental Impact Statement).
W74-06993 4A

Cooperative Gulf of Mexico Estuarine Inventory and Study, Florida: Phase 1 Area Description,
W74-06995 2L

Origin of Circular Beds of Thalassia (Spermatophyta:Hydrocharitaceae) in South Biscayne Bay, Florida, and Their Relationship to Mangrove Hammocks,
W74-07022 5A

Florida Mangroves as Shoreline Stabilizers,
W74-07047 4A

FLOW
Changes in Water Yield of Small Watersheds by Agricultural Practices,
W74-06597 2E

On Squire's Theorem in the Study of Hydrodynamic Stability of Plane-Parallel Flows of Incompressible Fluids about Deforming Boundaries,
W74-06911 8B

Structure of the Velocity Profile of a Suspension-Bearing Flow,
W74-06912 8B

Degree of Local Saturation of a Flow by Suspended Matter and Its Relation to the Volume Concentration,
W74-06913 8B

The Influence of Clay Fraction on the Basic Parameters of the Hydro-Transport of Fine Free-Flowing Materials,
W74-06914 8B

Distribution of Average Longitudinal Velocities in Flows with Coarse-Grained Materials,
W74-06915 8B

Energy Losses in a Two-Phase Flow Containing Coarse-Grain Material,
W74-06916 8B

FLOW MEASUREMENT
Regional Water and Sewer Districts: Rights, Powers and Duties.
W74-06981 6E

FLOW RATES
Regional Water and Sewer Districts: Rights, Powers and Duties.
W74-06981 6E

FLUID MECHANICS
Hydraulics of a Center Pivot System,
W74-06583 3F

On Squire's Theorem in the Study of Hydrodynamic Stability of Plane-Parallel Flows of Incompressible Fluids about Deforming Boundaries,
W74-06911 8B

FLUID MECHANICS

Structure of the Velocity Profile of a Suspension-Bearing Flow,
W74-06912 8B

Degree of Local Saturation of a Flow by Suspended Matter and Its Relation to the Volume Concentration,
W74-06913 8B

The Influence of Clay Fraction on the Basic Parameters of the Hydro-Transport of Fine Free-Flowing Materials,
W74-06914 8B

Distribution of Average Longitudinal Velocities in Flows with Coarse-Grained Materials,
W74-06915 8B

Energy Losses in a Two-Phase Flow Containing Coarse-Grain Material,
W74-06916 8B

FLUORINE

Dynamics of Changes in the Concentration of Fluorine Compounds Emitted by the Phosphorus Fertilizer Manufacturing Establishment in Pozan, and Their Influence on Surface and Underground Waters and on the Atmosphere Within th e Limits of the City of Poznan, (In Polish),
W74-07021 5B

FOLDS (GEOLOGIC)

Folding of Cold Ice,
W74-06928 2C

FOOD CHAINS

Mercury Levels in a Sample of Michigan Residents,
W74-06782 5B

The Role of Food Chains in Environmental Mercury Contamination,
W74-06795 5B

Mercury and Food Chains,
W74-06796 5B

Research Needs: Study of the Environmental Dynamics of Mercury,
W74-06798 5B

Survival and Reproduction of Ring-Necked Pheasants Consuming Two Mercurial Fungicides,
W74-06808 5C

Aquatic Vegetation of the Ottowa River Near Chalk River Nuclear Laboratories (CRNL),
W74-06819 5C

FOOD PROCESSING INDUSTRY

Packinghouse Waste Treatment.
W74-06511 5D

FOODS

Mercury in Humans in the Great Lakes Region,
W74-06783 5B

Mercury Content of Canadian Foods and Cereals Determined by Different Methods,
W74-06787 5A

FORAGES

Processing, Chemical Composition and Nutritive Value of Aquatic Weeds,
W74-06502 4A

FORECASTING

Predicting the Effects of Nutrient Diversion on Lake Recovery,
W74-06576 5C

A Physical Model for Prediction and Control of Saltwater Intrusion in the Floridan Aquifer,
W74-06609 2F

FOREIGN PROJECTS

Bibliography of Water Management.
W74-06854 3F

FOREIGN WATERS

Recent Developments in the Law of the Sea IV: A Synopsis,
W74-06965 6E

FOREST MANAGEMENT

Studies of the Forest Energy Budget,
W74-06518 2D

Automatic Interpretation of ERTS Data for Forest Management,
W74-06643 4A

Precision Annotation of Predetermined Primary Sampling Units on ERTS-1 MSS Images,
W74-06705 4A

FOREST SOILS

Gray Forest Soils in the Spruce-Fir Forests in the Sub-Ural Region (Vyatka-Kama Province), (In Russian),
W74-07004 2G

FORESTED AREAS

Interception Loss in the Humid Forested Areas (With Special Reference to Sungai Lui Catchment, West Malaysia),
W74-07015 2D

FOSSIL FUELS

Sources of Mercury in the Environment,
W74-06771 5B

FRANCE (NEOUVIELLE MASSIF)

Benthic Algae in Water of the Neouvielle Massif (Hautes-Pyrenees),
W74-07013 2H

FRANCE (RHONE DELTA)

First ERTS-1 Results in Southeastern France: Geology, Sedimentology, Pollution at Sea,
W74-06687 4A

FRANCE (RIVIERE DE MORLAIX)

Distribution and Seasonal Variations of the Plankton in 'Riviere de Morlaix,' (In French),
W74-07012 5C

FREMYELLA

An Examination of Three Strains of the Blue-Green Algal Genus, Fremyella,
W74-06759 5C

FRENCH CREEK (PA)

Woodcock Creek Lake, French Creek Basin, Pennsylvania (Final Environmental Impact Statement).
W74-06986 8A

FUEL PROCESSING

The Stack Monitoring System at the Idaho Chemical Processing Plant,
W74-06824 5A

FUNGUS

Competitive Saprophytic Colonization by Fusarium oxysporum F. Sp. vasinfectum,
W74-07011 3F

FURROW IRRIGATION

Evaluation of a Furrow Modifying Device,
W74-06588 3F

FURROW IRRIGATION *IRRIGATION DESIGN

Wheat and Grain Sorghum Irrigation in a Wide Bed-Furrow System,
W74-06580 3F

FUTURE PLANNING (PROJECTED)

U.S. Deepwater Port Study, Vol 2. Commodity Studies and Projections,
W74-06863 6D

U.S. Deepwater Port Study, Vol 3. Physical Coast and Port Characteristics, and Selected Deepwater Port Alternatives,
W74-06864 6D

GALERKIN METHOD

Solution of Equation for Vertical Unsaturated Flow of Soil Water,
W74-06736 2G

GAMBUSIA-AFFINIS

Observations on Gambusia affinis Introduced into Tokushima as a Natural Enemy of Mosquitoes, (In Japanese),
W74-07048 5G

GAME REFUGES

Geography of Waterfowl Resources of the Soviet Union. Condition of Reserves.
W74-06559 6B

GAMMA RADIATION

Aerial Radiological Measuring Survey of the Fort Calhoun Station, Fort Calhoun, Nebraska, August 9-10, 1972.
W74-06815 5A

Aerial Radiological Measuring Survey of the Area Surrounding the Palisades Plant, South Haven, Michigan, July 29, 1970.
W74-06816 5A

GAS CHROMATOGRAPHY

Organic Functional Group Analysis Via Gas Chromatograpy. III. Determination of Carbamates by Reaction with Alkali,
W74-06872 5A

GAS CHROMATROGRAPHY

The Determination of Mono- and Dimethylmercury Compounds by Gas Chromatography,
W74-06792 5A

GAS TRANSFER

Hypolimnion Aeration with Commercial Oxygen - Vol. II - Bubble Plume Gas Transfer,
W74-06526 5D

GEOGRAPHICAL REGIONS

Geography of Waterfowl Resources of the Soviet Union. Condition of Reserves.
W74-06559 6B

GEOLOGIC MAPPING

Pseudocolor Transformation of ERTS Imagery,
W74-06656 7C

Applications of Remote Sensing (ERTS) to Resource Management and Development in Sahelien Africa (Republic of Mali),
W74-06686 4A

A Preliminary Evaluation of ERTS-1 Images on the Volcanic Areas of Southern Italy (NASA Contract FO-013),
W74-06691 7C

Thermal Surveillance of Cascade Range Volcanoes Using ERTS-1 Multispectral Scanner, Aircraft Imaging Systems, and Ground-Based Data Communication Platforms,
W74-06692 7C

Initial Evaluation of the Geologic Applications of ERTS-1 Imagery for New Mexico,
W74-06693 4A

GEOLOGICAL MAPPING
First ERTS-1 Results in Southeastern France: Geology, Sedimentology, Pollution at Sea,
W74-06687 4A

GEOLOGY
Seamounts and Guyots: A Unique Resource,
W74-06966 6E

GEOMORPHOLOGY
New Insights into the Influence of Ice on the Coastal Marine Environment of the Beaufort Sea, Alaska,
W74-06669 2C

Coastal and Submarine Features on MSS Imagery of Southeastern Massachusetts: Comparison with Conventional Maps,
W74-06679 2L

Hydrogeomorphology,
W74-06891 2A

GEORGIA
Utilization of Phosphorus by Phytoplankton in Phosphorus-Rich Environments,
W74-06611 5C

Final Environmental Statement Related to the Proposed Alvin W. Vogtle Nuclear Plant Units 1, 2, 3, and 4.
W74-06821 5B

GEOTHERMAL ENERGY
Geothermal Development and Southwest Storage Basins,
W74-06945 4B

GEOTHERMAL STUDIES
Thermal Surveillance of Cascade Range Volcanoes Using ERTS-1 Multispectral Scanner, Aircraft Imaging Systems, and Ground-Based Data Communication Platforms,
W74-06692 7C

Geothermal Development and Southwest Storage Basins,
W74-06945 4B

GERMANY
Automatic Check and Correction of Meteorological Data in East Germany,
W74-06725 2B

GLACIERS
Snow Cover Surveys in Alaska From ERTS-1 Data,
W74-06697 2C

Recent Activity of Glaciers of Mount Rainier, Washington,
W74-06713 2C

Chemical Profile of the Ross Ice Shelf at Little America V, Antarctica,
W74-06921 2C

Folding of Cold Ice,
W74-06928 2C

GLACIOLOGY
Folding of Cold Ice,
W74-06928 2C

GOLD MINE WASTES
The Impact of Slimes-Dam Formation on Water Quality and Pollution,
W74-06604 5B

GOLDFISH
Interaction of Temperature and Copper Ions as Orienting Stimuli in the Locomotor Behavior of the Goldfish (Carassius auratus),
W74-06769 5C

GOVERNMENTAL INTERRELATIONS
Intergovernmental Relations as seen by Florida State Legislators: Land Use and Water Resource Problems,
W74-06845 6B

Ratification of Proposed Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (Final Environmental Impact Statement).
W74-06994 6E

GRAIN HARVESTING
Baking Quality of Spring Wheat as Affected by Rain During Drying After Reaping (In Polish),
W74-06548 3F

GRAIN SORGHUM
Wheat and Grain Sorghum Irrigation in a Wide Bed-Furrow System,
W74-06580 3F

GRANTS PASS (OREG)
Availability of Ground Water in the Grants Pass Area, Josephine County, Oregon,
W74-06959 7C

GRASSES
Some Comments on Seagrasses and Sedimentary Processes,
W74-06922 2J

GRAVIMETERIC ANALYSIS
Semimicrodetermination of Mercury(II) and Zinc(II) by Precipitation from Homogeneous Solution, Using Cation Generation Technique,
W74-06869 5A

GREAT LAKES
Mercury in Humans in the Great Lakes Region,
W74-06783 5B

GREENBELTS
Ecological and Physiological Implications of Greenbelt Irrigation,
W74-06608 5D

GROUNDWATER
The Problem of Direct Groundwater Discharge to the Seas,
W74-06881 2F

Procedings Ninth Biennial Conference on Ground Water.
W74-06942 5B

Ground Water Quality Models: What They Can and Cannot Do,
W74-06944 5B

Ground Water Quality Data for Planning, Monitoring and Surveillance,
W74-06947 5A

Sludge Disposal to Land,
W74-06950 5B

The Federal Role and Legislative Trends in Control of Ground Water Quality,
W74-06952 5G

Current State Board Activities in Ground Water Quality Management,
W74-06953 5G

Impact of Water Pollution Control Legislation on Meeting Future Water Needs in California,
W74-06954 5G

Ground Water Pollution--From the Waste Discharger's Viewpoint,
W74-06955 5G

Environmental Quality: As an Objective of Ground Water Management,
W74-06956 5B

Hydrology and Water Resources of the Hoosic River Basin, Massachusetts,
W74-06958 7C

Availability of Ground Water in the Grants Pass Area, Josephine County, Oregon,
W74-06959 7C

Groundwater Use Act of 1969.
W74-06973 6E

GROUNDWATER BASINS
Hydrologic Data from the Piceance Basin, Colorado.
W74-06714 4B

Geothermal Development and Southwest Storage Basins,
W74-06945 4B

GROUNDWATER MOVEMENT
Capillary Properties of Soils - Influence upon Specific Yield,
W74-06584 2F

Unsteady Radial Flow in Partially Saturated Soils,
W74-06587 2G

Upward Flow from Shallow Water Tables,
W74-06844 2F

On the Leakage Assumption Applied to Equations of Groundwater Flow,
W74-06888 2F

On the Solution of Transient Free-Surface Flow Problems in Porous Media by the Finite Element Method,
W74-06890 2F

Conservation Equations for Nonisothermal Flow in Porous Media,
W74-06892 2F

GROUNDWATER RECHARGE
Ground-Water Recharge Strip Basin-Experiments,
W74-06740 4B

Division of Water: Powers and Duties.
W74-06974 6E

GROUNDWATER RESOURCES
Ground-Water Hydrology of Northern Napa Valley, California,
W74-06880 2F

Effects of Ground-Water Development on the Proposed Palmetto Bend Dam and Reservoir in Southeast Texas,
W74-06920 4B

GROWTH COMPARISONS
Growth Comparisons of Oysters, Mussels and Scallops Cultivated on Algae Growth With Artificial Medium and Treated Sewage Effluent,
W74-07035 5C

GROWTH RATES
The Influence of Environmental Factors on the Distribution of Freshwater Algae: An Experimental Study. III. Effects of Temperature, Vitamin Requirements and Inorganic Nitrogen Compounds on Growth,
W74-06549 5C

GROWTH RATES

Growth of Streptococcus cremoris and Streptococcus lactis in a Chemostat. Production of Cells and Survival of Bacteria during Frozen Storage,
W74-06762 5C

Energetics of Daphnia Ambigua,
W74-06831 5C

Biological Response to Detergent and Nondetergent Phosphorus in Sewage - Part II,
W74-06873 5C

GROWTH STAGES
An Examination of Three Strains of the Blue-Green Algal Genus, Fremyella,
W74-06759 5C

GULF OF CALIFORNIA
Oceanographic Mapping of Structure and Dynamics of the Northern Gulf of California by the Use of Spectral Modeling and ERTS-1,
W74-06673 2L

GULF OF MEXICO
Distribution and Movement of Suspended Sediment in the Gulf of Mexico off the Texas Coast,
W74-06672 2L

Remote Sensing of Ocean Currents using ERTS Imagery,
W74-06675 2L

Application of ERTS-1 Imagery to the Harvest Model of the U.S. Menhaden Fishery,
W74-06678 2L

Cooperative Gulf of Mexico Estuarine Inventory and Study, Florida: Phase 1 Area Description,
W74-06995 2L

GUYOTS
Seamounts and Guyots: A Unique Resource,
W74-06966 6E

HAIR
Mercury Concentrations in Human Tissues Among Heavy Fish Eaters,
W74-06812 5B

HALF-LIFE
Behavior of Radioiodine in the Environment and in Man,
W74-06862 5B

HANFORD SITE (WASH)
241-T-106 Tank Leak Investigation.
W74-06861 5B

HARBORS
U.S. Deepwater Port Study, Vol. 2. Commodity Studies and Projections,
W74-06863 6D

U.S. Deepwater Port Study, Vol 3. Physical Coast and Port Characteristics, and Selected Deepwater Port Alternatives,
W74-06864 6D

HAWAII
Legal and Administrative Aspects of an Aquaculture Policy for Hawaii, An Assessment,
W74-06992 6E

HAZARDOUS MATERIALS
A Study of Hazardous Waste Materials, Hazardous Effects and Disposal Methods. Volume I.
W74-06555 5C

HAZARDS
A Study of Hazardous Waste Materials, Hazardous Effects and Disposal Methods. Volume I.
W74-06555 5C

A Study of Hazardous Waste Materials, Hazardous Effects and Disposal Methods. Volume II.
W74-06556 5C

A Study of Hazardous Waste Materials, Hazardous Effects and Disposal Methods. Volume III.
W74-06557 5C

HEAD LOSS
Hydraulics of a Center Pivot System,
W74-06583 3F

HEALTH RESORTS
Effect of Sodium-Potassium Chloride Mineral Water from the Splais Spring (Druskininkai Health Resort) on the Pseudocholinesterase Activity of Blood Serum and Protein-Synthesizing Function of the Liver in Experimental Acute Toxic Hepatitis, (In Russian),
W74-07005 5C

HEAT FLOW
Conservation Equations for Nonisothermal Flow in Porous Media,
W74-06892 2F

HEATED WATER
Use of Waste Heat for Soil Warming in North Carolina,
W74-07000 5D

HEAVY METALS
Distribution of Metals in Baltimore Harbor Sediments,
W74-06924 5B

HELE-SHAW MODEL
A Physical Model for Prediction and Control of Saltwater Intrusion in the Floridan Aquifer,
W74-06609 2F

HELMINTH EGGS
Search for a Method for Sanitizing Sewage from Helminth Eggs Using Agrochemical Means. (Preliminary Communication), (In Russian),
W74-07018 5D

HEPATITIS
Effect of Sodium-Potassium Chloride Mineral Water from the Splais Spring (Druskininkai Health Resort) on the Pseudocholinesterase Activity of Blood Serum and Protein-Synthesizing Function of the Liver in Experimental Acute Toxic Hepatitis, (In Russian),
W74-07005 5C

HIGH WATER MARK
Establishment of Mean High Water Lines in Florida Lakes,
W74-06610 2H

HIGHWAYS
River V. Richmond Metropolitan Authority.
W74-06984 6E

HISTORIC FLOODS
Flood of October 1972 at Petersburg and Colonial Heights, Virginia,
W74-06957 7C

HOGS
Dose-Response Relationships after Exposure of Swine to Organo-Mercurial Compounds,
W74-06809 5C

HOLMES CREEK (FLA)
Choctawhatchee River and Holmes Creek, Florida, Permit Application by Florida Game and Fresh Water Fish Commission (Final Environmental Impact Statement)
W74-06985 4A

HOOSIC RIVER BASIN (MASS)
Hydrology and Water Resources of the Hoosic River Basin, Massachusetts,
W74-06958 7C

HORMOTILA BLENNISTA
Lead Inhibition of Hormotila blennista (Chlorophyceae, Chlorococcales),
W74-06761 5C

HOUSTON (TEX)
A Comparison of Land-Use Determinations Using Data from ERTS-1 and High Altitude Aircraft,
W74-06638 4A

HUMAN BLOOD
The Binding of Inorganic and Organic Mercury Compounds (Hg 203) to Constituents of Normal Human Blood,
W74-06803 5C

HUMAN PATHOLOGY
Surface Electromyography in Chronic Inorganic Mercury Intoxication,
W74-06801 5C

Biotransformation of Organo-Mercurials in Mammals,
W74-06802 5C

The Binding of Inorganic and Organic Mercury Compounds (Hg 203) to Constituents of Normal Human Blood,
W74-06803 5C

Biological Reactions and Pathological Changes in Human Beings and Animals Caused by Organic Mercury Contamination,
W74-06804 5C

The Dose-Response Relationship Resulting from Exposure to Alkyl Mercury Compounds,
W74-06805 5C

The Relationship Between Mercury Concentration in Hair and the Onset of Minamata Disease,
W74-06806 5C

Organic Mercury Poisoning in Alamogordo, New Mexico,
W74-06807 5C

Detection and Appraisal of Subclinical Intoxications,
W74-06810 5C

Approaches to the Detection of Subclinical Mercury Intoxications: Experience in Minamata, Japan,
W74-06811 5C

Biological Effects of Mercury Compounds, Discussion Paper,
W74-06814 5C

HUMAN POPULATION
Epidemiological Approaches to the Study of Subclinical Effects of Mercury Intoxication,
W74-06813 5B

HUNGARY
Computer Monitoring of Precipitation in Hungary,
W74-06726 2B

HUNGARY (LAKE BALATON)
Studies on the Photosynthetic Pigments and Their Decomposition in the Sediment of Lake Balaton and Lake Belso,
W74-06741 5C

Horizontal Phytoplankton Studies in Lake Balaton Based on Scooped Samples and Filtrates Taken in 1967,
W74-06756 5C

HUNGARY (LAKE BELSO)
Studies on the Photosynthetic Pigments and Their Decomposition in the Sediment of Lake Balaton and Lake Belso,
W74-06741 5C

HURRICANE CREEK WATERSHED (TENN)
Hurricane Creek Watershed Project, Humphreys and Dickson Counties, Tennessee (Final Environmental Impact Statement).
W74-06988 4D

HYDRAULIC CONDUCTIVITY
Measurement of Hydraulic Conductivity By Means of Steady, Spherically Symmetric Flows,
W74-06735 2G

A Comparison of Hydraulic Conductivities Calculated with Morphometric and Physical Methods,
W74-06899 2G

Electro-Osmotic Effects in a Bentonite-Water System,
W74-06910 2K

One-Dimensional Vertical Infiltration,
W74-07034 2G

HYDRAULIC MODELS
Effect of Roughness Elements on Hydraulic Resistance for Overland Flow,
W74-06594 8B

Distribution and Mixing of Inflow into Stratified Lakes: A Hydraulic Model Study, (Phase I),
W74-06618 2H

Laboratory Experiments with Surface Runoff,
W74-06737 2E

Ground-Water Recharge Strip Basin-Experiments,
W74-06740 4B

HYDROBIOLOGY
Hydrobiological Studies 3.
W74-06530 5C

HYDRODYNAMICS
On Squire's Theorem in the Study of Hydrodynamic Stability of Plane-Parallel Flows of Incompressible Fluids about Deforming Boundaries,
W74-06911 8B

HYDROECONOMIC ANALYSIS
Application of DDDP in Water Resources Planning,
W74-06503 6A

HYDROGEN ION CONCENTRATION
Buffer Capacity in Aquatic Ecosystems,
W74-06829 5B

Buffer Intensities and Equilibrium pH of Minerals and Soils: 1. The Contribution of Minerals and Aqueous Carbonate to pH Buffering,
W74-06904 2G

Buffer Intensities and Equilibrium pH of Minerals and Soils: II. Theoretical and Actual pH of Minerals and Soils,
W74-06905 2G

HYDROGEOLOGY
Ground-Water Hydrology of Northern Napa Valley, California,
W74-06880 2F

Hydrogeomorphology,
W74-06891 2A

Karst Hydrology--A Review,
W74-06907 2F

Availability of Ground Water in the Grants Pass Area, Josephine County, Oregon,
W74-06959 7C

HYDROGEOMORPHOLOGY
Hydrogeomorphology,
W74-06891 2A

HYDROLOGIC BUDGET
Materials Input of Lake Champlain: A Synoptic Appraisal,
W74-06882 2H

HYDROLOGIC DATA
Hydrologic Data from the Piceance Basin, Colorado.
W74-06714 4B

Machine Control of the Quality of Observations in Automated Hydrometeorological-Data Processing,
W74-06723 2B

Fundamentals of Automatic Control of Meteorological Data,
W74-06724 2B

Automatic Check and Correction of Meteorological Data in East Germany,
W74-06725 2B

Computer Monitoring of Precipitation in Hungary,
W74-06726 2B

Automatic Monitoring of Daily Results of Basic Meteorological Observations,
W74-06727 2B

Automatic Method of Monitoring the Quality of Mean Monthly Meteorological Data,
W74-06728 2B

Automatic Monitoring of Processing of Daily Radiosonde Data on Temperature and Geopotential,
W74-06729 2B

Automatic Monitoring and Processing of Hourly Hydrometeorological Information,
W74-06730 2B

Some Principles of Objective Control of Marine Meteorological Information,
W74-06731 2B

Automatic Processing of Rainfall Data,
W74-06732 2B

An Algorithm for Monitoring Hydrometeorological Information,
W74-06733 2B

HYPOLIMNION
Hypolimnion Aeration with Commercial Oxygen - Vol. I - Dynamics of Bubble Plume,
W74-06525 5D

Hypolimnion Aeration with Commercial Oxygen - Vol. II - Bubble Plume Gas Transfer,
W74-06526 5D

ICE
Snow Cover Surveys in Alaska From ERTS-1 Data,
W74-06697 2C

Analysis of the Concentration of Microparticles in the Long Ice Core from Byrd Station,
W74-06931 2C

ICE COVER
Investigations Performed on the Arctic Ice Dynamics Joint Experiment, March 1971,
W74-06716 2C

Mesoscale Strain Measurements on the Beaufort Sea Pack Ice,
W74-06717 2C

Structure of a Multiyear Pressure Ridge,
W74-06718 2C

Top and Bottom Roughness of a Multiyear Ice Floe,
W74-06719 2C

Airphoto Analysis of Ice Deformation in the Beaufort Sea,
W74-06720 2C

Data on Morphological and Physical Characteristics of Sea Ice in the Beaufort Sea,
W74-06721 2C

ICELAND (CASCADE RANGE)
Thermal Surveillance of Cascade Range Volcanoes Using ERTS-1 Multispectral Scanner, Aircraft Imaging Systems, and Ground-Based Data Communication Platforms,
W74-06692 7C

IDAHO
1972 Operation of the ICPP Rare Gas Recovery Facility,
W74-06822 5D

The Stack Monitoring System at the Idaho Chemical Processing Plant,
W74-06824 5A

ILLINOIS
Network Analysis of Conjunctively Operated Ground Water-Surface Water Systems,
W74-06504 4B

Recovery of Fatty Materials from Edible Oil Refinery Effluents,
W74-06514 5D

Quantitative Methods for Preliminary Design of Water Quality Surveillance Systems,
W74-06885 5A

Nutwood Watershed, Illinois (Final Environmental Statement).
W74-06990 4A

ILLINOIS (LUSK CREEK)
An Annotated List of the Summer Vertebrate Fauna of Upper Lusk Creek, Pope County, Illinois,
W74-07036 2I

IMBIBITION
Unsteady Radial Flow in Partially Saturated Soils,
W74-06587 2G

IMPORT
U.S. Deepwater Port Study, Vol 2. Commodity Studies and Projections,
W74-06863 6D

IN-SEWER TREATMENT
Packinghouse Waste Treatment
W74-06511 5D

INDIA (BURABALANGA)
Ecological Aspects Along the Shores of the Burabalanga Tidal Estuary Balasore District, Orissa State,
W74-07049 2L

INDIANA
Stormwater Runoff Quality for Urban and Semi-Urban/Rural Watersheds,
W74-06851 5B

Quantitative Methods for Preliminary Design of Water Quality Surveillance Systems,
W74-06885 5A

INDUSTRIAL HYGIENE
Dose-Response Relationship Associated with Known Mercury Absorption at Low Dose Levels of Inorganic Mercury,
W74-06800 5C

INDUSTRIAL PLANTS
Dose-Response Relationship Associated with Known Mercury Absorption at Low Dose Levels of Inorganic Mercury,
W74-06800 5C

INDUSTRIAL PRODUCTION
Chlorine Production Drops as Demand Lags.
W74-06766 5B

INDUSTRIAL WASTES
Recovery of Fatty Materials from Edible Oil Refinery Effluents,
W74-06514 5D

Protozoans in Ponds Filled with Sugar Factory Wastes,
W74-06552 5C

Macrobenthos of Ponds with Sugar Factory Wastes,
W74-06553 5C

A Study of Hazardous Waste Materials, Hazardous Effects and Disposal Methods. Volume I.
W74-06555 5C

A Study of Hazardous Waste Materials, Hazardous Effects and Disposal Methods. Volume II.
W74-06556 5C

A Study of Hazardous Waste Materials, Hazardous Effects and Disposal Methods. Volume III.
W74-06557 5C

Chlorine Production Drops as Demand Lags.
W74-06766 5B

Sources of Mercury in the Environment,
W74-06771 5B

The Mercury Pollution Problem in Michigan,
W74-06773 5B

Mercury Levels in Wisconsin Fish,
W74-06778 5B

Investigation of Mercury Contamination in the Tennessee Valley Region,
W74-06780 5B

Distribution of Mercury in the Environment of Minamata Bay and the Inland Ariake Sea,
W74-06781 5B

Efficient Pricing for Urban Waste Water Renovation,
W74-06828 5D

INFILTRATION
Gravity Correction Due to a Variation of Pressure Head Within a Cavity,
W74-06734 2G

Solution of Equation for Vertical Unsaturated Flow of Soil Water,
W74-06736 2G

INFILTRATION RATES
Hydrodynamics of Border Irrigation Advance,
W74-06592 3F

Sensitivity of Surface Runoff to Variations of Watershed Parameters in Small Urban Areas-A Kinematic Model,
W74-06853 4C

INFILTRATION (VERTICAL)
One-Dimensional Vertical Infiltration,
W74-07034 2G

INFORMATION CLEARING-HOUSE
Information Resource: Final Report Water Pollution Control in Water Utilities,
W74-06527 5F

INFORMATION RESOURCE
Information Resource: Final Report Water Pollution Control in Water Utilities,
W74-06527 5F

INHIBITION
Lead Inhibition of Hormotila blennista (Chlorophyceae, Chlorococcales),
W74-06761 5C

INORGANIC COMPOUNDS
The Determination of Ethylmercury in Blood,
W74-06791 5A

INPUT-OUTPUT ANALYSIS
Techniques for Identifying and Evaluating Market and Nonmarket Benefits and Costs of Water Resource Systems.
W74-06852 6B

INSTITUTIONS
The Environmental Impulse and its Competitors: Attitudes, Interests, and Institutions at Lake Tahoe,
W74-06843 6E

INSTRUMENTATION
Analysis of the Feasibility of an Experiment to Measure Carbon Monoxide in the Atmosphere,
W74-06917 5A

INTER-AGENCY COMM
Three-Year Evolution,
W74-06970 6G

INTER-BASIN TRANSFERS
Conjunctive Operation of Southern California Ground Water Basins with the State Water Project,
W74-06943 4B

INTERCEPTION LOSS
Interception Loss in the Humid Forested Areas (With Special Reference to Sungai Lui Catchment, West Malaysia),
W74-07015 2D

INTERFACES (AQUATIC)
Applicability of ERTS-1 Imagery to the Study of Suspended Sediment and Aquatic Fronts
W74-06666 2L

INTERNATIONAL AGREEMENTS
Recent Developments in the Law of the Sea IV. A Synopsis,
W74-06965 6E

INTERNATIONAL LAW
Ratification of Proposed Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (Final Environmental Impact Statement)
W74-06994 6E

INTERNATIONAL WATERS
Seamounts and Guyots: A Unique Resource.
W74-06966 6E

Ratification of Proposed Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (Final Environmental Impact Statement).
W74-06994 6E

IODIDES
On the Reaction Between Iodide and Mercury(II),
W74-06870 5A

IODINE
Influence of Iodine on Growth and Development of the Brown Alga Ectocarpus Siliculosus in Axenic Cultures,
W74-06752 5C

Analysis of Iodine in Antarctic Snow,
W74-06929 5B

IODINE RADIOISOTOPES
Behavior of Radioiodine in the Environment and in Man,
W74-06862 5B

ION EXCHANGE
Physical-Chemical Treatment of Raw Municipal Wastewater,
W74-06509 5D

A Simple, Rapid Method for the Determination of Trace Mercury in Fish Via Neutron Activation Analysis,
W74-06788 5A

The Selective Removal of Nitrate and Nitrite from Polluted Water,
W74-06833 5G

Semimicrodetermination of Mercury(II) and Zinc(II) by Precipitation from Homogeneous Solution, Using Cation Generation Technique,
W74-06869 5A

Thermodynamics of Ion Exchange,
W74-06936 2G

Atomic Absorption Detector for Liquid-Liquid Chromatography,
W74-06998 5A

ION-SELECTIVE ELECTRODES
A Universal Ion-Selective Electrode Based on Graphite Paste,
W74-06758 2K

Selectrode - the Universal Ion-Selective Electrode. Part VI. The Calcium (II) Selectrode Employing a New Ion Exchanger in a Nonporous Membrane and a Solid-State Reference System,
W74-06764 5A

Selectrode - the Universal Ion-Selective Electrode. Part VII. A Valinomycin-Based Potassium Electrode with Nonporous Polymer Membrane and Solid-State Inner Reference System,
W74-06765 5A

ION TRANSPORT
Environmental Dynamics of Mercury: Discussion Paper,
W74-06799 5B

IONS
On the Reaction Between Iodide and Mercury(II),
W74-06870 5A

IOWA
Dry and Wet, July-August Rainfall Areas in Iowa,
W74-07045 2B

IRAN
Application of ERTS-1 Imagery in the Fields of Geology, Agriculture, Forestry, and Hydrology to Selected Test Sites in Iran,
W74-06710 4A

IRON
Transformation of Iron in a Waterlogged Soil as Influenced by Redox Potential and pH,
W74-06934 5B

IRON COMPOUNDS
Ionic State and Coordination of Iron in Bog Lakes,
W74-06744 5C

IRRIGATION
Bibliography of Water Management.
W74-06854 3F

IRRIGATION DESIGN
Design Criteria for Irrigation Systems with Complex Pipe Loops,
W74-06585 3F

Hydrodynamics of Border Irrigation Advance,
W74-06592 3F

IRRIGATION ENGINEERING
Design Criteria for Irrigation Systems with Complex Pipe Loops,
W74-06585 3F

IRRIGATION PRACTICES
Wheat and Grain Sorghum Irrigation in a Wide Bed-Furrow System,
W74-06580 3F

Hydrodynamics of Border Irrigation Advance,
W74-06592 3F

Sprinkler Precipitation Gage Errors,
W74-06593 3F

Pasture Irrigation with a Center-Pivot Sprinkler System,
W74-06601 3F

ITALY
A Preliminary Evaluation of ERTS-1 Images on the Volcanic Areas of Southern Italy (NASA Contract FO-013),
W74-06691 7C

ITALY (ISPRA)
Radioecological Researches in Freshwater and Terrestrial Environment, (In Italian),
W74-07009 5B

ITALY (RIVER TARO)
Predation on the Freshwater Bivalve Unio pictorum by the Rat, Rattus norvegicus, (In Italian),
W74-07008 2I

JAPAN
Yamadaphycus, a New Genus of the Delesseriaceae (Rhodophyta),
W74-06753 5A

Approaches to the Detection of Subclinical Mercury Intoxications: Experience in Minamata, Japan,
W74-06811 5C

JAPAN (KYOTO CITY)
An Epidemiological Study on Clonorchiasis in Kyoto City, (In Japanese),
W74-07050 5C

JAPAN (MINAMATA BAY)
Distribution of Mercury in the Environment of Minamata Bay and the Inland Ariake Sea,
W74-06781 5B

JAPAN (MINAMATA DISEASE)
Biological Reactions and Pathological Changes in Human Beings and Animals Caused by Organic Mercury Contamination,
W74-06804 5C

JAPAN (NIIGATA)
The Relationship Between Mercury Concentration in Hair and the Onset of Minamata Disease,
W74-06806 5C

JAPAN (TOKUSHIMA)
Observations on Gambusia affinis Introduced into Tokushima as a Natural Enemy of Mosquitoes, (In Japanese),
W74-07048 5G

JOINT TREATMENT
Treatment of Domestic Wastewater and NSSC Pulp and Paper Mill Wastes,
W74-06513 5D

JOSEPHINE COUNTY (OREG)
Availability of Ground Water in the Grants Pass Area, Josephine County, Oregon,
W74-06959 7C

JUDICIAL DECISIONS
Conservationists Go to Court--Part 1,
W74-06971 4D

River V. Richmond Metropolitan Authority.
W74-06984 6E

KANSAS
Energetics of Daphnia Ambigua,
W74-06831 5C

Modeling and Optimization of Transient Cooling Water Discharge from Power Generating Plants,
W74-06832 5B

KARST
Karst Hydrology--A Review,
W74-06907 2F

KARST HYDROLOGY
Karst Hydrology--A Review,
W74-06907 2F

KINEMATIC WAVES
Laboratory Experiments with Surface Runoff,
W74-06737 2E

KLAMATH RIVER (CALIF)
Lower Klamath River Flood Control Project, Del Norte County, California (Final Environmental Impact Statment).
W74-06989 4A

KOOTENAY LAKE (BRITISH COLUMBIA)
Capabilities and Limitations of Nutrient-Plankton Model,
W74-06570 5C

KRYPTON RADIOISOTOPES
1972 Operation of the ICPP Rare Gas Recovery Facility,
W74-06822 5D

LABORATORY TESTS
Start-Up of Municipal Wastewater Treatment Facilities,
W74-06578 5D

Determination of Mercury by Non-Destructive Neutron Activation Analysis,
W74-06789 5A

The Relationship Between Mercury Concentration in Hair and the Onset of Minamata Disease,
W74-06806 5C

Dose-Response Relationships after Exposure of Swine to Organo-Mercurial Compounds,
W74-06809 5C

LAGOONS
Production and Biogenic Activity of Distillates, Filtrates and Extracts from the Pomorie and Atanasovo Lagoon Mud, (In Bulgarian),
W74-07003 2H

The Laguna de Vegueta on the Mid-Peruvian Coast and Its Fishes, Particularly Aequidens rivulatus (Guenther 1859), (In German),
W74-07007 2H

LAKE CHAMPLAIN
Materials Input of Lake Champlain: A Synoptic Appraisal,
W74-06882 2H

LAKE ERIE
ERTS-1 Observes Algal Bloom in Lake Erie and Utah Lake,
W74-06699 5A

Mercury in Fish in the Great Lakes,
W74-06774 5B

Survey of Mercury Concentrations in Fishes of Lakes St. Clair, Erie, and Huron,
W74-06775 5B

Correlation Between CO2 and O2 Concentrations in Lake Erie, USA,
W74-07025 5C

LAKE HURON
Survey of Mercury Concentrations in Fishes of Lakes St. Clair, Erie, and Huron,
W74-06775 5B

LAKE MENDOTA (WIS
The Role of Thermocline Migration in Regulating Algal Blooms,
W74-06566 5C

LAKE MICHIGAN
Mercury in Fish in the Great Lakes,
W74-06774 5B

Mercury in the Lake Michigan Environment,
W74-06779 5B

LAKE MICHIGAN

Distribution and Circulation of Arsenic Through Water, Organisms and Sediments of Lake Michigan,
W74-07046 5B

LAKE RECLAMATION
Synopsis of Workshop on Modeling of the Eutrophication Process,
W74-06561 5C

LAKE RECOVERY
Long-Term Lake Recovery Related to Available Phosphorus,
W74-06562 5C

LAKE RESTORATION
Modeling the Eutrophication Process.
W74-06560 5C

Need for an Ecosystem Perspective in Eutrophication Modeling,
W74-06567 5C

Multi-Nutrient Dynamic Models of Algal Growth and Species Competition in Eutrophic Lakes,
W74-06568 5C

Rates of Carbon, Oxygen, Nitrogen, and Phosphorus Cycling Through Microbial Populations in Stratified Lakes,
W74-06569 5C

LAKE SEDIMENTS
Denitrification as a Pathway for Nitrate Removal in Aquatic Systems,
W74-06612 5B

Studies on the Photosynthetic Pigments and Their Decomposition in the Sediment of Lake Balaton and Lake Belso,
W74-06741 5C

LAKE SIDNEY LANIER (GEO)
Utilization of Phosphorus by Phytoplankton in Phosphorus-Rich Environments,
W74-06611 5C

LAKE ST
Mercury in Fish in the Great Lakes,
W74-06774 5B

Survey of Mercury Concentrations in Fishes of Lakes St. Clair, Erie, and Huron,
W74-06775 5B

Mercury in Wild Animals, Lake St. Clair, 1970,
W74-06776 5B

Mercury Levels in a Sample of Michigan Residents,
W74-06782 5B

LAKE SUPERIOR
Distribution and Circulation of Arsenic Through Water, Organisms and Sediments of Lake Michigan,
W74-07046 5B

LAKE TAHOE (CALIF)
The Environmental Impulse and its Competitors: Attitudes, Interests, and Institutions at Lake Tahoe,
W74-06843 6E

LAKE TRAVIS (TEX
Hypolimnion Aeration with Commercial Oxygen - Vol. I - Dynamics of Bubble Plume,
W74-06525 5D

Hypolimnion Aeration with Commercial Oxygen - Vol. II - Bubble Plume Gas Transfer,
W74-06526 5D

LAKE WINGRA (WIS
Simulation of Urban Runoff, Nutrient Loading, and Biotic Response of a Shallow Eutrophic Lake,
W74-06564 5C

LAKES
Productivity Investigations of Interconnected Marl Lakes (I). The Eight Lakes of the Oliver and Walters Chains, Northeastern Indiana,
W74-06533 5C

Changes in Water Chemistry Accompanying Summer Fish Kills in Shallow Eutrophic Lakes of Southwest Manitoba,
W74-06541 5C

Modeling the Eutrophication Process.
W74-06560 5C

Long-Term Lake Recovery Related to Available Phosphorus,
W74-06562 5C

Establishment of Mean High Water Lines in Florida Lakes,
W74-06610 2H

Utilization of ERTS-1 Data to Monitor and Classify Eutrophication of Inland Lakes,
W74-06698 5A

Determination of Land Use in Minnesota by Automatic Interpretation of ERTS MSS Data,
W74-06702 4A

Organic Phosphorus Compounds of a Northern Michigan Bog, Bog-Lake System,
W74-06742 5C

Ionic State and Coordination of Iron in Bog Lakes,
W74-06744 5C

The Runoff of Water and Nutrients from Watersheds Tributary to Cayuga Lake, New York,
W74-06848 5B

Water and Nutrient Budgets for Cayuga Lake, New York,
W74-06849 5B

Materials Input of Lake Champlain: A Synoptic Appraisal,
W74-06882 2H

Walden's Way Revealed,
W74-06925 2H

LAND CLASSIFICATION
Terrain Classification Maps of Yellowstone National Park,
W74-06645 4A

LAND DISPOSAL
Use of Waste Heat for Soil Warming in North Carolina,
W74-07000 5D

LAND DISPOSAL (WASTES)
Nitric Oxide Sorption by Calcareous Soils: II. Effect of Moisture on Capacity, Rate, and Sorption Products,
W74-06894 5B

LAND FORMING
A Computerized Solution for Bench Leveling Design,
W74-06600 4A

LAND GRADING
A Computerized Solution for Bench Leveling Design,
W74-06600 4A

LAND MANAGEMENT
A Multidisciplinary Survey for the Management of Alaskan Resources Utilizing ERTS Imagery,
W74-06633 4A

Nutwood Watershed, Illinois (Final Environmental Statement)
W74-06990 4A

LAND RESOURCES
Land Resources Survey for the State of Michigan,
W74-06644 4A

LAND USE
Change in Land Use in the Phoenix (1:250,000) Quadrangle, Arizona between 1970 and 1972: Successful Use of a Proposed Land Use Classification System,
W74-06622 4A

Land Use Investigations in the Central Valley and Central Coastal Test Sites, California,
W74-06623 4A

Land Use in Northern Coachella Valley,
W74-06624 4A

Land Use Classification and Change Analysis Using ERTS-1 Imagery in Carets,
W74-06625 4A

ERTS Regional-Scale Overview Linking Land Use and Environmental Processes in Carets,
W74-06626 4A

Evaluation of Land Use Mapping from ERTS in the Shore Zone of Carets,
W74-06627 4A

Land Use of Northern Megalopolis,
W74-06630 4A

Remote Sensing Applied to Land-Use Studies in Wyoming,
W74-06631 4A

ERTS-1 Applications to Minnesota Land Use Mapping,
W74-06632 4A

The Use of ERTS-1 Data for the Inventory of Critical Land Resources for Regional Land Use Planning,
W74-06634 4A

First Look Analyses of Five Cycles of ERTS-1 Imagery Over County of Los Angeles: Assessment of Data Utility for Urban Development and Regional Planning,
W74-06636 4A

Preparation of Urban Land Use Inventories by Machine-Processing of ERTS MSS Data,
W74-06637 4A

A Comparison of Land-Use Determinations Using Data from ERTS-1 and High Altitude Aircraft,
W74-06638 4A

Digital Land Use Mapping in Oakland County, Michigan,
W74-06639 4A

Mapping of Agricultural Land Use from ERTS-1 Digital Data,
W74-06640 4A

The Use of the Temporal Dimension in Classifying and Mapping ERTS-1 Mss Data,
W74-06641 4A

Land Resources Survey for the State of Michigan,
W74-06644 4A

Resource Management Implications of ERTS-1 Data to Ohio,
W74-06684 4A

Applications of Remote Sensing (ERTS) to Resource Management and Development in Sahelien Africa (Republic of Mali),
W74-06686 4A

Use of ERTS-1 Data for Regional Planning in the Metropolitan Washington Council of Governments--A Short Brief,
W74-06700 4A

Land Use Mapping and Change Detection Using ERTS Imagery in Montgomery County, Alabama,
W74-06701 4A

Determination of Land Use in Minnesota by Automatic Interpretation of ERTS MSS Data,
W74-06702 4A

Unsupervised Classification and Areal Measurement of Land and Water Coastal Features on the Texas Coast,
W74-06706 2L

Intergovernmental Relations as seen by Florida State Legislators: Land Use and Water Resource Problems,
W74-06845 6B

LANDFILLS
Effects of Solid Waste Disposal on Ground Water Quality,
W74-06949 5B

LARGEMOUTH BASS
The Effects of Ecological Changes on Buckeye Lake, Ohio, with Emphasis on Largemouth Bass and Aquatic Vascular Plants,
W74-06546 5C

LAW OF THE SEA
Recent Developments in the Law of the Sea IV: A Synopsis,
W74-06965 6E

Seamounts and Guyots: A Unique Resource,
W74-06966 6E

LEACHING
Azide and Ethylenethiourea Mobility in Soils,
W74-06896 5B

Mineral Nitrogen Movement into Subsoils Following Continued Annual Fertilization for Corn,
W74-06898 5B

LEAD
Lead Inhibition of Hormotila blennista (Chlorophyceae, Chlorococcales),
W74-06761 5C

PB-210 Concentration in Ice Measured at South Pole Station,
W74-06932 5A

LEAKY ARTESIAN AQUIFERS
On the Leakage Assumption Applied to Equations of Groundwater Flow,
W74-06888 2F

LEGAL ASPECTS
Coastal Wetlands in New England,
W74-06967 5G

LEGISLATION
Report of the Expert Group on Detergents.
W74-06554 5C

Will Municipal Sewage Continue to Threaten Primary Water-Contact Recreation: An Appraisal of the 1972 Water Pollution Control Act,
W74-06969 5G

Drainage Districts.
W74-06972 6E

Groundwater Use Act of 1969.
W74-06973 6E

Industrial Development--Pollution.
W74-06976 6E

Cleaning Agents.
W74-06977 6E

Sewer Construction.
W74-06978 6E

Water Pollution--Summer Intern Program.
W74-06982 6E

Proposal for Oklawaha River, Ocala National Forest, Florida, (Final Environmental Impact Statement).
W74-06993 4A

LEVEES
Lower Klamath River Flood Control Project, Del Norte County, California (Final Environmental Impact Statment).
W74-06989 4A

LIGHT
Endogenous and Photoperiodic Diurnal Rhythms of in Vivo Light Absorption and Scattering in the Green Alga Ulva Lactuca L.,
W74-06547 5C

LIGHT INTENSITY
Temperature Control of Reproduction and Productivity in a Subarctic Coralline Alga,
W74-06751 5C

LIMITING FACTORS
Multi-Nutrient Dynamic Models of Algal Growth and Species Competition in Eutrophic Lakes,
W74-06568 5C

Temperature Control of Reproduction and Productivity in a Subarctic Coralline Alga,
W74-06751 5C

LIMNOLOGY
Hydrobiological Studies 3.
W74-06530 5C

Survey of Reservoirs in Bohemia and Their Water Quality,
W74-06537 5C

Utilization of ERTS-1 Data to Monitor and Classify Eutrophication of Inland Lakes,
W74-06698 5A

LININGS
Development of Asphalt Moisture Barrier Equipment,
W74-06586 3F

LITTLE BAHAMA BANK
Calculations of Water Depth From ERTS-MSS Data,
W74-06681 2E

LITTORAL (RIVER)
Natural Phytocenoses of the River Littoral in the Lower Reaches of the River Hron,
W74-06550 2I

LONG ISLAND SOUND
Plume Development in Long Island Sound Observed by Remote Sensing (ERTS-1),
W74-06668 2L

LOOP NETWORKS
Design Criteria for Irrigation Systems with Complex Pipe Loops,
W74-06585 3F

LOS ANGELES
First Look Analyses of Five Cycles of ERTS-1 Imagery Over County of Los Angeles: Assessment of Data Utility for Urban Development and Regional Planning,
W74-06636 4A

LYSIMETERS
A Large Undisturbed, Weighing Lysimeter for Grassland Studies,
W74-06581 2G

MAINE
A Radioactive Isotopic Characterization of the Environment Near Wiscasset, Maine: A Preoperational Survey in the Vicinity of the Maine Yankee Atomic Power Plant,
W74-06855 5A

Spring Food of Chain Pickerel (Esox niger) in Maine Lakes,
W74-07032 2H

MAINE (SCHOODIC LAKE)
Relative Recoveries of Hatchery-Reared Landlocked Salmon Planted at Different Ages at Schoodic Lake, Maine,
W74-06865 8I

MALARIA CONTROL
Observations on Gambusia affinis Introduced into Tokushima as a Natural Enemy of Mosquitoes, (In Japanese),
W74-07048 5G

MALAYSIA (SUNGAI-LUI CATCHMENT)
Interception Loss in the Humid Forested Areas (With Special Reference to Sungai Lui Catchment, West Malaysia),
W74-07015 2D

MALI (SAHARA REGION)
Applications of Remote Sensing (ERTS) to Resource Management and Development in Sahelien Africa (Republic of Mali),
W74-06686 4A

MALONEY CANYON (CALIF)
Ecological and Physiological Implications of Greenbelt Irrigation,
W74-06608 5D

MANAGEMENT
Activity Analysis and the Management of Resources: A Model for Control of Eutrophication,
W74-06574 5C

Maintenance Management Systems for Municipal Wastewater Facilities,
W74-06579 5D

Multidisciplinary Application of ERTS-1 Data to North Carolina Natural Resource Management,
W74-06682 4C

MANAGEMENT

Water Supply Management Alternatives for Rhode Island,
W74-06827 6D

Modeling and Optimization of Transient Cooling Water Discharge from Power Generating Plants,
W74-06832 5B

Bibliography of Water Management.
W74-06854 3F

Whatever Happened to TVA,
W74-06968 6E

MANGROVE HAMMOCKS

Origin of Circular Beds of Thalassia (Spermatophyta:Hydrocharitaceae) in South Biscayne Bay, Florida, and Their Relationship to Mangrove Hammocks,
W74-07022 5A

MANGROVES (RED AND BLACK)

Florida Mangroves as Shoreline Stabilizers,
W74-07047 4A

MANNING'S EQUATION

Effect of Roughness Elements on Hydraulic Resistance for Overland Flow,
W74-06594 8B

MAPPING

Symposium on Significant Results Obtained From the Earth Resources Technology Satellite-1, Volume I: Technical Presentations, Section B.
W74-06619 7C

Cartographic Quality of ERTS-1 Images,
W74-06620 7C

Progress in Cartography, Eros Program,
W74-06621 7C

Change in Land Use in the Phoenix (1:250,000) Quadrangle, Arizona between 1970 and 1972: Successful Use of a Proposed Land Use Classification System,
W74-06622 4A

Land Use Investigations in the Central Valley and Central Coastal Test Sites, California,
W74-06623 4A

Land Use Classification and Change Analysis Using ERTS-1 Imagery in Carets,
W74-06625 4A

ERTS Regional-Scale Overview Linking Land Use and Environmental Processes in Carets,
W74-06626 4A

Evaluation of Land Use Mapping from ERTS in the Shore Zone of Carets,
W74-06627 4A

Geographic Applications of ERTS-1 Data to Landscape Change,
W74-06628 4A

Identification of Soil Associations in Western South Dakota on ERTS-1 Imagery,
W74-06629 2G

Land Use of Northern Megalopolis,
W74-06630 4A

Remote Sensing Applied to Land-Use Studies in Wyoming,
W74-06631 4A

ERTS-1 Applications to Minnesota Land Use Mapping,
W74-06632 4A

A Multidisciplinary Survey for the Management of Alaskan Resources Utilizing ERTS Imagery,
W74-06633 4A

The Use of ERTS-1 Data for the Inventory of Critical Land Resources for Regional Land Use Planning,
W74-06634 4A

Automatic Interpretation of ERTS Data for Forest Management,
W74-06643 4A

Land Resources Survey for the State of Michigan,
W74-06644 4A

Terrain Classification Maps of Yellowstone National Park,
W74-06645 4A

Use of ERTS Data for Mapping Arctic Sea Ice,
W74-06676 2C

Coastal and Submarine Features on MSS Imagery of Southeastern Massachusetts: Comparison with Conventional Maps,
W74-06679 2L

Precision Annotation of Predetermined Primary Sampling Units on ERTS-1 MSS Images,
W74-06705 4A

Application of ERTS-1 Imagery in the Fields of Geology, Agriculture, Forestry, and Hydrology to Selected Test Sites in Iran,
W74-06710 4A

Drainage Districts.
W74-06972 6E

MAPS

Flood of October 1972 at Petersburg and Colonial Heights, Virginia,
W74-06957 7C

Hydrology and Water Resources of the Hoosic River Basin, Massachusetts,
W74-06958 7C

Availability of Ground Water in the Grants Pass Area, Josephine County, Oregon,
W74-06959 7C

Quality of Ground Water in the Lower Colorado River Region, Arizona, Nevada, New Mexico, and Utah,
W74-06960 7C

Water Resources of Northwestern Missouri,
W74-06961 7C

Stream Temperatures in Washington State,
W74-06962 7C

MARINE AIR MASSES

Some Principles of Objective Control of Marine Meteorological Information,
W74-06731 2B

MARINE ALGAE

Culture Studies of Enteromorpha Linza (L.) J.AG. and Ulvaria Oxysperma (Kutzing) Bliding (Chlorophyceae, Ulvales) From Central America,
W74-06749 5C

Influence of Iodine on Growth and Development of the Brown Alga Ectocarpus Siliculosus in Axenic Cultures,
W74-06752 5C

Yamadaphycus, a New Genus of the Delesseriaceae (Rhodophyta)
W74-06753 5A

MARINE FISHERY

Seamounts and Guyots: A Unique Resource
W74-06966 6E

MARL

Productivity Investigations of Interconnected Marl Lakes (I). The Eight Lakes of the Oliver and Walters Chains, Northeastern Indiana
W74-06533 5C

MARYLAND

Seasonal Changes of Littoral Transport and Beach Width and Resulting Effect on Protective Structures,
W74-06664 2L

Recognition of Beach and Nearshore Depositional Features of Chesapeake Bay,
W74-06665 2L

Distribution of Metals in Baltimore Harbor Sediments,
W74-06924 5B

MASS SPECTROMETRY

Electron-Donor-Acceptor Complexing Reagents in the Analysis of Pesticides. VI. Influence of Structure in Detection and Identification,
W74-06871 5A

MASS TRANSFER

Nitrogen Removal by Ammonia Stripping,
W74-06842 5D

Conservation Equations for Nonisothermal Flow in Porous Media,
W74-06892 2F

MASSACHUSETTS

Coastal and Submarine Features on MSS Imagery of Southeastern Massachusetts: Comparison with Conventional Maps,
W74-06679 2L

Walden's Way Revealed,
W74-06925 2H

Hydrology and Water Resources of the Hoosic River Basin, Massachusetts,
W74-06958 7C

MATHEMATICAL MODELS

Utilization of Oxygen in Estuaries,
W74-06540 5C

Synopsis of Workshop on Modeling of the Eutrophication Process,
W74-06561 5C

Long-Term Lake Recovery Related to Available Phosphorus,
W74-06562 5C

Modeling Algal Growth Dynamics in Shagawa Lake, Minnesota, with Comments Concerning Projected Restoration of the Lake,
W74-06563 5C

Need for an Ecosystem Perspective in Eutrophication Modeling,
W74-06567 5C

Multi-Nutrient Dynamic Models of Algal Growth and Species Competition in Eutrophic Lakes,
W74-06568 5C

Rates of Carbon, Oxygen, Nitrogen, and Phosphorus Cycling Through Microbial Populations in Stratified Lakes,
W74-06569 5C

Capabilities and Limitations of Nutrient-Plankton Model,
W74-06570 5C

Phytoplankton Population Changes and Nutrient Fluctuations in a Simple Aquatic Ecosystem Model,
W74-06571 5C

Predicting the Effects of Nutrient Diversion on Lake Recovery,
W74-06576 5C

Mathematical Model of Water Advance in Border Irrigation,
W74-06582 3F

Unsteady Radial Flow in Partially Saturated Soils,
W74-06587 2G

Hydrodynamics of Border Irrigation Advance,
W74-06592 3F

Laboratory Experiments with Surface Runoff,
W74-06737 2E

Numerical Model of St. Lawrence River Estuary,
W74-06738 2L

Efficient Pricing for Urban Waste Water Renovation,
W74-06828 5D

Mathematical Model for Barged Ocean Disposal of Wastes,
W74-06837 5B

Sensitivity of Surface Runoff to Variations of Watershed Parameters in Small Urban Areas-A Kinematic Model,
W74-06853 4C

A Discrete Space Continuous Time Modeling Approach to Nonsteady Flow in a Leaky Aquifer System of Finite Configuration,
W74-06887 2F

Assessing Systematic Errors in Rainfall-Runoff Models,
W74-06893 2A

Ground Water Quality Models: What They Can and Cannot Do,
W74-06944 5B

IATHEMATICAL STUDIES
Modeling the Eutrophication Process.
W74-06560 5C

Need for an Ecosystem Perspective in Eutrophication Modeling,
W74-06567 5C

EASUREMENT
Water and Nutrient Budgets for Cayuga Lake, New York,
W74-06849 5B

EAT PACKING WASTEWATER
Packinghouse Waste Treatment.
W74-06511 5D

ENHADEN
Application of ERTS-1 Imagery to the Harvest Model of the U.S. Menhaden Fishery,
W74-06678 2L

MERCURY
Mercury in the Environment,
W74-06523 5B

Chlorine Production Drops as Demand Lags.
W74-06766 5B

Mercury as a Hydrospheric Pollutant II. Biological Half-Time of Methyl Mercury in Four Mediterranean Species: A Fish, a Crab, and Two Molluscs,
W74-06767 5C

Environmental Mercury Contamination.
W74-06770 5B

Sources of Mercury in the Environment,
W74-06771 5B

Some Estimates of Natural Levels of Mercury in the Environment,
W74-06772 5B

The Mercury Pollution Problem in Michigan,
W74-06773 5B

Mercury in Fish in the Great Lakes,
W74-06774 5B

Survey of Mercury Concentrations in Fishes of Lakes St. Clair, Erie, and Huron,
W74-06775 5B

Mercury in Wild Animals, Lake St. Clair, 1970,
W74-06776 5B

Mercury Contents of Bottom Sediments from Wisconsin Rivers and Lakes,
W74-06777 5B

Mercury Levels in Wisconsin Fish,
W74-06778 5B

Mercury in the Lake Michigan Environment,
W74-06779 5B

Investigation of Mercury Contamination in the Tennessee Valley Region,
W74-06780 5B

Distribution of Mercury in the Environment of Minamata Bay and the Inland Ariake Sea,
W74-06781 5B

Mercury Levels in a Sample of Michigan Residents,
W74-06782 5B

Mercury in Humans in the Great Lakes Region,
W74-06783 5B

The Occurrence of Mercury in the Environment and Man, Discussion Paper,
W74-06784 5B

Methods of Analysis for Mercury and its Compounds: A Review,
W74-06785 5A

Preparation of Biological Samples for Neutron Activation Analysis of Mercury,
W74-06786 5A

Mercury Content of Canadian Foods and Cereals Determined by Different Methods,
W74-06787 5A

A Simple, Rapid Method for the Determination of Trace Mercury in Fish Via Neutron Activation Analysis,
W74-06788 5A

Determination of Mercury by Non-Destructive Neutron Activation Analysis,
W74-06789 5A

Determination of Mercury in Biological Tissues,
W74-06790 5A

The Determination of Ethylmercury in Blood,
W74-06791 5A

The Determination of Mono- and Dimethylmercury Compounds by Gas Chromatography,
W74-06792 5A

Analytical Methodology for Mercury-Discussion Paper,
W74-06793 5A

Factors in the Transformation of Mercury to Methylmercury,
W74-06794 5B

The Role of Food Chains in Environmental Mercury Contamination,
W74-06795 5B

Mercury and Food Chains,
W74-06796 5B

Distribution of Mercury in Residual Soils,
W74-06797 5B

Research Needs: Study of the Environmental Dynamics of Mercury,
W74-06798 5B

Environmental Dynamics of Mercury: Discussion Paper,
W74-06799 5B

Dose-Response Relationship Associated with Known Mercury Absorption at Low Dose Levels of Inorganic Mercury,
W74-06800 5C

Surface Electromyography in Chronic Inorganic Mercury Intoxication,
W74-06801 5C

Biotransformation of Organo-Mercurials in Mammals,
W74-06802 5C

The Binding of Inorganic and Organic Mercury Compounds (Hg 203) to Constituents of Normal Human Blood,
W74-06803 5C

Biological Reactions and Pathological Changes in Human Beings and Animals Caused by Organic Mercury Contamination,
W74-06804 5C

The Dose-Response Relationship Resulting from Exposure to Alkyl Mercury Compounds,
W74-06805 5C

The Relationship Between Mercury Concentration in Hair and the Onset of Minamata Disease,
W74-06806 5C

Organic Mercury Poisoning in Alamogordo, New Mexico,
W74-06807 5C

Survival and Reproduction of Ring-Necked Pheasants Consuming Two Mercurial Fungicides,
W74-06808 5C

Dose-Response Relationships after Exposure of Swine to Organo-Mercurial Compounds,
W74-06809 5C

MERCURY

Detection and Appraisal of Subclinical Intoxications,
W74-06810 5C

Approaches to the Detection of Subclinical Mercury Intoxications: Experience in Minamata, Japan,
W74-06811 5C

Mercury Concentrations in Human Tissues Among Heavy Fish Eaters,
W74-06812 5B

Epidemiological Approaches to the Study of Subclinical Effects of Mercury Intoxication,
W74-06813 5B

Biological Effects of Mercury Compounds, Discussion Paper,
W74-06814 5C

Semimicrodetermination of Mercury(II) and Zinc(II) by Precipitation from Homogeneous Solution, Using Cation Generation Technique,
W74-06869 5A

On the Reaction Between Iodide and Mercury(II),
W74-06870 5A

The Mercury Content of Prehistoric Fish,
W74-07026 5A

MERCURY POLLUTION

Research Needs: Study of the Environmental Dynamics of Mercury,
W74-06798 5B

METABOLISM

Oxidation of Organic Matter in Sediments,
W74-06528 5C

An Examination of Three Strains of the Blue-Green Algal Genus, Fremyella,
W74-06759 5C

Mercury as a Hydrospheric Pollutant II. Biological Half-Time of Methyl Mercury in Four Mediterranean Species: A Fish, a Crab, and Two Molluscs,
W74-06767 5C

Biotransformation of Organo-Mercurials in Mammals,
W74-06802 5C

The Binding of Inorganic and Organic Mercury Compounds (Hg 203) to Constituents of Normal Human Blood,
W74-06803 5C

The Dose-Response Relationship Resulting from Exposure to Alkyl Mercury Compounds,
W74-06805 5C

METAL IONS

An Atomic Absorption Analysis Method for Cyanide,
W74-06999 5A

METALS

Mercury in the Environment,
W74-06523 5B

Evaluation of a Microwave-Induced Plasma Spectrometer for Trace Analysis,
W74-06841 5A

METEOROLOGICAL DATA

Automatic Processing and Verification of Meteorological Observations.
W74-06722 2B

Machine Control of the Quality of Observations in Automated Hydrometeorological Data Processing,
W74-06723 2B

Fundamentals of Automatic Control of Meteorological Data,
W74-06724 2B

Automatic Check and Correction of Meteorological Data in East Germany,
W74-06725 2B

Computer Monitoring of Precipitation in Hungary,
W74-06726 2B

Automatic Monitoring of Daily Results of Basic Meteorological Observations,
W74-06727 2B

Automatic Method of Monitoring the Quality of Mean Monthly Meteorological Data,
W74-06728 2B

Automatic Monitoring of Processing of Daily Radiosonde Data on Temperature and Geopotential,
W74-06729 2B

Automatic Monitoring and Processing of Hourly Hydrometeorological Information,
W74-06730 2B

Some Principles of Objective Control of Marine Meteorological Information,
W74-06731 2B

An Algorithm for Monitoring Hydrometeorological Information,
W74-06733 2B

METHODOLOGY

Component Description and Analysis of Environmental Systems: Oxygen Utilization in Aquatic Microcosms,
W74-06575 5C

Chemical Aspects of Bioassay Techniques for Establishing Water Quality Criteria,
W74-06747 5A

Complexiometric Determination of Phosphate,
W74-06757 5A

METHYLATION

Mercury Contents of Bottom Sediments from Wisconsin Rivers and Lakes,
W74-06777 5B

Factors in the Transformation of Mercury to Methylmercury,
W74-06794 5B

Environmental Dynamics of Mercury: Discussion Paper,
W74-06799 5B

Biological Reactions and Pathological Changes in Human Beings and Animals Caused by Organic Mercury Contamination,
W74-06804 5C

Organic Mercury Poisoning in Alamogordo, New Mexico,
W74-06807 5C

Biological Effects of Mercury Compounds, Discussion Paper,
W74-06814 5C

METHYLMERCURY

Sources of Mercury in the Environment,
W74-06771 5B

The Determination of Mono- and Dimethylmercury Compounds by Gas Chromatography
W74-06792 5A

Factors in the Transformation of Mercury to Methylmercury,
W74-06794 5B

METHYLMERCURY POISONING

Mercury Levels in a Sample of Michigan Residents,
W74-06782 5B

MICHAELIS-MENTON MODEL

Nitrogen Turnover in Impoundments
W74-06505 5C

MICHIGAN

Mercury in the Environment,
W74-06523 5B

Digital Land Use Mapping in Oakland County Michigan,
W74-06639 4A

Land Resources Survey for the State of Michigan,
W74-06644 4A

Utilization of ERTS-1 Data to Monitor and Classify Eutrophication of Inland Lakes,
W74-06698 5A

Organic Phosphorus Compounds of a Northern Michigan Bog, Bog-Lake System,
W74-06742 5C

Preliminary Report of the Role of Sphagnum in the Cycling of Phosphorus in a Bog-Lake System,
W74-06743 5C

Ionic State and Coordination of Iron in Bog Lakes,
W74-06744 5C

The Mercury Pollution Problem in Michigan,
W74-06773 5B

Mercury Levels in a Sample of Michigan Residents,
W74-06782 5B

Aerial Radiological Measuring Survey of the Area Surrounding the Palisades Plant, South Haven, Michigan, July 29, 1970.
W74-06816 5A

Aerial Radiological Measuring Survey of the Area Surrounding the Enrico Fermi Atomic Power Plant, Monroe, Michigan, September 1970.
W74-06817 5A

Industrial Development--Pollution.
W74-06976 6E

Cleaning Agents.
W74-06977 6E

Sewer Construction.
W74-06978 6E

Sewage Treatment Facilities, State Grants.
W74-06979 6E

Sewage Collection Facilities.
W74-06980 6E

MICROBIAL DEGRADATION

Oxidation of n-Alkanes by Cladosporium resinae,
W74-06763 5C

Distribution of Autotrophic Nitrifying Bacteria in a Polluted Stream,
W74-06834 5C

MICROORGANISMS
Epiphytic Microphytes in a Pond Polluted with Beet Sugar Factory Wastes,
W74-06551 5C

MIGRATION
On the Selection of a Ground Disposal Site by Sensitivity Analysis,
W74-06858 5B

MILITARY ASPECTS
The Challenge of Military Nuclear Construction,
W74-06859 8H

MINAMATA DISEASE
The Relationship Between Mercury Concentration in Hair and the Onset of Minamata Disease,
W74-06806 5C

MINE WASTES
Identification and Mapping of Coal Refuse Banks and Other Targets in the Anthracite Region,
W74-06642 4A

MINERALIZATION (SOIL NITROGEN)
Nitrogen Mineralization-Water Relations in Soils,
W74-06897 5B

MINERALS
Effect of Sodium-Potassium Chloride Mineral Water from the Splais Spring (Druskininkai Health Resort) on the Pseudocholinesterase Activity of Blood Serum and Protein-Synthesizing Function of the Liver in Experimental Acute Toxic Hepatitis, (In Russian),
W74-07005 5C

MINING ENGINEERING
The Law to Govern Deepsea Mining Until Superseded by International Agreement,
W74-06964 6E

MINNESOTA
ERTS-1 Applications to Minnesota Land Use Mapping,
W74-06632 4A

Determination of Land Use in Minnesota by Automatic Interpretation of ERTS MSS Data,
W74-06702 4A

Area Financing of Water Resource Development in West Minnesota,
W74-06846 6B

MISSISSIPPI
Estimating Soil Erosion from the Redistribution of Fallout Cs-137,
W74-06901 2J

MISSISSIPPI SOUND
Relationships Between Remotely Sensed Fisheries Distribution Information and Selected Oceanographic Parameters in the Mississippi Sound,
W74-06708 7B

MISSOURI
University of Chicago Contribution to Project Metromex-I.
W74-06937 2B

Radar Studies of Urban Precipitation Anomaly,
W74-06938 2B

Observations of the Cloud Nucleus Concentration Around the St. Louis Urban Complex,
W74-06939 2B

Upwind and Downwind Cloud-Base Microstructure,
W74-06940 2B

Metromex Temperature and Aerosol Data Reduction: Analysis of the Urban Anomaly,
W74-06941 2B

Water Resources of Northwestern Missouri,
W74-06961 7C

MIXING
Distribution and Mixing of Inflow into Stratified Lakes: A Hydraulic Model Study, (Phase I),
W74-06618 2H

MODEL STUDIES
Modeling the Eutrophication Process.
W74-06560 5C

Simulation of Urban Runoff, Nutrient Loading, and Biotic Response of a Shallow Eutrophic Lake,
W74-06564 5C

Some Aspects of Phosphorus Dynamics of the Twin Lakes Watershed,
W74-06565 5C

A Physical Model for Simulation of Aquatic Ecosystems,
W74-06573 5C

Activity Analysis and the Management of Resources: A Model for Control of Eutrophication,
W74-06574 5C

Component Description and Analysis of Environmental Systems: Oxygen Utilization in Aquatic Microcosms,
W74-06575 5C

Mathematical Model of Water Advance in Border Irrigation,
W74-06582 3F

A Physical Model for Prediction and Control of Saltwater Intrusion in the Floridan Aquifer,
W74-06609 2F

Environmental Sciences Division Annual Progress Report for Period Ending September 30, 1973,
W74-06826 5B

MOISTURE BALANCE
The Role of Dew in the Seasonal Moisture Balance of a Summer-Dry Climate,
W74-07037 2B

MOISTURE BARRIERS
Development of Asphalt Moisture Barrier Equipment,
W74-06586 3F

MOISTURE METERS
A Large Undisturbed, Weighing Lysimeter for Grassland Studies,
W74-06581 2G

MOISTURE RETENTION
A Comparison of Hydraulic Conductivities Calculated with Morphometric and Physical Methods,
W74-06899 2G

MOLLUSCS
Mercury as a Hydrospheric Pollutant II. Biological Half-Time of Methyl Mercury in Four Mediterranean Species: A Fish, a Crab, and Two Molluscs,
W74-06767 5C

MOLLUSKS (BIVALVE)
Predation on the Freshwater Bivalve Unio pictorum by the Rat, Rattus norvegicus, (In Italian),
W74-07008 2I

MONITORING
Symposium on Significant Results Obtained From the Earth Resources Technology Satellite-1, Volume I: Technical Presentations, Section B.
W74-06619 7C

Aerial Radiological Measuring Survey of the Area Surrounding the Enrico Fermi Atomic Power Plant, Monroe, Michigan, September 1970.
W74-06817 5A

The Stack Monitoring System at the Idaho Chemical Processing Plant,
W74-06824 5A

A Radioactive Isotopic Characterization of the Environment Near Wiscasset, Maine: A Preoperational Survey in the Vicinity of the Maine Yankee Atomic Power Plant,
W74-06855 5A

Environmental Aspects of Plutonium and Other Elements, a Selected Annotated Bibliography.
W74-06857 5C

Quantitative Methods for Preliminary Design of Water Quality Surveillance Systems,
W74-06885 5A

Analysis of the Feasibility of an Experiment to Measure Carbon Monoxide in the Atmosphere,
W74-06917 5A

Ground Water Quality Data for Planning, Monitoring and Surveillance,
W74-06947 5A

MONOMOLECULAR FILMS
Evaporation Suppression, A Bibliography.
W74-06501 3D

MONONGAHELA RIVER (W VA)
Micro-Ecosystems Simulation of Primary Production in Thermal and Acid Mine Water Loadings Related to Water Use of the Monongahela River,
W74-06507 5C

MONTE CARLO METHOD
Application of Monte Carlo Method to Soil Water Movement,
W74-06599 2G

MONTGOMERY COUNTY (ALA)
Land Use Mapping and Change Detection Using ERTS Imagery in Montgomery County, Alabama,
W74-06701 4A

MONTSWEAG BAY (MAINE)
A Radioactive Isotopic Characterization of the Environment Near Wiscasset, Maine: A Preoperational Survey in the Vicinity of the Maine Yankee Atomic Power Plant,
W74-06855 5A

MORRISTOWN (N
Unrecorded Pollution and Dynamics of Biochemical Oxygen Demand,
W74-06613 5B

MORTALITY
Survival and Reproduction of Ring-Necked Pheasants Consuming Two Mercurial Fungicides,
W74-06808 5C

MOSQUITO CONTROL
Control of Mosquitoes Breeding in Rice-Fields,
W74-07041 5G

MOSSES
Preliminary Report of the Role of Sphagnum in the Cycling of Phosphorus in a Bog-Lake System,
W74-06743 5C

MOUNT RAINIER (WASH)
Recent Activity of Glaciers of Mount Rainier, Washington,
W74-06713 2C

MOUNT RUSHMORE (SO
Demonstration of a Non-Aqueous Sewage Disposal System,
W74-06519 5D

MUD
Production and Biogenic Activity of Distillates, Filtrates and Extracts from the Pomorie and Atanasovo Lagoon Mud, (In Bulgarian),
W74-07003 2H

MUNICIPAL WASTES
Maintenance Management Systems for Municipal Wastewater Facilities,
W74-06579 5D

MUNICIPAL WASTEWATER
Physical-Chemical Treatment of Raw Municipal Wastewater,
W74-06509 5D

MUSSELS
Growth Comparisons of Oysters, Mussels and Scallops Cultivated on Algae Growth With Artificial Medium and Treated Sewage Effluent,
W74-07035 5C

N-15 ISOTOPE
Nitrogen Turnover in Impoundments,
W74-06505 5C

NAPA VALLEY (CALIF)
Ground-Water Hydrology of Northern Napa Valley, California,
W74-06880 2F

NATIONAL ENVIRONMENTAL POLICY ACT
Three-Year Evolution,
W74-06970 6G

Conservationists Go to Court--Part 1,
W74-06971 4D

NATIONAL PARKS
Terrain Classification Maps of Yellowstone National Park,
W74-06645 4A

NATURAL RADIOISOTOPES
Uptake of Natural Radioisotopes by Aquatic Organisms,
W74-06534 5C

NATURAL RESOURCES
Multidisciplinary Application of ERTS-1 Data to North Carolina Natural Resource Management,
W74-06682 4C

Natural Resource Inventory and Monitoring in Oregon With ERTS Imagery,
W74-06683 4A

NAVIGABLE RIVERS
Choctawhatchee River and Holmes Creek, Florida, Permit Application by Florida Game and Fresh Water Fish Commission (Final Environmental Impact Statement).
W74-06985 4A

NAVIGABLE WATERS
River V. Richmond Metropolitan Authority.
W74-06984 6E

NEBRASKA
Pasture Irrigation with a Center-Pivot Sprinkler System,
W74-06601 3F

Aerial Radiological Measuring Survey of the Fort Calhoun Station, Fort Calhoun, Nebraska, August 9-10, 1972.
W74-06815 5A

Biological Treatment of Feedlot Runoff,
W74-06847 5D

NEOCHLORIS
The Genus Neochloris Starr (Chlorophyceae, Chlorococcales),
W74-06760 5A

NETWORK FLOW ANALYSIS
Network Analysis of Conjunctively Operated Ground Water-Surface Water Systems,
W74-06504 4B

NEUTRALIZATION
An Appraisal of Neutralization Processes to Treat Coal Mine Drainage,
W74-06512 5D

NEUTRON ACTIVATION ANALYSIS
Preparation of Biological Samples for Neutron Activation Analysis of Mercury,
W74-06786 5A

A Simple, Rapid Method for the Determination of Trace Mercury in Fish Via Neutron Activation Analysis,
W74-06788 5A

Determination of Mercury by Non-Destructive Neutron Activation Analysis,
W74-06789 5A

Distribution and Circulation of Arsenic Through Water, Organisms and Sediments of Lake Michigan,
W74-07046 5B

NEVADA (LAKE MEAD)
Phytoplankton Successions and Lake Dynamics in Las Vegas Bay, Lake Mead, Nevada,
W74-07001 5C

NEVADA TEST SITE
(Radiation Data, Section II. Water).
W74-06856 5A

NEVADA TEST STE
Environmental Aspects of Plutonium and Other Elements, a Selected Annotated Bibliography.
W74-06857 5C

NEW JERSEY
Utilization of Trickling Filters for Dual Treatment of Dry and Wet Weather Flows.
W74-06508 5D

Unrecorded Pollution and Dynamics of Biochemical Oxygen Demand,
W74-06613 5B

Distribution of Autotrophic Nitrifying Bacteria in a Polluted Stream,
W74-06834 5C

Water Pollution--Summer Intern Program
W74-06982 6E

NEW MEXICO
Initial Evaluation of the Geologic Applications of ERTS-1 Imagery for New Mexico,
W74-06693 4A

Organic Mercury Poisoning in Alamogordo, New Mexico,
W74-06807 5C

Geologic and Hydrologic Background for Selecting Site of Pilot-Plant Repository for Radioactive Waste,
W74-06820 5B

NEW YORK
A Chart of New York Water Law,
W74-06614 6E

The Runoff of Water and Nutrients from Watersheds Tributary to Cayuga Lake, New York,
W74-06848 5B

Water and Nutrient Budgets for Cayuga Lake, New York,
W74-06849 5B

Materials Input of Lake Champlain: A Synoptic Appraisal,
W74-06882 2H

Drainage.
W74-06983 6E

NEW YORK BIGHT
The Effects of Waste Disposal in the New York Bight. Section 3: Zooplankton Studies.
W74-06866 5C

The Effects of Waste Disposal in the New York Bight. Section 5: Chemical Studies.
W74-06867 5C

The Effects of Waste Disposal in the New York Bight. Sections 7, 8, and 9.
W74-06868 5C

NIGERIA
An Ecological Study of Vellozia schnitzleinia, a Drought-Enduring Plant of Northern Nigeria,
W74-06768 2I

NITRATES
Denitrification as a Pathway for Nitrate Removal in Aquatic Systems,
W74-06612 5B

A Universal Ion-Selective Electrode Based on Graphite Paste,
W74-06758 2K

The Selective Removal of Nitrate and Nitrite from Polluted Water,
W74-06833 5G

New Methods of Nitrite and Nitrate Analysis for Natural Waters,
W74-06836 5A

New Spot Tests for Nitrates and Nitrites,
W74-06878 5A

Mineral Nitrogen Movement into Subsoils Following Continued Annual Fertilization for Corn,
W74-06898 5B

NITRIC OXIDE
Nitric Oxide Sorption by Calcareous Soils: II. Effect of Moisture on Capacity, Rate, and Sorption Products,
W74-06894 5B

NITRIFICATION
Distribution of Autotrophic Nitrifying Bacteria in a Polluted Stream,
W74-06834 5C

NITRIFYING BACTERIA
Distribution of Autotrophic Nitrifying Bacteria in a Polluted Stream,
W74-06834 5C

NITRITES
The Selective Removal of Nitrate and Nitrite from Polluted Water,
W74-06833 5G

New Methods of Nitrite and Nitrate Analysis for Natural Waters,
W74-06836 5A

New Spot Tests for Nitrates and Nitrites,
W74-06878 5A

NITROGEN
Energetics of Daphnia Ambigua,
W74-06831 5C

Ammonia-Nitrogen Removal by Breakpoint Chlorination,
W74-06838 5D

Nitric Oxide Sorption by Calcareous Soils: II. Effect of Moisture on Capacity, Rate, and Sorption Products,
W74-06894 5B

Nitrogen Mineralization-Water Relations in Soils,
W74-06897 5B

NITROGEN FERTILIZER
Effect of Plant Growth and Form of Nitrogen Fertilizer on Dentrification from Four South Australian Soils,
W74-07039 2G

NITROGEN-FIXING ACTIVITY
Nitrogen-Fixing Activity in Upland and Flooded Rice Fields,
W74-07024 5B

NITROGENOUS OXYGEN DEMAND
Distribution of Autotrophic Nitrifying Bacteria in a Polluted Stream,
W74-06834 5C

NON-DESTRUCTIVE TESTS
Determination of Mercury by Non-Destructive Neutron Activation Analysis,
W74-06789 5A

NON-POINT POLLUTION SOURCES
Unrecorded Pollution and Dynamics of Biochemical Oxygen Demand,
W74-06613 5B

NORFOLK (VA)
Land Use Classification and Change Analysis Using ERTS-1 Imagery in Carets,
W74-06625 4A

NORTH CAROLINA
Color Removal from Kraft Mill Effluents by Ultrafiltration,
W74-06521 5D

Inventory of Active Water Resources Research Projects in North Carolina.
W74-06615 9D

Water Resources Research Interests in the Colleges and Universities of North Carolina.
W74-06616 9A

Annual Report, FY 1973.
W74-06617 9A

Multidisciplinary Application of ERTS-1 Data to North Carolina Natural Resource Management,
W74-06682 4C

The Present and Future Status of Eastern North Carolina Wetlands,
W74-06850 2L

Drainage Districts.
W74-06972 6E

Use of Waste Heat for Soil Warming in North Carolina,
W74-07000 5D

NORTH GATE LAKE (MICH
Organic Phosphorus Compounds of a Northern Michigan Bog, Bog-Lake System,
W74-06742 5C

NUCLEAR ENERGY
Whatever Happened to TVA,
W74-06968 6E

NUCLEAR EXPLOSIONS
A Review of Soviet Data on the Peaceful Uses of Nuclear Explosions,
W74-06823 6B

The Challenge of Military Nuclear Construction,
W74-06859 8H

NUCLEAR MOISTURE METERS
Gamma Radiation Measurements of Bulk Density Changes in a Soil Pedon Following Irrigation,
W74-06715 2G

NUCLEAR POWERPLANTS
Aquatic Vegetation of the Ottowa River Near Chalk River Nuclear Laboratories (CRNL),
W74-06819 5C

Final Environmental Statement Related to the Proposed Alvin W. Vogtle Nuclear Plant Units 1, 2, 3, and 4.
W74-06821 5B

A Critical Review of Solid Radioactive Waste Practices at Nuclear Power Plants,
W74-06825 5B

The National Environmental Policy Act and the Licensing Process: Environmentalist Magna Carta or Agency Coup de Grace,
W74-06963 5G

NUCLEAR WASTES
241-T-106 Tank Leak Investigation.
W74-06861 5B

NUMERICAL ANALYSIS
Numerical Model of St. Lawrence River Estuary,
W74-06738 2L

On the Solution of Transient Free-Surface Flow Problems in Porous Media by the Finite Element Method,
W74-06890 2F

NUTRIENT REMOVAL
Basic Research in the Aquatic Environment: Effects of Eutrophication on Phytoplankton Populations and Selected Species of Aquatic Vascular Plants,
W74-06835 5C

NUTRIENTS
Processing, Chemical Composition and Nutritive Value of Aquatic Weeds,
W74-06502 4A

Nitrogen Turnover in Impoundments,
W74-06505 5C

Simulation of Urban Runoff, Nutrient Loading, and Biotic Response of a Shallow Eutrophic Lake,
W74-06564 5C

Multi-Nutrient Dynamic Models of Algal Growth and Species Competition in Eutrophic Lakes,
W74-06568 5C

Capabilities and Limitations of Nutrient-Plankton Model,
W74-06570 5C

Phytoplankton Population Changes and Nutrient Fluctuations in a Simple Aquatic Ecosystem Model,
W74-06571 5C

Predicting the Effects of Nutrient Diversion on Lake Recovery,
W74-06576 5C

The Runoff of Water and Nutrients from Watersheds Tributary to Cayuga Lake, New York,
W74-06848 5B

Water and Nutrient Budgets for Cayuga Lake, New York,
W74-06849 5B

NUTWOOD WATERSHED (ILL)
Nutwood Watershed, Illinois (Final Environmental Statement).
W74-06990 4A

OCCUPATIONAL HEALTH
Surface Electromyography in Chronic Inorganic Mercury Intoxication,
W74-06801 5C

OCEAN CURRENTS
Oceanographic Mapping of Structure and Dynamics of the Northern Gulf of California by the Use of Spectral Modeling and ERTS-1,
W74-06673 2L

Remote Sensing of Ocean Currents using ERTS Imagery,
W74-06675 2L

OCEAN DISPOSAL
Mathematical Model for Barged Ocean Disposal of Wastes,
W74-06837 5B

OCEANOGRAPHY
Oceanographic Mapping of Structure and Dynamics of the Northern Gulf of California by the Use of Spectral Modeling and ERTS-1,
W74-06673 2L

OCEANOGRAPHY

Oceanographic Features in the Lee of the Windward and Leeward Islands: ERTS and Ship Data,
W74-06674 2E

Remote Sensing of Ocean Currents using ERTS Imagery,
W74-06675 2L

Water Depth Estimation with ERTS-1 Imagery,
W74-06680 2L

Calculations of Water Depth From ERTS-MSS Data,
W74-06681 2E

Use of ERTS-1 Pictures in Coastal Oceanography in British Columbia,
W74-06707 2L

Application of ERTS-1 Imagery in Coastal Studies,
W74-06709 2L

ODOR
Contribution to the Investigation of Odours in Water,
W74-06538 5C

OECD
Report of the Expert Group on Detergents.
W74-06554 5C

OHIO
The Effects of Ecological Changes on Buckeye Lake, Ohio, with Emphasis on Largemouth Bass and Aquatic Vascular Plants,
W74-06546 5C

Resource Management Implications of ERTS-1 Data to Ohio,
W74-06684 4A

Mapping of Spoil Banks Using ERTS-1 Pictures,
W74-06695 5A

Division of Water: Powers and Duties.
W74-06974 6E

Powers of the Water Pollution Control Board: Powers of Director of Environmental Protection.
W74-06975 6E

Regional Water and Sewer Districts: Rights, Powers and Duties.
W74-06981 6E

OHIO RIVER
Ohio River Basin Commission Annual Report, Fiscal Year Ending June 30, 1972.
W74-06918 6E

OHIO RIVER BASIN COMMISSION
Ohio River Basin Commission Annual Report, Fiscal Year Ending June 30, 1972.
W74-06918 6E

OIL DISPERSANTS
Effects of Oil Dispersants and Oil Emulsions on Marine Animals,
W74-06745 5C

Using Artemia to Assay Oil Dispersant Toxicities,
W74-06877 5A

OIL EMULSIONS
Effects of Oil Dispersants and Oil Emulsions on Marine Animals,
W74-06745 5C

OIL POLLUTION
Effects of Oil Dispersants and Oil Emulsions on Marine Animals,
W74-06745 5C

OIL SHALES
Hydrologic Data from the Piceance Basin, Colorado.
W74-06714 4B

OIL WASTES
Recovery of Fatty Materials from Edible Oil Refinery Effluents,
W74-06514 5D

OKLAHOMA
Ninth Annual Report of the Oklahoma Water Resources Research Institute, Fiscal Year 1974.
W74-06515 9A

Evaporation from Brine Storage Reservoirs,
W74-06517 2D

OKLAWAHA RIVER (FLA)
Proposal for Oklawaha River, Ocala National Forest, Florida, (Final Environmental Impact Statement).
W74-06993 4A

OPEN CHANNEL FLOW
Effect of Roughness Elements on Hydraulic Resistance for Overland Flow,
W74-06594 8B

OPERATING COSTS
Recovery of Fatty Materials from Edible Oil Refinery Effluents,
W74-06514 5D

Maintenance Management Systems for Municipal Wastewater Facilities,
W74-06579 5D

OPERATION AND MAINTENANCE
Maintenance Management Systems for Municipal Wastewater Facilities,
W74-06579 5D

OPERATIONS
Start-Up of Municipal Wastewater Treatment Facilities,
W74-06578 5D

OPTIMIZATION
Application of DDDP in Water Resources Planning,
W74-06503 6A

Modeling and Optimization of Transient Cooling Water Discharge from Power Generating Plants,
W74-06832 5B

Production Function Theory and the Optimal Design of Waste Treatment Facilities,
W74-06997 6D

OPTIMUM DEVELOPMENT PLANS
Network Analysis of Conjunctively Operated Ground Water-Surface Water Systems,
W74-06504 4B

OREGON
Coliform Bacteria Growth and Control in Aerated Stabilization Basins,
W74-06520 5D

Natural Resource Inventory and Monitoring in Oregon With ERTS Imagery,
W74-06683 4A

Distribution of Mercury in Residual Soils,
W74-06797 5B

Availability of Ground Water in the Grants Pass Area, Josephine County, Oregon,
W74-06959 7C

OREGON (SIXES RIVER)
Social Interaction Between Juvenile Coho (Oncorhynchus kisutch) and Fall Chinook Salmon (O. tshawytscha) in Sixes River, Oregon,
W74-07040 2I

ORGANIC COMPOUNDS
The Determination of Ethylmercury in Blood.
W74-06791 5A

Approaches to the Detection of Subclinical Mercury Intoxications. Experience in Minamata, Japan,
W74-06811 5C

New Methods of Nitrite and Nitrate Analysis for Natural Waters,
W74-06836 5A

ORGANIC MATTER
Oxidation of Organic Matter in Sediments,
W74-06528 5C

Preparation of Biological Samples for Neutron Activation Analysis of Mercury,
W74-06786 5A

ORGANIC WASTES
Buffer Capacity in Aquatic Ecosystems,
W74-06829 5B

ORGANIZATIONS
Inventory of Active Water Resources Research Projects in North Carolina.
W74-06615 9D

ORGANOMERCURIALS
Biotransformation of Organo-Mercurials in Mammals,
W74-06802 5C

The Binding of Inorganic and Organic Mercury Compounds (Hg 203) to Constituents of Normal Human Blood,
W74-06803 5C

Dose-Response Relationships after Exposure of Swine to Organo-Mercurial Compounds,
W74-06809 5C

ORTHO-DIAMINES
New Methods of Nitrite and Nitrate Analysis for Natural Waters,
W74-06836 5A

OTTAWA RIVER (CANADA)
Aquatic Vegetation of the Ottowa River Near Chalk River Nuclear Laboratories (CRNL),
W74-06819 5C

OVERLAND FLOW
Laboratory Experiments with Surface Runoff,
W74-06737 2E

Sensitivity of Surface Runoff to Variations of Watershed Parameters in Small Urban Areas-A Kinematic Model,
W74-06853 4C

OWNERSHIP OF BEDS
The Law to Govern Deepsea Mining Until Superseded by International Agreement,
W74-06964 6E

OXIDATION
An Appraisal of Neutralization Processes to Treat Coal Mine Drainage,
W74-06512 5D

A Design and Economic Evaluation of Catalytic Oxidation of Phenols in Wastewater,
W74-06516 5D

Oxidation of Organic Matter in Sediments,
W74-06528 5C

Oxidation of n-Alkanes by Cladosporium resinae,
W74-06763 5C

OXIDATION LAGOONS
Intermittent Sand Filtration to Upgrade Existing Wastewater Treatment Facilities,
W74-06506 5D

OXYGEN
Sources of Oxygen in Estuaries,
W74-06539 5C

Oxygen in Estuaries: Requirements for Fisheries,
W74-06542 5C

Activated Sludge Treatment Systems with Oxygen,
W74-06839 5D

Correlation Between CO2 and O2 Concentrations in Lake Erie, USA,
W74-07025 5C

OXYGEN ACTIVATED SLUDGE
Activated Sludge Treatment Systems with Oxygen,
W74-06839 5D

OXYGEN CONSUMPTION
Energetics of Daphnia Ambigua,
W74-06831 5C

OXYGEN DEMAND
Oxidation of Organic Matter in Sediments,
W74-06528 5C

Distribution of Autotrophic Nitrifying Bacteria in a Polluted Stream,
W74-06834 5C

OXYGEN DEMAND KINETICS
Unrecorded Pollution and Dynamics of Biochemical Oxygen Demand,
W74-06613 5B

OXYGEN ISOTOPES
Analysis of the Concentration of Microparticles in the Long Ice Core from Byrd Station,
W74-06931 2C

OXYGEN SAG
Oxygen in Estuaries: Requirements for Fisheries,
W74-06542 5C

OXYGEN SOURCES
Sources of Oxygen in Estuaries,
W74-06539 5C

OXYGENATION
Hypolimnion Aeration with Commercial Oxygen - Vol. I - Dynamics of Bubble Plume,
W74-06525 5D

Hypolimnion Aeration with Commercial Oxygen - Vol. II - Bubble Plume Gas Transfer,
W74-06526 5D

OYSTERS
Growth Comparisons of Oysters, Mussels and Scallops Cultivated on Algae Growth With Artificial Medium and Treated Sewage Effluent,
W74-07035 5C

OZONE
Laboratory Ozonation of Muncipal Wastewaters,
W74-06840 5D

PACIFIC OCEAN
Temperature Control of Reproduction and Productivity in a Subarctic Coralline Alga,
W74-06751 5C

PACK ICE
Investigations Performed on the Arctic Ice Dynamics Joint Experiment, March 1971,
W74-06716 2C

Mesoscale Strain Measurements on the Beaufort Sea Pack Ice,
W74-06717 2C

Structure of a Multiyear Pressure Ridge,
W74-06718 2C

Top and Bottom Roughness of a Multiyear Ice Floe,
W74-06719 2C

Airphoto Analysis of Ice Deformation in the Beaufort Sea,
W74-06720 2C

Data on Morphological and Physical Characteristics of Sea Ice in the Beaufort Sea,
W74-06721 2C

PALEOCLIMATOLOGY
Recent Activity of Glaciers of Mount Rainier, Washington,
W74-06713 2C

PALMETTO BEND DAM (TEX)
Effects of Ground-Water Development on the Proposed Palmetto Bend Dam and Reservoir in Southeast Texas,
W74-06920 4B

PASSAIC RIVER (N
Distribution of Autotrophic Nitrifying Bacteria in a Polluted Stream,
W74-06834 5C

PASTURE MANAGEMENT
Pasture Irrigation with a Center-Pivot Sprinkler System,
W74-06601 3F

PASTURES (TROPICAL)
Evaluation of Influence of Available Soil Water Storage Capacity on Growing Season Length and Yield of Tropical Pastures Using Simple Water Balance Models,
W74-06927 3F

PATH OF POLLUTANTS
The Impact of Slimes-Dam Formation on Water Quality and Pollution,
W74-06604 5B

Some Estimates of Natural Levels of Mercury in the Environment,
W74-06772 5B

Mercury in Wild Animals, Lake St. Clair, 1970,
W74-06776 5B

Mercury Levels in Wisconsin Fish,
W74-06778 5B

The Role of Food Chains in Environmental Mercury Contamination,
W74-06795 5B

Mercury and Food Chains,
W74-06796 5B

Distribution of Mercury in Residual Soils,
W74-06797 5B

Research Needs: Study of the Environmental Dynamics of Mercury,
W74-06798 5B

A Radioactive Isotopic Characterization of the Environment Near Wiscasset, Maine: A Preoperational Survey in the Vicinity of the Maine Yankee Atomic Power Plant,
W74-06855 5A

(Radiation Data, Section II. Water).
W74-06856 5A

Azide and Ethylenethiourea Mobility in Soils,
W74-06896 5B

Mineral Nitrogen Movement into Subsoils Following Continued Annual Fertilization for Corn,
W74-06898 5B

Distribution of Metals in Baltimore Harbor Sediments,
W74-06924 5B

Solute Movement Through Disturbed and Undisturbed Soil Cores,
W74-06935 5B

PATHOLOGY
The Effects of Waste Disposal in the New York Bight. Sections 7, 8, and 9.
W74-06868 5C

PATTERSON WATERSHED PROJECT (CALIF)
Patterson Watershed Project, Stanislaus County, California (Final Environmental Impact Statement).
W74-06987 4A

PEACEFUL USES
A Review of Soviet Data on the Peaceful Uses of Nuclear Explosions,
W74-06823 6B

PEARSON LAW
Determination of the Confidence Intervals of the Pearson III Law Using Order Statistics (Determination des intervalles de confiance de la loi Pearson III par les statistiques d'ordre),
W74-06906 2E

PENNSYLVANIA
An Appraisal of Neutralization Processes to Treat Coal Mine Drainage,
W74-06512 5D

Investigations of an Urban Area and its Locale Using ERTS-1 Data Supported by U-Photography,
W74-06635 4A

Mapping of Agricultural Land Use from ERTS-1 Digital Data,
W74-06640 4A

The Use of the Temporal Dimension in Classifying and Mapping ERTS-1 Mss Data,
W74-06641 4A

Identification and Mapping of Coal Refuse Banks and Other Targets in the Anthracite Region,
W74-06642 4A

Woodcock Creek Lake, French Creek Basin, Pennsylvania (Final Environmental Impact Statement).
W74-06986 8A

PERCOLATION
Quality Improvement of Feedlot Lagoon Water by Percolation Through Soil Under Native Pasture,
W74-06830 5D

PERIPHYTON
Epiphytic Microphytes in a Pond Polluted with Beet Sugar Factory Wastes,
W74-06551 5C

PERU (LAGUNA DE VEGUETA)
The Laguna de Vegueta on the Mid-Peruvian Coast and Its Fishes, Particularly Aequidens rivulatus (Guenther 1859), (In German),
W74-07007 2H

PESTICIDE KINETICS
Azide and Ethylenethiourea Mobility in Soils,
W74-06896 5B

PESTICIDES
Electron-Donor-Acceptor Complexing Reagents in the Analysis of Pesticides. VI. Influence of Structure in Detection and Identification,
W74-06871 5A

PHAEOPHYTA
Influence of Iodine on Growth and Development of the Brown Alga Ectocarpus Siliculosus in Axenic Cultures,
W74-06752 5C

PHENOLS
A Design and Economic Evaluation of Catalytic Oxidation of Phenols in Wastewater,
W74-06516 5D

PHOENIX (ARIZ)
Change in Land Use in the Phoenix (1:250,000) Quadrangle, Arizona between 1970 and 1972: Successful Use of a Proposed Land Use Classification System,
W74-06622 4A

PHOSPHATES
Report of the Expert Group on Detergents.
W74-06554 5C

Complexim etric Determination of Phosphate,
W74-06757 5A

Kinetics of the Phosphate Interaction with Calcite,
W74-06895 5B

PHOSPHORIMETRY
Phosphorimetric Determination of Traces of Boron,
W74-06755 5A

PHOSPHORUS
Long-Term Lake Recovery Related to Available Phosphorus,
W74-06562 5C

Some Aspects of Phosphorus Dynamics of the Twin Lakes Watershed,
W74-06565 5C

Activity Analysis and the Management of Resources: A Model for Control of Eutrophication,
W74-06574 5C

Utilization of Phosphorus by Phytoplankton in Phosphorus-Rich Environments,
W74-06611 5C

Preliminary Report of the Role of Sphagnum in the Cycling of Phosphorus in a Bog-Lake System,
W74-06743 5C

Quality Improvement of Feedlot Lagoon Water by Percolation Through Soil Under Native Pasture,
W74-06830 5D

Biological Response to Detergent and Nondetergent Phosphorus in Sewage - Part II,
W74-06873 5C

Dynamics of Changes in the Concentration of Fluorine Compounds Emitted by the Phosphorus Fertilizer Manufacturing Establishment in Pozan, and Their Influence on Surface and Underground Waters and on the Atmosphere Within th e Limits of the City of Poznan, (In Polish),
W74-07021 5B

PHOSPHORUS COMPOUNDS
Organic Phosphorus Compounds of a Northern Michigan Bog, Bog-Lake System,
W74-06742 5C

PHOSPHORUS MANAGEMENT
Activity Analysis and the Management of Resources: A Model for Control of Eutrophication,
W74-06574 5C

PHOTOACTIVATION
Absence of Oxygen-Evolving Capacity in Dark-Grown Chlorella: The Photoactivation of Oxygen-Evolving Centers,
W74-06544 5C

PHOTOGRAPHIC PROCESSING
The Use of Photographic Methods in Contrast Enhancement of ERTS-1 Images,
W74-06704 7C

PHOTOSYNTHETIC OXYGEN
Absence of Oxygen-Evolving Capacity in Dark-Grown Chlorella: The Photoactivation of Oxygen-Evolving Centers,
W74-06544 5C

PHOTOSYNTHETIC PIGMENTS
Studies on the Photosynthetic Pigments and Their Decomposition in the Sediment of Lake Balaton and Lake Belso,
W74-06741 5C

PHYSICAL-CHEMICAL TREATMENT
Physical-Chemical Treatment of Raw Municipal Wastewater,
W74-06509 5D

PHYSICAL PROPERTIES
U.S. Deepwater Port Study, Vol 3. Physical Coast and Port Characteristics, and Selected Deepwater Port Alternatives,
W74-06864 6D

PHYSICOCHEMICAL PROPERTIES
Phytoplankton Population Changes and Nutrient Fluctuations in a Simple Aquatic Ecosystem Model,
W74-06571 5C

PHYSIOLOGICAL ECOLOGY
Studies on the Phytoplankton Ecology of the Trondheimsfjord. I. The Chemical Composition of Phytoplankton Populations,
W74-06545 5C

PHYTOCENOSES
Natural Phytocenoses of the River Littoral in the Lower Reaches of the River Hron,
W74-06550 2I

PHYTOPLANKTON
Phytoplankton Populations in Relation to Different Trophic Levels at Winnipesaukee Lake, New Hampshire, U S A ,
W74-06529 5C

Studies on the Phytoplankton Ecology of the Trondheimsfjord I The Chemical Composition of Phytoplankton Populations,
W74-06545 5C

Phytoplankton Population Changes and Nutrient Fluctuations in a Simple Aquatic Ecosystem Model,
W74-06571 5C

Utilization of Phosphorus by Phytoplankton in Phosphorus-Rich Environments,
W74-06611 5C

Horizontal Phytoplankton Studies in Lake Balaton Based on Scooped Samples and Filtrates Taken in 1967,
W74-06756 5C

Basic Research in the Aquatic Environment: Effects of Eutrophication on Phytoplankton Populations and Selected Species of Aquatic Vascular Plants,
W74-06835 5C

Phytoplankton Successions and Lake Dynamics in Las Vegas Bay, Lake Mead, Nevada,
W74-07001 5C

PICEANCE BASIN (COLO)
Hydrologic Data from the Piceance Basin, Colorado.
W74-06714 4B

PIPE FLOW
Hydraulics of a Center Pivot System,
W74-06583 3F

Design Criteria for Irrigation Systems with Complex Pipe Loops,
W74-06585 3F

PLANKTON
The Effect of Mineral Fertilization and of Carp Fry on the Composition and Dynamics of Plankton,
W74-06535 5C

Capabilities and Limitations of Nutrient-Plankton Model,
W74-06570 5C

Biomass in the Upwelling Areas Along the Northwest Coast of Africa as Viewed with ERTS-1,
W74-06677 5A

Mercury in the Lake Michigan Environment,
W74-06779 5B

Distribution and Seasonal Variations of the Plankton in 'Riviere de Morlaix,' (In French),
W74-07012 5C

PLANNING
Application of DDDP in Water Resources Planning,
W74-06503 6A

Emergency Planning for Municipal Wastewater Treatment Facilities,
W74-06577 5D

Area Financing of Water Resource Development in West Minnesota,
W74-06846 6B

Ohio River Basin Commission Annual Report, Fiscal Year Ending June 30, 1972.
W74-06918 6E

A Simulation Approach to Recreation Planning (A Case of Changing Quality),
W74-06996 6B

Production Function Theory and the Optimal Design of Waste Treatment Facilities,
W74-06997 6D

PLANT GROWTH
Modeling Algal Growth Dynamics in Shagawa Lake, Minnesota, with Comments Concerning Projected Restoration of the Lake,
W74-06563 5C

Multi-Nutrient Dynamic Models of Algal Growth and Species Competition in Eutrophic Lakes,
W74-06568 5C

A Simulated Environmental Model of Temperature, Evaporation, Rainfall, and Soil Moisture,
W74-06591 3F

Influence of Iodine on Growth and Development of the Brown Alga Ectocarpus Siliculosus in Axenic Cultures,
W74-06752 5C

Lead Inhibition of Hormotila blennista (Chlorophyceae, Chlorococcales),
W74-06761 5C

Biological Response to Detergent and Nondetergent Phosphorus in Sewage - Part II,
W74-06873 5C

Effect of Plant Growth and Form of Nitrogen Fertilizer on Dentrification from Four South Australian Soils,
W74-07039 2G

PLANT MORPHOLOGY
Absence of Oxygen-Evolving Capacity in Dark-Grown Chlorella: The Photoactivation of Oxygen-Evolving Centers,
W74-06544 5C

An Examination of Three Strains of the Blue-Green Algal Genus, Fremyella,
W74-06759 5C

PLANT PHYSIOLOGY
Endogenous and Photoperiodic Diurnal Rhythms of in Vivo Light Absorption and Scattering in the Green Alga Ulva Lactuca L.,
W74-06547 5C

PLASTIC DEFORMATION
Comparison of Strength Test Methods for Corrugated Plastic Drainage Tubing,
W74-06602 8A

PLASTIC PIPES
Hydraulic Roughness of Corrugated Plastic Tubing,
W74-06589 8B

Comparison of Strength Test Methods for Corrugated Plastic Drainage Tubing,
W74-06602 8A

PLAYAS
In Situ Spectroradiometric Quantification of ERTS Data,
W74-06663 2G

PLOWING
Evaluation of a Furrow Modifying Device,
W74-06588 3F

PLUTONIUM
Environmental Aspects of Plutonium and Other Elements, a Selected Annotated Bibliography.
W74-06857 5C

POECILIID FISH
Observations on Gambusia affinis Introduced into Tokushima as a Natural Enemy of Mosquitoes, (In Japanese),
W74-07048 5G

POISONING
Dose-Response Relationships after Exposure of Swine to Organo-Mercurial Compounds,
W74-06809 5C

POISONS
Organic Mercury Poisoning in Alamogordo, New Mexico,
W74-06807 5C

POLAND
Baking Quality of Spring Wheat as Affected by Rain During Drying After Reaping (In Polish),
W74-06548 3F

Water Pollution and Biology, (In Polish),
W74-07020 5B

POLAND (CZARNA PRZEMSZA-PRZEMSZA RIVERS)
Influence of Some Hydrological Parameters on Changes in the Radioactivity of the Waters of the Rivers Czarna Przemsza and Przemsza,
W74-07019 5B

POLAND (POZNAN)
Dynamics of Changes in the Concentration of Fluorine Compounds Emitted by the Phosphorus Fertilizer Manufacturing Establishment in Pozan, and Their Influence on Surface and Underground Waters and on the Atmosphere Within th e Limits of the City of Poznan, (In Polish),
W74-07021 5B

POLITICAL ASPECTS
Intergovernmental Relations as seen by Florida State Legislators: Land Use and Water Resource Problems,
W74-06845 6B

POLITICAL CONSTRAINTS
The Environmental Impulse and its Competitors: Attitudes, Interests, and Institutions at Lake Tahoe,
W74-06843 6E

POLLUTANT IDENTIFICATION
Biomass in the Upwelling Areas Along the Northwest Coast of Africa as Viewed with ERTS-1,
W74-06677 5A

First ERTS-1 Results in Southeastern France: Geology, Sedimentology, Pollution at Sea,
W74-06687 4A

Use of ERTS-1 Pictures in Coastal Oceanography in British Columbia,
W74-06707 2L

Application of ERTS-1 Imagery in Coastal Studies,
W74-06709 2L

Detection of Turbidity Dynamics in Tampa Bay, Florida Using Multispectral Imagery from ERTS-1,
W74-06711 2L

Complexiметric Determination of Phosphate,
W74-06757 5A

Methods of Analysis for Mercury and its Compounds: A Review,
W74-06785 5A

Preparation of Biological Samples for Neutron Activation Analysis of Mercury,
W74-06786 5A

Mercury Content of Canadian Foods and Cereals Determined by Different Methods,
W74-06787 5A

A Simple, Rapid Method for the Determination of Trace Mercury in Fish Via Neutron Activation Analysis,
W74-06788 5A

Determination of Mercury by Non-Destructive Neutron Activation Analysis,
W74-06789 5A

Determination of Mercury in Biological Tissues,
W74-06790 5A

The Determination of Mono- and Dimethylmercury Compounds by Gas Chromatography,
W74-06792 5A

Analytical Methodology for Mercury-Discussion Paper,
W74-06793 5A

New Methods of Nitrite and Nitrate Analysis for Natural Waters,
W74-06836 5A

Evaluation of a Microwave-Induced Plasma Spectrometer for Trace Analysis,
W74-06841 5A

Semimicrodetermination of Mercury(II) and Zinc(II) by Precipitation from Homogeneous Solution, Using Cation Generation Technique,
W74-06869 5A

Electron-Donor-Acceptor Complexing Reagents in the Analysis of Pesticides. VI. Influence of Structure in Detection and Identification,
W74-06871 5A

Organic Functional Group Analysis Via Gas Chromatograpy. III. Determination of Carbamates by Reaction with Alkali,
W74-06872 5A

Method of Preparing Washed Suspensions of Anaerobic Bacteria for Metabolic Studies,
W74-06875 5A

New Spot Tests for Nitrates and Nitrites,
W74-06878 5A

PB-210 Concentration in Ice Measured at South Pole Station,
W74-06932 5A

Atomic Absorption Detector for Liquid-Liquid Chromatography,
W74-06998 5A

An Atomic Absorption Analysis Method for Cyanide,
W74-06999 5A

Investigation of Brewing Water Treatment,
W74-07023 5A

POLLUTION ABATEMENT
Co-operation for Water Protection: Eutrophication Control,
W74-06543 5C

Basic Research in the Aquatic Environment: Effects of Eutrophication on Phytoplankton Populations and Selected Species of Aquatic Vascular Plants,
W74-06835 5C

Water Pollution--Summer Intern Program.
W74-06982 6E

POLLUTOGRAPHS
Stormwater Runoff Quality for Urban and Semi-Urban/Rural Watersheds,
W74-06851 5B

POLYCARPIC PLANTS
Changes in Rate and Rhythms of Development of Perennial Polycarpic Plants at Different Altitudes in Humid High Mountains, (In Russian),
W74-07014 2I

PONDS
The Effect of Mineral Fertilization and of Carp Fry on the Composition and Dynamics of Plankton,
W74-06535 5C

Macrobenthos of Ponds with Sugar Factory Wastes,
W74-06553 5C

POPULATION
Geography of Waterfowl Resources of the Soviet Union. Condition of Reserves.
W74-06559 6B

POROUS MEDIA
Capillary Properties of Soils - Influence upon Specific Yield,
W74-06584 2F

Conservation Equations for Nonisothermal Flow in Porous Media,
W74-06892 2F

POTABLE WATER
Dynamics of Changes in the Concentration of Fluorine Compounds Emitted by the Phosphorus Fertilizer Manufacturing Establishment in Pozan, and Their Influence on Surface and Underground Waters and on the Atmosphere Within th e Limits of the City of Poznan, (In Polish),
W74-07021 5B

POTASSIUM
Selectrode - the Universal Ion-Selective Electrode. Part VII. A Valinomycin-Based Potassium Electrode with Nonporous Polymer Membrane and Solid-State Inner Reference System,
W74-06765 5A

POTEMOGETON NODOSUS
Nitrogen Turnover in Impoundments,
W74-06505 5C

PRE-IMPOUNDMENT
Effects of Ground-Water Development on the Proposed Palmetto Bend Dam and Reservoir in Southeast Texas,
W74-06920 4B

PRECIPITATION (ATMOSPHERIC)
Analysis of Iodine in Antarctic Snow,
W74-06929 5B

Silver Concentrations in Antarctic Snow and Firn,
W74-06930 5A

University of Chicago Contribution to Project Metromex-I.
W74-06937 2B

Radar Studies of Urban Precipitation Anomaly.
W74-06938 2B

Observations of the Cloud Nucleus Concentration Around the St. Louis Urban Complex,
W74-06939 2B

Upwind and Downwind Cloud-Base Microstructure,
W74-06940 2B

Metromex Temperature and Aerosol Data Reduction: Analysis of the Urban Anomaly,
W74-06941 2B

Estimates of Prairie Provincial Wheat Yields Based on Precipitation and Potential Evapotranspiration,
W74-07027 3F

PRECIPITATION GAGES
Sprinkler Precipitation Gage Errors,
W74-06593 3F

PREDATION
Predation on the Freshwater Bivalve Unio pictorum by the Rat, Rattus norvegicus, (In Italian),
W74-07008 2I

Effects of Alewives (Alosa pseudoharengus) on the Zooplankton of Lake Wononskopomus, Connecticut,
W74-07033 2H

Observations on Comparative Propensities for Carp Fry Destruction by Adults and Last Instar Preimaginal Stages of Predatory Aquatic Insects,
W74-07044 2I

PRESSURE HEAD
Gravity Correction Due to a Variation of Pressure Head Within a Cavity,
W74-06734 2G

PRESSURIZED WATER REACTORS
Final Environmental Statement Related to the Proposed Alvin W. Vogtle Nuclear Plant Units 1, 2, 3, and 4.
W74-06821 5B

PRIMARY PRODUCTION
Systems Analysis in the Marion Lake IBP Project,
W74-07010 5C

PRIMARY PRODUCTIVITY
Micro-Ecosystems Simulation of Primary Production in Thermal and Acid Mine Water Loadings Related to Water Use of the Monongahela River,
W74-06507 5C

The Effect of Mineral Fertilization and of Carp Fry on the Composition and Dynamics of Plankton,
W74-06535 5C

Temperature Control of Reproduction and Productivity in a Subarctic Coralline Alga,
W74-06751 5C

PROBABILITY
Determination of the Confidence Intervals of the Pearson III Law Using Order Statistics (Determination des intervalles de confiance de la loi Pearson III par les statistiques d'ordre),
W74-06906 2E

On Flood Probabilities of East Alpine Rivers
W74-06909 2E

PROCESS CONTROL
Digital Control Algorithms Part III Tuning PI and PID Controllers,
W74-06750 7C

PRODUCTION FUNCTIONS
Production Function Theory and the Optimal Design of Waste Treatment Facilities,
W74-06997 6D

PRODUCTIVITY
Productivity Investigations of Interconnected Marl Lakes (I) The Eight Lakes of the Oliver and Walters Chains, Northeastern Indiana,
W74-06533 5C

Biomass in the Upwelling Areas Along the Northwest Coast of Africa as Viewed with ERTS-1,
W74-06677 5A

Production and Biogenic Activity of Distillates, Filtrates and Extracts from the Pomorie and Atanasovo Lagoon Mud, (In Bulgarian),
W74-07003 2H

PROGRAMS
Water Pollution--Summer Intern Program.
W74-06982 6E

PROJECT PLANNING
Application of DDDP in Water Resources Planning,
W74-06503 6A

PROJECTILES
Quasi-Continuous Explosive Concepts for Hard Rock Excavations,
W74-06860 8H

PROJECTIONS
A Simulation Approach to Recreation Planning (A Case of Changing Quality),
W74-06996 6B

PROJECTS
Inventory of Active Water Resources Research Projects in North Carolina.
W74-06615 9D

PROTECTION
Geography of Waterfowl Resources of the Soviet Union. Condition of Reserves.
W74-06559 6B

PROTEINS
The Binding of Inorganic and Organic Mercury Compounds (Hg 203) to Constituents of Normal Human Blood,
W74-06803 5C

PROTOTYPES
A Physical Model for Simulation of Aquatic Ecosystems,
W74-06573 5C

PROTOZOA
Protozoans in Ponds Filled with Sugar Factory Wastes,
W74-06552 5C

PROVENANCE
Chemical Profile of the Ross Ice Shelf at Little America V, Antarctica,
W74-06921 2C

PUBLIC BENEFITS
A Review of Soviet Data on the Peaceful Uses of Nuclear Explosions,
W74-06823 6B

PUBLIC FINANCING POTENTIALS
Area Financing of Water Resource Development in West Minnesota,
W74-06846 6B

PUBLIC HEALTH
Environmental Mercury Contamination.
W74-06770 5B

Mercury Levels in a Sample of Michigan Residents,
W74-06782 5B

Mercury in Humans in the Great Lakes Region,
W74-06783 5B

Dose-Response Relationship Associated with Known Mercury Absorption at Low Dose Levels of Inorganic Mercury,
W74-06800 5C

Biological Reactions and Pathological Changes in Human Beings and Animals Caused by Organic Mercury Contamination,
W74-06804 5C

Mercury Concentrations in Human Tissues Among Heavy Fish Eaters,
W74-06812 5B

Protecting Ground Water Quality--Some Problems and Solutions,
W74-06946 5B

Urbanization and Human Health,
W74-07017 5G

PULP WASTES
Treatment of Domestic Wastewater and NSSC Pulp and Paper Mill Wastes,
W74-06513 5D

Coliform Bacteria Growth and Control in Aerated Stabilization Basins,
W74-06520 5D

Color Removal from Kraft Mill Effluents by Ultrafiltration,
W74-06521 5D

PUMPS (SYRINGE)
A Multichannel Syringe Pump for Steady State Flow in Soil Columns,
W74-07028 2G

QUALITY CONTROL
Machine Control of the Quality of Observations in Automated Hydrometeorological-Data Processing,
W74-06723 2B

Fundamentals of Automatic Control of Meteorological Data,
W74-06724 2B

Automatic Check and Correction of Meteorological Data in East Germany,
W74-06725 2B

Computer Monitoring of Precipitation in Hungary,
W74-06726 2B

Automatic Monitoring of Daily Results of Basic Meteorological Observations,
W74-06727 2B

Automatic Method of Monitoring the Quality of Mean Monthly Meteorological Data,
W74-06728 2B

Automatic Monitoring of Processing of Daily Radiosonde Data on Temperature and Geopotential,
W74-06729 2B

Automatic Monitoring and Processing of Hourly Hydrometeorological Information,
W74-06730 2B

Some Principles of Objective Control of Marine Meteorological Information,
W74-06731 2B

Automatic Processing of Rainfall Data,
W74-06732 2B

An Algorithm for Monitoring Hydrometeorological Information,
W74-06733 2B

RADIANCE (ATMOSPHERIC)
Computed Atmospheric Effects on ERTS Observations,
W74-06694 2B

RADIATION
DCP-Collected Absolute Target Reflectance Signatures Assist Accurate Interpretation of ERTS-1 Imagery,
W74-06688 7C

RADIOACTIVE WASTE DISPOSAL
Geologic and Hydrologic Background for Selecting Site of Pilot-Plant Repository for Radioactive Waste,
W74-06820 5B

On the Selection of a Ground Disposal Site by Sensitivity Analysis,
W74-06858 5B

RADIOACTIVITY
Aerial Radiological Measuring Survey of the Fort Calhoun Station, Fort Calhoun, Nebraska, August 9-10, 1972.
W74-06815 5A

Aerial Radiological Measuring Survey of the Area Surrounding the Palisades Plant, South Haven, Michigan, July 29, 1970.
W74-06816 5A

Aerial Radiological Measuring Survey of the Area Surrounding the Enrico Fermi Atomic Power Plant, Monroe, Michigan, September 1970.
W74-06817 5A

The EXREM III Computer Code for Estimating External Radiation Doses to Populations from Environmental Releases,
W74-06818 5B

1972 Operation of the ICPP Rare Gas Recovery Facility,
W74-06822 5D

A Critical Review of Solid Radioactive Waste Practices at Nuclear Power Plants,
W74-06825 5B

A Radioactive Isotopic Characterization of the Environment Near Wiscasset, Maine: A Preoperational Survey in the Vicinity of the Maine Yankee Atomic Power Plant,
W74-06855 5A

(Radiation Data, Section II. Water).
W74-06856 5A

The Challenge of Military Nuclear Construction,
W74-06859 8H

Influence of Some Hydrological Parameters on Changes in the Radioactivity of the Waters of the Rivers Czarna Przemsza and Przemsza,
W74-07019 5B

RADIOACTIVITY EFFECTS
Aquatic Vegetation of the Ottowa River Near Chalk River Nuclear Laboratories (CRNL),
W74-06819 5C

RADIOCHEMICAL ANALYSIS
The Binding of Inorganic and Organic Mercury Compounds (Hg 203) to Constituents of Normal Human Blood,
W74-06803 5C

RADIOECOLOGY
Radioecological Researches in Freshwater and Terrestrial Environment, (In Italian),
W74-07009 5B

RADIOISOTOPES
Uptake of Natural Radioisotopes by Aquatic Organisms,
W74-06534 5C

Mercury as a Hydrospheric Pollutant II. Biological Half-Time of Methyl Mercury in Four Mediterranean Species: A Fish, a Crab, and Two Molluscs,
W74-06767 5C

On the Selection of a Ground Disposal Site by Sensitivity Analysis,
W74-06858 5B

Behavior of Radioiodine in the Environment and in Man,
W74-06862 5B

Estimating Soil Erosion from the Redistribution of Fallout Cs-137,
W74-06901 2J

RADIOSONDES
Automatic Monitoring of Processing of Daily Radiosonde Data on Temperature and Geopotential,
W74-06729 2B

RAINFALL
Automatic Processing of Rainfall Data,
W74-06732 2B

Dry and Wet, July-August Rainfall Areas in Iowa,
W74-07045 2B

RAINFALL DURATION
Sensitivity of Surface Runoff to Variations of Watershed Parameters in Small Urban Areas-A Kinematic Model,
W74-06853 4C

RAINFALL-RUNOFF RELATIONSHIPS
Laboratory Experiments with Surface Runoff,
W74-06737 2E

Assessing Systematic Errors in Rainfall-Runoff Models,
W74-06893 2A

RARE GAS RECOVERY
1972 Operation of the ICPP Rare Gas Recovery Facility,
W74-06822 5D

RECIRCULATED WATER
Ecological and Physiological Implications of Greenbelt Irrigation,
W74-06608 5D

RECLAIMED WATER
Effects of Sewage Disposal and Reclamation on Ground Water Quality,
W74-06948 5D

RECLAMATION
Long-Term Lake Recovery Related to Available Phosphorus,
W74-06562 5C

RECREATION
A Simulation Approach to Recreation Planning (A Case of Changing Quality),
W74-06996 6B

RECREATION FACILITIES
Demonstration of a Non-Aqueous Sewage Disposal System,
W74-06519 5D

RECYCLING
1972 Operation of the ICPP Rare Gas Recovery Facility,
W74-06822 5D

REGIONAL ANALYSIS
Modeling and Optimization of Transient Cooling Water Discharge from Power Generating Plants,
W74-06832 5B

Techniques for Identifying and Evaluating Market and Nonmarket Benefits and Costs of Water Resource Systems.
W74-06852 6B

REGULATION
The Stack Monitoring System at the Idaho Chemical Processing Plant,
W74-06824 5A

The Present and Future Status of Eastern North Carolina Wetlands,
W74-06850 2L

REMOTE SENSING
Symposium on Significant Results Obtained From the Earth Resources Technology Satellite-1, Volume I: Technical Presentations, Section B.
W74-06619 7C

Cartographic Quality of ERTS-1 Images,
W74-06620 7C

Progress in Cartography, Eros Program,
W74-06621 7C

Change in Land Use in the Phoenix (1:250,000) Quadrangle, Arizona between 1970 and 1972: Successful Use of a Proposed Land Use Classification System,
W74-06622 4A

Land Use Investigations in the Central Valley and Central Coastal Test Sites, California,
W74-06623 4A

Land Use in Northern Coachella Valley,
W74-06624 4A

Land Use Classification and Change Analysis Using ERTS-1 Imagery in Carets,
W74-06625 4A

ERTS Regional-Scale Overview Linking Land Use and Environmental Processes in Carets,
W74-06626 4A

Evaluation of Land Use Mapping from ERTS in the Shore Zone of Carets,
W74-06627 4A

Geographic Applications of ERTS-1 Data to Landscape Change,
W74-06628 4A

Identification of Soil Associations in Western South Dakota on ERTS-1 Imagery,
W74-06629 2G

Land Use of Northern Megalopolis,
W74-06630 4A

Remote Sensing Applied to Land-Use Studies in Wyoming,
W74-06631 4A

ERTS-1 Applications to Minnesota Land Use Mapping,
W74-06632 4A

A Multidisciplinary Survey for the Management of Alaskan Resources Utilizing ERTS Imagery,
W74-06633 4A

The Use of ERTS-1 Data for the Inventory of Critical Land Resources for Regional Land Use Planning,
W74-06634 4A

Investigations of an Urban Area and its Locale Using ERTS-1 Data Supported by U-Photography,
W74-06635 4A

First Look Analyses of Five Cycles of ERTS-1 Imagery Over County of Los Angeles: Assessment of Data Utility for Urban Development and Regional Planning,
W74-06636 4A

Preparation of Urban Land Use Inventories by Machine-Processing of ERTS MSS Data,
W74-06637 4A

A Comparison of Land-Use Determinations Using Data from ERTS-1 and High Altitude Aircraft,
W74-06638 4A

Digital Land Use Mapping in Oakland County, Michigan,
W74-06639 4A

Mapping of Agricultural Land Use from ERTS-1 Digital Data,
W74-06640 4A

The Use of the Temporal Dimension in Classifying and Mapping ERTS-1 Mss Data,
W74-06641 4A

Identification and Mapping of Coal Refuse Banks and Other Targets in the Anthracite Region,
W74-06642 4A

Automatic Interpretation of ERTS Data for Forest Management,
W74-06643 4A

Land Resources Survey for the State of Michigan,
W74-06644 4A

Terrain Classification Maps of Yellowstone National Park,
W74-06645 4A

Atmospheric Effects in ERTS 1 Data and Advanced Information Extraction Techniques
W74-06646 7C

Determination of Aerosol Content in the Atmosphere,
W74-06647 7C

A Technique for Correcting ERTS Data for Solar and Atmospheric Effects,
W74-06648 7C

Experimental Masking of RBV Images to Reduce Stationary Residual Inaccuracies in Radiometric Correction,
W74-06649 7C

Digital Rectification of ERTS Multispectral Imagery,
W74-06650 7C

Results of Precision Processing (Scene Correction) of ERTS-1 Images Using Digital Image Processing Techniques,
W74-06651 7C

Significant Techniques in the Processing and Interpretation of ERTS-1 Data,
W74-06652 7C

Computer Techniques Used for Some Enhancements of ERTS Images,
W74-06653 7C

Digital Enhancement of Multispectral MSS Data for Maximum Image Visibility,
W74-06654 7C

ERTS-1 Image Enhancement by Optically Combining Density Slices,
W74-06655 7C

Pseudocolor Transformation of ERTS Imagery,
W74-06656 7C

Digital Interactive Image Analysis by Array Processing,
W74-06657 7C

Combining Human and Computer Interpretation Capabilities to Analyze ERTS Imagery,
W74-06658 7C

Analysis of ERTS Imagery Using Special Electronic Viewing/Measuring Equipment,
W74-06659 7C

Combined Spectral and Spatial Processing of ERTS Imagery Data,
W74-06660 7C

Terrain Type Recognition Using ERTS-1 MSS Images,
W74-06661 7C

Classification of ERTS-1 MSS Data by Canonical Analysis,
W74-06662 7C

In Situ Spectroradiometric Quantification of ERTS Data,
W74-06663 2G

Seasonal Changes of Littoral Transport and Beach Width and Resulting Effect on Protective Structures,
W74-06664 2L

Recognition of Beach and Nearshore Depositional Features of Chesapeake Bay,
W74-06665 2L

Applicability of ERTS-1 Imagery to the Study of Suspended Sediment and Aquatic Fronts,
W74-06666 2L

Correlation of ERTS Multispectral Imagery with Suspended Matter and Chlorophyll in Lower Chesapeake Bay,
W74-06667 2L

Plume Development in Long Island Sound Observed by Remote Sensing (ERTS-1),
W74-06668 2L

New Insights into the Influence of Ice on the Coastal Marine Environment of the Beaufort Sea, Alaska,
W74-06669 2C

ERTS-1 Observations of Sea Surface Circulation and Sediment Transport, Cook Inlet, Alaska,
W74-06670 2L

Sediment Distribution and Coastal Processes in Cook Inlet, Alaska,
W74-06671 2L

Distribution and Movement of Suspended Sediment in the Gulf of Mexico off the Texas Coast,
W74-06672 2L

Oceanographic Mapping of Structure and Dynamics of the Northern Gulf of California by the Use of Spectral Modeling and ERTS-1,
W74-06673 2L

Oceanographic Features in the Lee of the Windward and Leeward Islands: ERTS and Ship Data,
W74-06674 2E

Remote Sensing of Ocean Currents using ERTS Imagery,
W74-06675 2L

Use of ERTS Data for Mapping Arctic Sea Ice,
W74-06676 2C

Biomass in the Upwelling Areas Along the Northwest Coast of Africa as Viewed with ERTS-1,
W74-06677 5A

Application of ERTS-1 Imagery to the Harvest Model of the U.S. Menhaden Fishery,
W74-06678 2L

Coastal and Submarine Features on MSS Imagery of Southeastern Massachusetts: Comparison with Conventional Maps,
W74-06679 2L

Water Depth Estimation with ERTS-1 Imagery,
W74-06680 2L

Calculations of Water Depth From ERTS-MSS Data,
W74-06681 2E

Multidisciplinary Application of ERTS-1 Data to North Carolina Natural Resource Management,
W74-06682 4C

Natural Resource Inventory and Monitoring in Oregon With ERTS Imagery,
W74-06683 4A

Resource Management Implications of ERTS-1 Data to Ohio,
W74-06684 4A

Assessment of Southern California Environment From ERTS-1,
W74-06685 4A

Applications of Remote Sensing (ERTS) to Resource Management and Development in Sahelien Africa (Republic of Mali),
W74-06686 4A

First ERTS-1 Results in Southeastern France: Geology, Sedimentology, Pollution at Sea,
W74-06687 4A

DCP-Collected Absolute Target Reflectance Signatures Assist Accurate Interpretation of ERTS-1 Imagery,
W74-06688 7C

Unique Characteristics of ERTS,
W74-06689 7B

ERTS-1 Applied for Structural and Morphological Investigations Case Studies: (1) Los Angeles, California and (2) Coastal Plain, New Jersey,
W74-06690 7C

A Preliminary Evaluation of ERTS-1 Images on the Volcanic Areas of Southern Italy (NASA Contract FO-013),
W74-06691 7C

Thermal Surveillance of Cascade Range Volcanoes Using ERTS-1 Multispectral Scanner, Aircraft Imaging Systems, and Ground-Based Data Communication Platforms,
W74-06692 7C

Initial Evaluation of the Geologic Applications of ERTS-1 Imagery for New Mexico,
W74-06693 4A

Computed Atmospheric Effects on ERTS Observations,
W74-06694 2B

Mapping of Spoil Banks Using ERTS-1 Pictures,
W74-06695 5A

Air Quality Indices from ERTS-1 MSS Information, PR 568,
W74-06696 5A

Snow Cover Surveys in Alaska From ERTS-1 Data,
W74-06697 2C

Utilization of ERTS-1 Data to Monitor and Classify Eutrophication of Inland Lakes,
W74-06698 5A

ERTS-1 Observes Algal Bloom in Lake Erie and Utah Lake,
W74-06699 5A

Use of ERTS-1 Data for Regional Planning in the Metropolitan Washington Council of Governments--A Short Brief,
W74-06700 4A

Land Use Mapping and Change Detection Using ERTS Imagery in Montgomery County, Alabama,
W74-06701 4A

Determination of Land Use in Minnesota by Automatic Interpretation of ERTS MSS Data,
W74-06702 4A

Digital Data Processing of ERTS-1 Imagery of Delaware Bay,
W74-06703 2L

The Use of Photographic Methods in Contrast Enhancement of ERTS-1 Images,
W74-06704 7C

Precision Annotation of Predetermined Primary Sampling Units on ERTS-1 MSS Images,
W74-06705 4A

Unsupervised Classification and Areal Measurement of Land and Water Coastal Features on the Texas Coast,
W74-06706 2L

Use of ERTS-1 Pictures in Coastal Oceanography in British Columbia,
W74-06707 2L

Relationships Between Remotely Sensed Fisheries Distribution Information and Selected Oceanographic Parameters in the Mississippi Sound,
W74-06708 7B

Application of ERTS-1 Imagery in Coastal Studies,
W74-06709 2L

Application of ERTS-1 Imagery in the Fields of Geology, Agriculture, Forestry, and Hydrology to Selected Test Sites in Iran,
W74-06710 4A

Detection of Turbidity Dynamics in Tampa Bay, Florida Using Multispectral Imagery from ERTS-1,
W74-06711 2L

Advanced Scanners and Imaging Systems for Earth Observations.
W74-06712 7B

Aerial Radiological Measuring Survey of the Fort Calhoun Station, Fort Calhoun, Nebraska, August 9-10, 1972.
W74-06815 5A

Aerial Radiological Measuring Survey of the Area Surrounding the Palisades Plant, South Haven, Michigan, July 29, 1970.
W74-06816 5A

Aerial Radiological Measuring Survey of the Area Surrounding the Enrico Fermi Atomic Power Plant, Monroe, Michigan, September 1970.
W74-06817 5A

Radar Studies of Urban Precipitation Anomaly,
W74-06938 2B

REPRODUCTION

Survival and Reproduction of Ring-Necked Pheasants Consuming Two Mercurial Fungicides,
W74-06808 5C

RESEARCH

Radioecological Researches in Freshwater and Terrestrial Environment, (In Italian),
W74-07009 5B

RESEARCH AND DEVELOPMENT

Inventory of Active Water Resources Research Projects in North Carolina.
W74-06615 9D

Annual Report, FY 1973.
W74-06617 9A

An Expanding Role for Subarctic Watershed Research,
W74-06884 4D

Legal Impediments to the Use of Interstate Agreements in Coordinated Fisheries Management Programs: States in the N.M.F.S. Southeast Region,
W74-06991 6E

RESEARCH INTERESTS (EDUCATION)
Water Resources Research Interests in the Colleges and Universities of North Carolina.
W74-06616 9A

RESEARCH PRIORITIES
Research Needs: Study of the Environmental Dynamics of Mercury,
W74-06798 5B

RESERVOIR CONSTRUCTION
Woodcock Creek Lake, French Creek Basin, Pennsylvania (Final Environmental Impact Statement).
W74-06986 8A

RESERVOIR EVAPORATION
Evaporation Suppression, A Bibliography.
W74-06501 3D

RESERVOIR SEDIMENTATION
Reservoir Sedimentation,
W74-06883 2J

RESERVOIR SILTING
Reservoir Sedimentation,
W74-06883 2J

RESERVOIR STORAGE
Evaporation from Brine Storage Reservoirs,
W74-06517 2D

RESERVOIRS
Hydrobiological Studies 3.
W74-06530 5C

Survey of Reservoirs in Bohemia and Their Water Quality,
W74-06537 5C

Contribution to the Investigation of Odours in Water,
W74-06538 5C

The Effects of Ecological Changes on Buckeye Lake, Ohio, with Emphasis on Largemouth Bass and Aquatic Vascular Plants,
W74-06546 5C

Effects of Ground-Water Development on the Proposed Palmetto Bend Dam and Reservoir in Southeast Texas,
W74-06920 4B

Proposal for Oklawaha River, Ocala National Forest, Florida, (Final Environmental Impact Statement).
W74-06993 4A

RESIDUAL SOILS
Distribution of Mercury in Residual Soils,
W74-06797 5B

RESINS
The Selective Removal of Nitrate and Nitrite from Polluted Water,
W74-06833 5G

RESOURCE ALLOCATION
The Law to Govern Deepsea Mining Until Superseded by International Agreement,
W74-06964 6E

RESOURCE DEVELOPMENT
The Law to Govern Deepsea Mining Until Superseded by International Agreement,
W74-06964 6E

RESOURCE MANAGEMENT
Resource Management Implications of ERTS-1 Data to Ohio,
W74-06684 4A

RETURN FLOW
Ecological and Physiological Implications of Greenbelt Irrigation,
W74-06608 5D

REVIEWS
Chemical Aspects of Bioassay Techniques for Establishing Water Quality Criteria,
W74-06747 5A

Cyanophages - Viruses Attacking Blue-Green Algae,
W74-06754 5C

Methods of Analysis for Mercury and its Compounds: A Review,
W74-06785 5A

Environmental Dynamics of Mercury: Discussion Paper,
W74-06799 5B

A Review of Soviet Data on the Peaceful Uses of Nuclear Explosions,
W74-06823 6B

A Critical Review of Solid Radioactive Waste Practices at Nuclear Power Plants,
W74-06825 5B

The Problem of Direct Groundwater Discharge to the Seas,
W74-06881 2F

Hydrogeomorphology,
W74-06891 2A

Karst Hydrology--A Review,
W74-06907 2F

REYNOLDS NUMBER
Hydraulic Roughness of Corrugated Plastic Tubing,
W74-06589 8B

RHODE ISLAND
Water Supply Management Alternatives for Rhode Island,
W74-06827 6D

RHODOPHYTA
Yamadaphycus, a New Genus of the Delesseriaceae (Rhodophyta),
W74-06753 5A

RICE FIELDS
Nitrogen-Fixing Activity in Upland and Flooded Rice Fields,
W74-07024 5B

Control of Mosquitoes Breeding in Rice-Fields,
W74-07041 5G

RICHMOND (VA)
River V. Richmond Metropolitan Authority.
W74-06984 6E

RIPARIAN RIGHTS
A Chart of New York Water Law,
W74-06614 6E

RIVER BASIN COMMISSIONS
Ohio River Basin Commission Annual Report, Fiscal Year Ending June 30, 1972.
W74-06918 6E

RIVERS AND HARBORS ACT
River V. Richmond Metropolitan Authority.
W74-06984 6E

RIVERS AND HARBORS ACTS
Conservationists Go to Court- Part I.
W74-06971 4D

ROCK EXCAVATION
Quasi-Continuous Explosive Concepts for Hard Rock Excavations,
W74-06860 8H

ROCK MECHANICS
Geologic and Hydrologic Background for Selecting Site of Pilot Plant Repository for Radioactive Waste,
W74-06820 5B

Quasi-Continuous Explosive Concepts for Hard Rock Excavations,
W74-06860 8H

RODENTS
Predation on the Freshwater Bivalve Unio pictorum by the Rat, Rattus norvegicus, (In Italian),
W74-07008 2I

ROOTED AQUATIC PLANTS
Processing, Chemical Composition and Nutritive Value of Aquatic Weeds,
W74-06502 4A

ROSS ICE SHELF (ANTARCTICA)
Chemical Profile of the Ross Ice Shelf at Little America V, Antarctica,
W74-06921 2C

ROUGHNESS (HYDRAULIC)
Hydraulic Roughness of Corrugated Plastic Tubing,
W74-06589 8B

Effect of Roughness Elements on Hydraulic Resistance for Overland Flow,
W74-06594 8B

Sensitivity of Surface Runoff to Variations of Watershed Parameters in Small Urban Areas-A Kinematic Model,
W74-06853 4C

RUNOFF
Changes in Water Yield of Small Watersheds by Agricultural Practices,
W74-06597 2E

The Runoff of Water and Nutrients from Watersheds Tributary to Cayuga Lake, New York,
W74-06848 5B

RURAL WATERSHEDS
Stormwater Runoff Quality for Urban and Semi-Urban/Rural Watersheds,
W74-06851 5B

SAFETY FACTORS
The Challenge of Military Nuclear Construction,
W74-06859 8H

SALINE WATER INTRUSION
A Physical Model for Prediction and Control of Saltwater Intrusion in the Floridan Aquifer,
W74-06609 2F

SALINITY
Evaporation from Brine Storage Reservoirs,
W74-06517 2D

SALMON
Relative Recoveries of Hatchery-Reared Landlocked Salmon Planted at Different Ages at Schoodic Lake, Maine,
W74-06865 8I

SALMONELLA TYPHI
Survival in Maturation Ponds of Coliform Bacteria With Transferable Drug Resistance,
W74-06748 5C

SALTON SEA (CALIF)
A Simulation Approach to Recreation Planning (A Case of Changing Quality),
W74-06996 6B

SAMPLE PRESERVATION
Growth of Streptococcus cremoris and Streptococcus lactis in a Chemostat. Production of Cells and Survival of Bacteria during Frozen Storage,
W74-06762 5C

Analytical Methodology for Mercury-Discussion Paper,
W74-06793 5A

SAMPLING
Start-Up of Municipal Wastewater Treatment Facilities,
W74-06578 5D

Some Estimates of Natural Levels of Mercury in the Environment,
W74-06772 5B

Mercury in Fish in the Great Lakes,
W74-06774 5B

Survey of Mercury Concentrations in Fishes of Lakes St. Clair, Erie, and Huron,
W74-06775 5B

Analytical Methodology for Mercury-Discussion Paper,
W74-06793 5A

A Radioactive Isotopic Characterization of the Environment Near Wiscasset, Maine: A Preoperational Survey in the Vicinity of the Maine Yankee Atomic Power Plant,
W74-06855 5A

(Radiation Data, Section II. Water).
W74-06856 5A

An Isokinetic Sampler for Wind Erosible Silt and Clay Particle Measurement,
W74-06902 2J

SAND FILTERS
Intermittent Sand Filtration to Upgrade Existing Wastewater Treatment Facilities,
W74-06506 5D

SAPROPHYTIC COLONIZATION
Competitive Saprophytic Colonization by Fusarium oxysporum F. Sp. vasinfectum,
W74-07011 3F

SATELLITES (ARTIFICIAL)
Symposium on Significant Results Obtained From the Earth Resources Technology Satellite-1, Volume I: Technical Presentations, Section B.
W74-06619 7C

Advanced Scanners and Imaging Systems for Earth Observations.
W74-06712 7B

SATURATED FLOW
Measurements of the Downslope Flow of Water in a Soil,
W74-06886 2G

SATURATED SOILS
Unsteady Radial Flow in Partially Saturated Soils,
W74-06587 2G

SATURATION
Degree of Local Saturation of a Flow by Suspended Matter and Its Relation to the Volume Concentration,
W74-06913 8B

SAVANNAH RIVER (GA)
Final Environmental Statement Related to the Proposed Alvin W. Vogtle Nuclear Plant Units 1, 2, 3, and 4.
W74-06821 5B

SCALING
Nitrogen Removal by Ammonia Stripping,
W74-06842 5D

SCALLOPS
Growth Comparisons of Oysters, Mussels and Scallops Cultivated on Algae Growth With Artificial Medium and Treated Sewage Effluent,
W74-07035 5C

SEA ICE
New Insights into the Influence of Ice on the Coastal Marine Environment of the Beaufort Sea, Alaska,
W74-06669 2C

Use of ERTS Data for Mapping Arctic Sea Ice,
W74-06676 2C

Investigations Performed on the Arctic Ice Dynamics Joint Experiment, March 1971,
W74-06716 2C

Mesoscale Strain Measurements on the Beaufort Sea Pack Ice,
W74-06717 2C

Structure of a Multiyear Pressure Ridge,
W74-06718 2C

Top and Bottom Roughness of a Multiyear Ice Floe,
W74-06719 2C

Airphoto Analysis of Ice Deformation in the Beaufort Sea,
W74-06720 2C

Data on Morphological and Physical Characteristics of Sea Ice in the Beaufort Sea,
W74-06721 2C

SEA WATER
Phosphorimetric Determination of Traces of Boron,
W74-06755 5A

SEABED RESOURCES
Recent Developments in the Law of the Sea IV: A Synopsis,
W74-06965 6E

Seamounts and Guyots: A Unique Resource,
W74-06966 6E

SEAGRASSES
Some Comments on Seagrasses and Sedimentary Processes,
W74-06922 2J

SEAMOUNTS
Seamounts and Guyots: A Unique Resource,
W74-06966 6E

SEASONAL
Distribution and Seasonal Variations of the Plankton in 'Riviere de Morlaix,' (In French),
W74-07012 5C

SEDIMENT TRANSPORT
Plume Development in Long Island Sound Observed by Remote Sensing (ERTS-1),
W74-06668 2L

ERTS-1 Observations of Sea Surface Circulation and Sediment Transport, Cook Inlet, Alaska,
W74-06670 2L

Sediment Distribution and Coastal Processes in Cook Inlet, Alaska,
W74-06671 2L

The Influence of Clay Fraction on the Basic Parameters of the Hydro-Transport of Fine Free-Flowing Materials,
W74-06914 8B

Energy Losses in a Two-Phase Flow Containing Coarse-Grain Material,
W74-06916 8B

SEDIMENT-WATER INTERFACE
Denitrification as a Pathway for Nitrate Removal in Aquatic Systems,
W74-06612 5B

SEDIMENTATION
Seasonal Changes of Littoral Transport and Beach Width and Resulting Effect on Protective Structures,
W74-06664 2L

Recognition of Beach and Nearshore Depositional Features of Chesapeake Bay,
W74-06665 2L

Materials Input of Lake Champlain: A Synoptic Appraisal,
W74-06882 2H

Reservoir Sedimentation,
W74-06883 2J

Some Comments on Seagrasses and Sedimentary Processes,
W74-06922 2J

SEDIMENTS
Mercury Contents of Bottom Sediments from Wisconsin Rivers and Lakes,
W74-06777 5B

Mercury in the Lake Michigan Environment,
W74-06779 5B

Distribution of Mercury in the Environment of Minamata Bay and the Inland Ariake Sea,
W74-06781 5B

SEED TREATMENT
Organic Mercury Poisoning in Alamogordo, New Mexico,
W74-06807 5C

Survival and Reproduction of Ring-Necked Pheasants Consuming Two Mercurial Fungicides,
W74-06808 5C

SEEPAGE
On the Leakage Assumption Applied to Equations of Groundwater Flow,
W74-06888 2F

SELENASTRUM CAPRICORNUTUM
Biological Response to Detergent and Nondetergent Phosphorus in Sewage - Part II,
W74-06873 5C

SEPARATION TECHNIQUES
An Appraisal of Neutralization Processes to Treat Coal Mine Drainage,
W74-06512 5D

New Methods of Nitrite and Nitrate Analysis for Natural Waters,
W74-06836 5A

Semimicrodetermination of Mercury(II) and Zinc(II) by Precipitation from Homogeneous Solution, Using Cation Generation Technique,
W74-06869 5A

SESTON
Energetics of Daphnia Ambigua,
W74-06831 5C

SETTLING VELOCITY
Mathematical Model for Barged Ocean Disposal of Wastes,
W74-06837 5B

SEWAGE
Growth Comparisons of Oysters, Mussels and Scallops Cultivated on Algae Growth With Artificial Medium and Treated Sewage Effluent,
W74-07035 5C

SEWAGE DISPOSAL
Sewage Collection Facilities.
W74-06980 6E

SEWAGE EFFLUENTS
Biological Response to Detergent and Nondetergent Phosphorus in Sewage - Part II,
W74-06873 5C

Phytoplankton Successions and Lake Dynamics in Las Vegas Bay, Lake Mead, Nevada,
W74-07001 5C

SEWAGE LAGOONS
Epiphytic Microphytes in a Pond Polluted with Beet Sugar Factory Wastes,
W74-06551 5C

Protozoans in Ponds Filled with Sugar Factory Wastes,
W74-06552 5C

Macrobenthos of Ponds with Sugar Factory Wastes,
W74-06553 5C

Survival in Maturation Ponds of Coliform Bacteria With Transferable Drug Resistance,
W74-06748 5C

SEWAGE TREATMENT
Utilization of Trickling Filters for Dual Treatment of Dry and Wet Weather Flows,
W74-06508 5D

Demonstration of a Non-Aqueous Sewage Disposal System,
W74-06519 5D

Nitrogen Elimination by Bogus Alternation of Aerobic/'Anoxic' Conditions in 'Orbal' Activated Sludge Plants,
W74-06605 5D

Sewage Treatment Facilities, State Grants.
W74-06979 6E

Search for a Method for Sanitizing Sewage from Helminth Eggs Using Agrochemical Means. (Preliminary Communication), (In Russian),
W74-07018 5D

SEWERAGE
Sewage Collection Facilities.
W74-06980 6E

SHAGAWA LAKE (MINN
Modeling Algal Growth Dynamics in Shagawa Lake, Minnesota, with Comments Concerning Projected Restoration of the Lake,
W74-06563 5C

SHORELINE STABILIZERS (PLANTS)
Florida Mangroves as Shoreline Stabilizers,
W74-07047 4A

SICILY
A Preliminary Evaluation of ERTS-1 Images on the Volcanic Areas of Southern Italy (NASA Contract FO-013),
W74-06691 7C

SILVER
Silver Concentrations in Antarctic Snow and Firn,
W74-06930 5A

SIMULATED RAINFALL
Effect of Varying the On-Off Time of Rainfall Simulator Nozzles on Surface Sealing and Intake Rate,
W74-06903 2J

SIMULATION ANALYSIS
Micro-Ecosystems Simulation of Primary Production in Thermal and Acid Mine Water Loadings Related to Water Use of the Monongahela River,
W74-06507 5C

A Simulated Environmental Model of Temperature, Evaporation, Rainfall, and Soil Moisture,
W74-06591 3F

Techniques for Identifying and Evaluating Market and Nonmarket Benefits and Costs of Water Resource Systems.
W74-06852 6B

A Simulation Approach to Recreation Planning (A Case of Changing Quality),
W74-06996 6B

Systems Analysis in the Marion Lake IBP Project,
W74-07010 5C

SITES
Geologic and Hydrologic Background for Selecting Site of Pilot-Plant Repository for Radioactive Waste,
W74-06820 5B

Final Environmental Statement Related to the Proposed Alvin W. Vogtle Nuclear Plant Units 1, 2, 3, and 4.
W74-06821 5B

SLIMES DAMS
The Impact of Slimes-Dam Formation on Water Quality and Pollution,
W74-06604 5B

SLOPES
Sensitivity of Surface Runoff to Variations of Watershed Parameters in Small Urban Areas-A Kinematic Model,
W74-06853 4C

SLUDGE
An Appraisal of Neutralization Processes to Treat Coal Mine Drainage,
W74-06512 5D

SLUDGE DISPOSAL
Information Resource: Final Report Water Pollution Control in Water Utilities,
W74-06527 5F

Sludge Disposal to Land,
W74-06950 5B

SLUDGE TREATMENT
Information Resource: Final Report Water Pollution Control in Water Utilities,
W74-06527 5F

SMALL WATERSHEDS
Changes in Water Yield of Small Watersheds by Agricultural Practices,
W74-06597 2E

SNOW COVER
Snow Cover Surveys in Alaska From ERTS-1 Data,
W74-06697 2C

SNOWPACKS
PB-210 Concentration in Ice Measured at South Pole Station,
W74-06932 5A

SOIL ALGAE
The Genus Neochloris Starr (Chlorophyceae, Chlorococcales),
W74-06760 5A

Lead Inhibition of Hormotila blennista (Chlorophyceae, Chlorococcales),
W74-06761 5C

SOIL AMENDMENTS
Deep Plowing and Chemical Amendment Effect on a Sodic Claypan Soil,
W74-06598 3F

SOIL CHEMICAL PROPERTIES
Quality Improvement of Feedlot Lagoon Water by Percolation Through Soil Under Native Pasture,
W74-06830 5D

SOIL CHEMISTRY
Nitrogen Mineralization-Water Relations in Soils,
W74-06897 5B

Transformation of Iron in a Waterlogged Soil as Influenced by Redox Potential and pH,
W74-06934 5B

SOIL COLUMNS
A Multichannel Syringe Pump for Steady State Flow in Soil Columns,
W74-07028 2G

SOIL CONSERVATION
Soil and Water Losses as Affected by Tillage Practices,
W74-06595 3F

SOIL CONTAMINATION
Distribution of Mercury in Residual Soils,
W74-06797 5B

The EXREM III Computer Code for Estimating External Radiation Doses to Populations from Environmental Releases,
W74-06818 5B

SOIL EROSION
Estimating Soil Erosion from the Redistribution of Fallout Cs-137,
W74-06901 2J

An Isokinetic Sampler for Wind Erosible Silt and Clay Particle Measurement,
W74-06902 2J

Effect of Varying the On-Off Time of Rainfall Simulator Nozzles on Surface Sealing and Intake Rate,
W74-06903 2J

SOIL MANAGEMENT
Evaluation of a Furrow Modifying Device,
W74-06588 3F

Deep Plowing - An Engineering Appraisal,
W74-06590 3F

Deep Plowing and Chemical Amendment Effect on a Sodic Claypan Soil,
W74-06598 3F

Hurricane Creek Watershed Project, Humphreys and Dickson Counties, Tennessee (Final Environmental Impact Statement).
W74-06988 4D

SOIL MOISTURE
Development of Asphalt Moisture Barrier Equipment,
W74-06586 3F

Unsteady Radial Flow in Partially Saturated Soils,
W74-06587 2G

A Simulated Environmental Model of Temperature, Evaporation, Rainfall, and Soil Moisture,
W74-06591 3F

In Situ Spectroradiometric Quantification of ERTS Data,
W74-06663 2G

Nitrogen Mineralization-Water Relations in Soils,
W74-06897 5B

Field Measurement of Evaporation from Soil Shrinkage Cracks,
W74-06900 2D

Competitive Saprophytic Colonization by Fusarium oxysporum F. Sp. vasinfectum,
W74-07011 3F

Soil Moisture Distribution During Two-Dimensional Absorption from a Cylindrical Source,
W74-07042 2G

SOIL PERCOLATOR
A Simple Automatic Soil Percolator,
W74-06531 7B

SOIL PHYSICS
Application of Monte Carlo Method to Soil Water Movement,
W74-06599 2G

SOIL SURVEYS
Identification of Soil Associations in Western South Dakota on ERTS-1 Imagery,
W74-06629 2G

SOIL TEMPERATURE
Use of Waste Heat for Soil Warming in North Carolina,
W74-07000 5D

SOIL TREATMENT
Evaluation of a Furrow Modifying Device,
W74-06588 3F

SOIL WATER
Field Measurement of Evaporation from Soil Shrinkage Cracks,
W74-06900 2D

Evaluation of Influence of Available Soil Water Storage Capacity on Growing Season Length and Yield of Tropical Pastures Using Simple Water Balance Models,
W74-06927 3F

SOIL WATER MOVEMENT
Application of Monte Carlo Method to Soil Water Movement,
W74-06599 2G

Gravity Correction Due to a Variation of Pressure Head Within a Cavity,
W74-06734 2G

Measurement of Hydraulic Conductivity By Means of Steady, Spherically Symmetric Flows,
W74-06735 2G

Solution of Equation for Vertical Unsaturated Flow of Soil Water,
W74-06736 2G

Upward Flow from Shallow Water Tables,
W74-06844 2F

Measurements of the Downslope Flow of Water in a Soil,
W74-06886 2G

Solute Movement Through Disturbed and Undisturbed Soil Cores,
W74-06935 5B

SOILS
Gray Forest Soils in the Spruce-Fir Forests in the Sub-Ural Region (Vyatka-Kama Province), (In Russian),
W74-07004 2G

Seasonal and Stratigraphic Controls in Coastal Floodplain Soils,
W74-07030 2G

SOLAR RADIATION
A Technique for Correcting ERTS Data for Solar and Atmospheric Effects,
W74-06648 7C

SOLUBILITY
Ionic State and Coordination of Iron in Bog Lakes,
W74-06744 5C

SOLUTES
Solute Movement Through Disturbed and Undisturbed Soil Cores,
W74-06935 5B

SORPTION
Nitric Oxide Sorption by Calcareous Soils: II. Effect of Moisture on Capacity, Rate, and Sorption Products,
W74-06894 5B

Kinetics of the Phosphate Interaction with Calcite,
W74-06895 5B

SORPTIVITY
One-Dimensional Vertical Infiltration,
W74-07034 2G

SOUTH AFRICA
Water Quality Control,
W74-06603 5G

The Impact of Slimes-Dam Formation on Water Quality and Pollution,
W74-06604 5B

An Ecological Account of the Past and Future of South African Rivers,
W74-06606 5C

SOUTH AFRICA (VAAL RIVER)
The Effect of Pollution on the Vaal River Barrage and the Quest for Water Quality,
W74-06607 5B

SOUTH CAROLINA
Wando River Environmental Quality Studies, An Interim Report.
W74-06919 5B

Groundwater Use Act of 1969.
W74-06973 6E

SOUTH DAKOTA
Demonstration of a Non-Aqueous Sewage Disposal System,
W74-06519 5D

Identification of Soil Associations in Western South Dakota on ERTS-1 Imagery,
W74-06629 2G

DCP-Collected Absolute Target Reflectance Signatures Assist Accurate Interpretation of ERTS-1 Imagery,
W74-06688 7C

SOUTHEAST U
Legal Impediments to the Use of Interstate Agreements in Coordinated Fisheries Management Programs: States in the N.M.F.S. Southeast Region,
W74-06991 6E

SOUTHWEST MANITOBA
Changes in Water Chemistry Accompanying Summer Fish Kills in Shallow Eutrophic Lakes of Southwest Manitoba,
W74-06541 5C

SOUTHWEST U
Geothermal Development and Southwest Storage Basins,
W74-06945 4B

SOVEREIGNTY
Recent Developments in the Law of the Sea IV: A Synopsis,
W74-06965 6E

Seamounts and Guyots: A Unique Resource,
W74-06966 6E

SOVIET UNION
Geography of Waterfowl Resources of the Soviet Union. Condition of Reserves.
W74-06559 6B

SPATIAL DISTRIBUTION
The Role of Thermocline Migration in Regulating Algal Blooms,
W74-06566 5C

SPECIATION
Yamadaphycus, a New Genus of the Delesseriaceae (Rhodophyta),
W74-06753 5A

SPECIES DIVERSITY INDEX
Stream Pollution and a Simplified Diversity Index,
W74-06876 5A

SPECIFIC YIELD
Capillary Properties of Soils - Influence upon Specific Yield,
W74-06584 2F

SPECTROPHOMETRY
Determination of Mercury in Biological Tissues,
W74-06790 5A

SPECTROPHOTOMETERY
Cancellation of Spectrophotometer System Characteristics Using an Analog Computer,
W74-06874 2K

SPECTROPHOTOMETRY
Mercury Content of Canadian Foods and Cereals Determined by Different Methods,
W74-06787 5A

SPECTRORADIOMETRY
In Situ Spectroradiometric Quantification of ERTS Data,
W74-06663 2G

SPECTROSCOPY
Evaluation of a Microwave-Induced Plasma Spectrometer for Trace Analysis,
W74-06841 5A

An Atomic Absorption Analysis Method for Cyanide,
W74-06999 5A

SPILLWAYS
Developing Region in Self-Aerated Flows,
W74-06739 8B

SPRINGS
The Problem of Direct Groundwater Discharge to the Seas,
W74-06881 2F

SPRINKLER IRRIGATION
Design Criteria for Irrigation Systems with Complex Pipe Loops,
W74-06585 3F

Sprinkler Precipitation Gage Errors,
W74-06593 3F

Pasture Irrigation with a Center-Pivot Sprinkler System,
W74-06601 3F

SQUIRE'S THEOREM
On Squire's Theorem in the Study of Hydrodynamic Stability of Plane-Parallel Flows of Incompressible Fluids about Deforming Boundaries,
W74-06911 8B

ST
Numerical Model of St. Lawrence River Estuary,
W74-06738 2L

Eight Years of Observations on the Water Level at Quebec and Grondines 1962-1969: Part I--Analysis of the Tidal Signal,
W74-06926 2E

University of Chicago Contribution to Project Metromex-I.
W74-06937 2B

Radar Studies of Urban Precipitation Anomaly,
W74-06938 2B

Observations of the Cloud Nucleus Concentration Around the St. Louis Urban Complex,
W74-06939 2B

Upwind and Downwind Cloud-Base Microstructure,
W74-06940 2B

Metromex Temperature and Aerosol Data Reduction: Analysis of the Urban Anomaly,
W74-06941 2B

STABILITY
On Squire's Theorem in the Study of Hydrodynamic Stability of Plane-Parallel Flows of Incompressible Fluids about Deforming Boundaries,
W74-06911 8B

STANDING (LEGAL)
Conservationists Go to Court--Part 1,
W74-06971 4D

STATE GOVERNMENTS
Intergovernmental Relations as seen by Florida State Legislators: Land Use and Water Resource Problems,
W74-06845 6B

Legal Impediments to the Use of Interstate Agreements in Coordinated Fisheries Management Programs: States in the N.M.F.S. Southeast Region,
W74-06991 6E

STATISTICAL METHODS
Sample Sizes Required for Two-Sided Comparisons of Two Treatments With a Control,
W74-06746 7C

Assessing Systematic Errors in Rainfall-Runoff Models,
W74-06893 2A

Determination of the Confidence Intervals of the Pearson III Law Using Order Statistics (Determination des intervalles de confiance de la loi Pearson III par les statistiques d'ordre),
W74-06906 2E

STEADY-STATE SLOW
A Multichannel Syringe Pump for Steady State Flow in Soil Columns,
W74-07028 2G

STORAGE
Analytical Methodology for Mercury-Discussion Paper,
W74-06793 5A

STORAGE TANKS
241-T-106 Tank Leak Investigation.
W74-06861 5B

STORM RUNOFF
Stormwater Runoff Quality for Urban and Semi-Urban/Rural Watersheds,
W74-06851 5B

STRATIFICATION
Distribution and Mixing of Inflow into Stratified Lakes: A Hydraulic Model Study, (Phase I),
W74-06618 2H

STRATIGRAPHIC CONTROLS
Seasonal and Stratigraphic Controls in Coastal Floodplain Soils,
W74-07030 2G

STREAMS
Stream Temperatures in Washington State,
W74-06962 7C

STRENGTH
Comparison of Strength Test Methods for Corrugated Plastic Drainage Tubing,
W74-06602 8A

STREPTOCOCCUS
Growth of Streptococcus cremoris and Streptococcus lactis in a Chemostat Production of Cells and Survival of Bacteria during Frozen Storage,
W74-06762 5C

STRIP MINES
Geographic Applications of ERTS-1 Data to Landscape Change,
W74-06628 4A

STRIP MINING
Mapping of Spoil Banks Using ERTS-1 Pictures,
W74-06695 5A

STURGEON (ATLANTIC)
Atlantic Sturgeon (Acipenser sturio) in Waters of Georgia, (In Russian),
W74-07016 2H

STYLOSANTHES-HUMILIS
Evaluation of Influence of Available Soil Water Storage Capacity on Growing Season Length and Yield of Tropical Pastures Using Simple Water Balance Models,
W74-06927 3F

SUB-LETHAL EFFECTS
Interaction of Temperature and Copper Ions as Orienting Stimuli in the Locomotor Behavior of the Goldfish (Carassius auratus),
W74-06769 5C

SUBCLINICAL EFFECTS
Detection and Appraisal of Subclinical Intoxications,
W74-06810 5C

Approaches to the Detection of Subclinical Mercury Intoxications: Experience in Minamata, Japan,
W74-06811 5C

Epidemiological Approaches to the Study of Subclinical Effects of Mercury Intoxication,
W74-06813 5B

SUBMARINE SPRINGS
The Problem of Direct Groundwater Discharge to the Seas,
W74-06881 2F

SUBSURFACE DRAINS
Hydraulic Roughness of Corrugated Plastic Tubing,
W74-06589 8B

SUBSURFACE RUNOFF
Measurements of the Downslope Flow of Water in a Soil,
W74-06886 2G

SUGAR FACTORY WASTES
Epiphytic Microphytes in a Pond Polluted with Beet Sugar Factory Wastes,
W74-06551 5C

Protozoans in Ponds Filled with Sugar Factory Wastes,
W74-06552 5C

Macrobenthos of Ponds with Sugar Factory Wastes,
W74-06553 5C

SURFACE-GROUNDWATER RELATIONSHIPS
Walden's Way Revealed,
W74-06925 2H

SURFACE IRRIGATION
Mathematical Model of Water Advance in Border Irrigation,
W74-06582 3F

SURFACE WATERS
Hydrology and Water Resources of the Hoosic River Basin, Massachusetts,
W74-06958 7C

SURGES
Eight Years of Observations on the Water Level at Quebec and Grondines 1962-1969: Part I--Analysis of the Tidal Signal,
W74-06926 2E

SURVEILLANCE PROGRAM
(Radiation Data, Section II. Water).
W74-06856 5A

SURVEY
Aquatic Vegetation of the Ottowa River Near Chalk River Nuclear Laboratories (CRNL),
W74-06819 5C

Geologic and Hydrologic Background for Selecting Site of Pilot-Plant Repository for Radioactive Waste,
W74-06820 5B

A Radioactive Isotopic Characterization of the Environment Near Wiscasset, Maine: A Preoperational Survey in the Vicinity of the Maine Yankee Atomic Power Plant,
W74-06855 5A

SURVEYING
Drainage Districts.
W74-06972 6E

SURVEYS
Symposium on Significant Results Obtained From the Earth Resources Technology Satellite-1, Volume I: Technical Presentations, Section B.
W74-06619 7C

Land Use Investigations in the Central Valley and Central Coastal Test Sites, California,
W74-06623 4A

Land Use in Northern Coachella Valley,
W74-06624 4A

Automatic Interpretation of ERTS Data for Forest Management,
W74-06643 4A

Natural Resource Inventory and Monitoring in Oregon With ERTS Imagery,
W74-06683 4A

Resource Management Implications of ERTS-1 Data to Ohio,
W74-06684 4A

Application of ERTS-1 Imagery in the Fields of Geology, Agriculture, Forestry, and Hydrology to Selected Test Sites in Iran,
W74-06710 4A

Epidemiological Approaches to the Study of Subclinical Effects of Mercury Intoxication,
W74-06813 5B

Aerial Radiological Measuring Survey of the Fort Calhoun Station, Fort Calhoun, Nebraska, August 9-10, 1972.
W74-06815 5A

Aerial Radiological Measuring Survey of the Area Surrounding the Palisades Plant, South Haven, Michigan, July 29, 1970.
W74-06816 5A

Aerial Radiological Measuring Survey of the Area Surrounding the Enrico Fermi Atomic Power Plant, Monroe, Michigan, September 1970.
W74-06817 5A

SURVIVAL
Survival in Maturation Ponds of Coliform Bacteria With Transferable Drug Resistance,
W74-06748 5C

SUSPENDED LOAD
Correlation of ERTS Multispectral Imagery with Suspended Matter and Chlorophyll in Lower Chesapeake Bay,
W74-06667 2L

SUSPENDED SOLIDS
Degree of Local Saturation of a Flow by Suspended Matter and Its Relation to the Volume Concentration,
W74-06913 8B

SUSPENSION
Structure of the Velocity Profile of a Suspension-Bearing Flow,
W74-06912 8B

The Influence of Clay Fraction on the Basic Parameters of the Hydro-Transport of Fine Free-Flowing Materials,
W74-06914 8B

SWEDEN
Factors in the Transformation of Mercury to Methylmercury,
W74-06794 5B

Mercury and Food Chains,
W74-06796 5B

SWITZERLAND (GENEVA)
Climatic Data of the High Altitude Meteorological Stations of the Geneva Region For 1970, (In French),
W74-06532 7C

SYSTEMATICS
Yamadaphycus, a New Genus of the Delesseriaceae (Rhodophyta),
W74-06753 5A

SYSTEMS ANALYSIS
Water Quality Control,
W74-06603 5G

Systems Analysis in the Marion Lake IBP Project,
W74-07010 5C

TAMPA BAY (FLA)
Detection of Turbidity Dynamics in Tampa Bay, Florida Using Multispectral Imagery from ERTS-1,
W74-06711 2L

TEMPERATURE
The Influence of Environmental Factors on the Distribution of Freshwater Algae: An Experimental Study. III. Effects of Temperature, Vitamin Requirements and Inorganic Nitrogen Compounds on Growth,
W74-06549 5C

Interaction of Temperature and Copper Ions as Orienting Stimuli in the Locomotor Behavior of the Goldfish (Carassius auratus),
W74-06769 5C

TENNESSEE
Geographic Applications of ERTS-1 Data to Landscape Change,
W74-06628 4A

Hurricane Creek Watershed Project, Humphreys and Dickson Counties, Tennessee (Final Environmental Impact Statement).
W74-06988 4D

TENNESSEE RIVER
Whatever Happened to TVA,
W74-06968 6E

TENNESSEE VALLEY AUTHORITY
Investigation of Mercury Contamination in the Tennessee Valley Region,
W74-06780 5B

Whatever Happened to TVA,
W74-06968 6E

TENSIOMETERS
Measurement of Hydraulic Conductivity By Means of Steady, Spherically Symmetric Flows,
W74-06735 2G

TERRAIN ANALYSIS
Terrain Classification Maps of Yellowstone National Park,
W74-06645 4A

TERRITORIAL WATERS
Recent Developments in the Law of the Sea IV: A Synopsis,
W74-06965 6E

TERTIARY TREATMENT
Intermittent Sand Filtration to Upgrade Existing Wastewater Treatment Facilities,
W74-06506 5D

Coliform Bacteria Growth and Control in Aerated Stabilization Basins,
W74-06520 5D

Tertiary Treatment with a Controlled Ecological System.
W74-06524 5D

TESTING
Sample Sizes Required for Two-Sided Comparisons of Two Treatments With a Control,
W74-06746 7C

TESTING PROCEDURES
Preparation of Biological Samples for Neutron Activation Analysis of Mercury,
W74-06786 5A

TEXAS
Hypolimnion Aeration with Commercial Oxygen - Vol. I - Dynamics of Bubble Plume,
W74-06525 5D

Hypolimnion Aeration with Commercial Oxygen - Vol. II - Bubble Plume Gas Transfer,
W74-06526 5D

Wheat and Grain Sorghum Irrigation in a Wide Bed-Furrow System,
W74-06580 3F

A Comparison of Land-Use Determinations Using Data from ERTS-1 and High Altitude Aircraft,
W74-06638 4A

Distribution and Movement of Suspended Sediment in the Gulf of Mexico off the Texas Coast,
W74-06672 2L

Unsupervised Classification and Areal Measurement of Land and Water Coastal Features on the Texas Coast,
W74-06706 2L

TEXAS

Techniques for Identifying and Evaluating Market and Nonmarket Benefits and Costs of Water Resource Systems.
W74-06852 6B

Effects of Ground-Water Development on the Proposed Palmetto Bend Dam and Reservoir in Southeast Texas,
W74-06920 4B

THALASSIA
Origin of Circular Beds of Thalassia (Spermatophyta:Hydrocharitaceae) in South Biscayne Bay, Florida, and Their Relationship to Mangrove Hammocks,
W74-07022 5A

THERMAL POLLUTION
Micro-Ecosystems Simulation of Primary Production in Thermal and Acid Mine Water Loadings Related to Water Use of the Monongahela River,
W74-06507 5C

Modeling and Optimization of Transient Cooling Water Discharge from Power Generating Plants,
W74-06832 5B

Use of Waste Heat for Soil Warming in North Carolina,
W74-07000 5D

THERMOCLINE
The Role of Thermocline Migration in Regulating Algal Blooms,
W74-06566 5C

THIN LAYER CHROMATOGRAPHY
Electron-Donor-Acceptor Complexing Reagents in the Analysis of Pesticides. VI. Influence of Structure in Detection and Identification,
W74-06871 5A

TIDAL ESTUARY
Ecological Aspects Along the Shores of the Burabalanga Tidal Estuary Balasore District, Orissa State,
W74-07049 2L

TIDAL MARSHES
Cooperative Gulf of Mexico Estuarine Inventory and Study, Florida: Phase I Area Description,
W74-06995 2L

TIDES
Numerical Model of St. Lawrence River Estuary,
W74-06738 2L

Eight Years of Observations on the Water Level at Quebec and Grondines 1962-1969: Part I--Analysis of the Tidal Signal,
W74-06926 2E

TILE DRAINS
Hydraulic Roughness of Corrugated Plastic Tubing,
W74-06589 8B

TOXICITY
Coliform Bacteria Growth and Control in Aerated Stabilization Basins,
W74-06520 5D

Effects of Oil Dispersants and Oil Emulsions on Marine Animals,
W74-06745 5C

Surface Electromyography in Chronic Inorganic Mercury Intoxication,
W74-06801 5C

The Dose-Response Relationship Resulting from Exposure to Alkyl Mercury Compounds,
W74-06805 5C

Dose-Response Relationships after Exposure of Swine to Organo-Mercurial Compounds,
W74-06809 5C

Detection and Appraisal of Subclinical Intoxications,
W74-06810 5C

Approaches to the Detection of Subclinical Mercury Intoxications: Experience in Minamata, Japan,
W74-06811 5C

Mercury Concentrations in Human Tissues Among Heavy Fish Eaters,
W74-06812 5B

Epidemiological Approaches to the Study of Subclinical Effects of Mercury Intoxication,
W74-06813 5B

Biological Effects of Mercury Compounds, Discussion Paper,
W74-06814 5C

Biological Response to Detergent and Nondetergent Phosphorus in Sewage - Part II,
W74-06873 5C

Using Artemia to Assay Oil Dispersant Toxicities,
W74-06877 5A

TOXINS
The Role of Food Chains in Environmental Mercury Contamination,
W74-06795 5B

TRACE ELEMENTS
Evaluation of a Microwave-Induced Plasma Spectrometer for Trace Analysis,
W74-06841 5A

The Effects of Waste Disposal in the New York Bight. Section 5: Chemical Studies.
W74-06867 5C

TRACERS
Groundwater Tracing with Post Sampling Activation Analysis,
W74-06889 2F

Estimating Soil Erosion from the Redistribution of Fallout Cs-137,
W74-06901 2J

TRAINING
Freshwater Biology and Pollution Ecology: Training Manual.
W74-06558 5A

TRANSLOCATION
Azide and Ethylenethiourea Mobility in Soils,
W74-06896 5B

Solute Movement Through Disturbed and Undisturbed Soil Cores,
W74-06935 5B

TRANSPIRATION CONTROL
Evaporation Suppression, A Bibliography.
W74-06501 3D

TREATMENT FACILITIES
Emergency Planning for Municipal Wastewater Treatment Facilities,
W74-06577 5D

Start-Up of Municipal Wastewater Treatment Facilities,
W74-06578 5D

Maintenance Management Systems for Municipal Wastewater Facilities,
W74-06579 5D

Production Function Theory and the Optimal Design of Waste Treatment Facilities,
W74-06997 6D

TRICKLING FILTERS
Utilization of Trickling Filters for Dual Treatment of Dry and Wet Weather Flows,
W74-06508 5D

TRONDHEIMSFJORD (NORWAY)
Studies on the Phytoplankton Ecology of the Trondheimsfjord. I. The Chemical Composition of Phytoplankton Populations,
W74-06545 5C

TROPHIC LEVEL
Phytoplankton Populations in Relation to Different Trophic Levels at Winnipesaukee Lake, New Hampshire, U.S.A.,
W74-06529 5C

Water and Nutrient Budgets for Cayuga Lake, New York,
W74-06849 5B

TURBIDITY
Applicability of ERTS-1 Imagery to the Study of Suspended Sediment and Aquatic Fronts,
W74-06666 2L

Plume Development in Long Island Sound Observed by Remote Sensing (ERTS-1),
W74-06668 2L

Distribution and Movement of Suspended Sediment in the Gulf of Mexico off the Texas Coast,
W74-06672 2L

Air Quality Indices from ERTS-1 MSS Information, PR 568,
W74-06696 5A

Application of ERTS-1 Imagery in Coastal Studies,
W74-06709 2L

Detection of Turbidity Dynamics in Tampa Bay, Florida Using Multispectral Imagery from ERTS-1,
W74-06711 2L

TWIN LAKES (OHIO)
Some Aspects of Phosphorus Dynamics of the Twin Lakes Watershed,
W74-06565 5C

ULTRAFILTRATION PROCESS
Color Removal from Kraft Mill Effluents by Ultrafiltration,
W74-06521 5D

ULVARIA OXYSPERMA
Culture Studies of Enteromorpha Linza (L.) J.AG. and Ulvaria Oxysperma (Kutzing) Bliding (Chlorophyceae, Ulvales) From Central America,
W74-06749 5C

UNITED STATES
Ratification of Proposed Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (Final Environmental Impact Statement).
W74-06994 6E

UNIVERSITIES
Inventory of Active Water Resources Research Projects in North Carolina.
W74-06615 9D

Water Resources Research Interests in the Colleges and Universities of North Carolina.
W74-06616 9A

Annual Report, FY 1973.
W74-06617 9A

UNSATURATED FLOW
Measurement of Hydraulic Conductivity By Means of Steady, Spherically Symmetric Flows,
W74-06735 2G

Solution of Equation for Vertical Unsaturated Flow of Soil Water,
W74-06736 2G

Measurements of the Downslope Flow of Water in a Soil,
W74-06886 2G

Solute Movement Through Disturbed and Undisturbed Soil Cores,
W74-06935 5B

UNSTEADY FLOW
Mathematical Model of Water Advance in Border Irrigation,
W74-06582 3F

Unsteady Radial Flow in Partially Saturated Soils,
W74-06587 2G

UPWELLING (OCEANS)
Biomass in the Upwelling Areas Along the Northwest Coast of Africa as Viewed with ERTS-1,
W74-06677 5A

URBAN DRAINAGE
Stormwater Runoff Quality for Urban and Semi-Urban/Rural Watersheds,
W74-06851 5B

URBAN MAPPING
First Look Analyses of Five Cycles of ERTS-1 Imagery Over County of Los Angeles: Assessment of Data Utility for Urban Development and Regional Planning,
W74-06636 4A

Preparation of Urban Land Use Inventories by Machine-Processing of ERTS MSS Data,
W74-06637 4A

A Comparison of Land-Use Determinations Using Data from ERTS-1 and High Altitude Aircraft,
W74-06638 4A

Digital Land Use Mapping in Oakland County, Michigan,
W74-06639 4A

URBAN RUNOFF
Simulation of Urban Runoff, Nutrient Loading, and Biotic Response of a Shallow Eutrophic Lake,
W74-06564 5C

Unrecorded Pollution and Dynamics of Biochemical Oxygen Demand,
W74-06613 5B

Stormwater Runoff Quality for Urban and Semi-Urban/Rural Watersheds,
W74-06851 5B

Sensitivity of Surface Runoff to Variations of Watershed Parameters in Small Urban Areas-A Kinematic Model,
W74-06853 4C

URBAN WATERSHEDS
Stormwater Runoff Quality for Urban and Semi-Urban/Rural Watersheds,
W74-06851 5B

URBANIZATION
Geographic Applications of ERTS-1 Data to Landscape Change,
W74-06628 4A

Investigations of an Urban Area and its Locale Using ERTS-1 Data Supported by U-Photography,
W74-06635 4A

Use of ERTS-1 Data for Regional Planning in the Metropolitan Washington Council of Governments--A Short Brief,
W74-06700 4A

Land Use Mapping and Change Detection Using ERTS Imagery in Montgomery County, Alabama,
W74-06701 4A

Urbanization and Human Health,
W74-07017 5G

USSR
Automatic Processing and Verification of Meteorological Observations.
W74-06722 2B

Automatic Monitoring of Daily Results of Basic Meteorological Observations,
W74-06727 2B

Automatic Method of Monitoring the Quality of Mean Monthly Meteorological Data,
W74-06728 2B

Automatic Monitoring of Processing of Daily Radiosonde Data on Temperature and Geopotential,
W74-06729 2B

Automatic Monitoring and Processing of Hourly Hydrometeorological Information,
W74-06730 2B

Some Principles of Objective Control of Marine Meteorological Information,
W74-06731 2B

Automatic Processing of Rainfall Data,
W74-06732 2B

An Algorithm for Monitoring Hydrometeorological Information,
W74-06733 2B

USSR (CAUCASUS)
Changes in Rate and Rhythms of Development of Perennial Polycarpic Plants at Different Altitudes in Humid High Mountains, (In Russian),
W74-07014 2I

USSR (GEORGIA)
Atlantic Sturgeon (Acipenser sturio) in Waters of Georgia, (In Russian),
W74-07016 2H

USSR (SPALIS SPRING)
Effect of Sodium-Potassium Chloride Mineral Water from the Splais Spring (Druskininkai Health Resort) on the Pseudocholinesterase Activity of Blood Serum and Protein-Synthesizing Function of the Liver in Experimental Acute Toxic Hepatitis, (In Russian),
W74-07005 5C

USSR (VYATKA-KAMA PROVINCE)
Gray Forest Soils in the Spruce-Fir Forests in the Sub-Ural Region (Vyatka-Kama Province), (In Russian),
W74-07004 2G

UTAH
Physical Microclimates of Erosion-Control Structures in a Salt Desert Area,
W74-07029 2G

UTAH LAKE
ERTS-1 Observes Algal Bloom in Lake Erie and Utah Lake,
W74-06699 5A

VEGETATION EFFECTS
Some Comments on Seagrasses and Sedimentary Processes,
W74-06922 2J

VELLOZIA-SCHNITZLEINIA-VAR-OCCIDENTA
An Ecological Study of Vellozia schnitzleinia, a Drought-Enduring Plant of Northern Nigeria,
W74-06768 2I

VELOCITY
Structure of the Velocity Profile of a Suspension-Bearing Flow,
W74-06912 8B

Distribution of Average Longitudinal Velocities in Flows with Coarse-Grained Materials,
W74-06915 8B

VERMONT
Materials Input of Lake Champlain: A Synoptic Appraisal,
W74-06882 2H

VERTICAL DISTORTION
Distribution and Mixing of Inflow into Stratified Lakes: A Hydraulic Model Study, (Phase I),
W74-06618 2H

VIRGINIA
Land Use Classification and Change Analysis Using ERTS-1 Imagery in Carets,
W74-06625 4A

ERTS Regional-Scale Overview Linking Land Use and Environmental Processes in Carets,
W74-06626 4A

Evaluation of Land Use Mapping from ERTS in the Shore Zone of Carets,
W74-06627 4A

Correlation of ERTS Multispectral Imagery with Suspended Matter and Chlorophyll in Lower Chesapeake Bay,
W74-06667 2L

Flood of October 1972 at Petersburg and Colonial Heights, Virginia,
W74-06957 7C

River V. Richmond Metropolitan Authority.
W74-06984 6E

VIRUSES
Cyanophages - Viruses Attacking Blue-Green Algae,
W74-06754 5C

VITAMIN B
Environmental Dynamics of Mercury: Discussion Paper,
W74-06799 5B

VITAMINS
The Influence of Environmental Factors on the Distribution of Freshwater Algae: An Experimental Study. III. Effects of Temperature, Vitamin Requirements and Inorganic Nitrogen Compounds on Growth,
W74-06549 5C

VITAMINS (WATER SOLUBLE)
Qualitative Requirements of Young Eels Anguilla japonica for Water-Soluble Vitamins and Their Deficiency Symptoms,
W74-07006 5C

VOLCANOES
A Preliminary Evaluation of ERTS-1 Images on the Volcanic Areas of Southern Italy (NASA Contract FO-013),
W74-06691 7C

Thermal Surveillance of Cascade Range Volcanoes Using ERTS-1 Multispectral Scanner, Aircraft Imaging Systems, and Ground-Based Data Communication Platforms,
W74-06692 7C

VOLUMETRIC ANALYSIS
On the Reaction Between Iodide and Mercury(II),
W74-06870 5A

WABASH RIVER
Quantitative Methods for Preliminary Design of Water Quality Surveillance Systems,
W74-06885 5A

WALDEN POND (MASS)
Walden's Way Revealed,
W74-06925 2H

WANDO RIVER (S
Wando River Environmental Quality Studies, An Interim Report.
W74-06919 5B

WASHED SUSPENSIONS
Method of Preparing Washed Suspensions of Anaerobic Bacteria for Metabolic Studies,
W74-06875 5A

WASHINGTON
Studies of the Forest Energy Budget,
W74-06518 2D

Oxidation of Organic Matter in Sediments,
W74-06528 5C

Recent Activity of Glaciers of Mount Rainier, Washington,
W74-06713 2C

241-T-106 Tank Leak Investigation.
W74-06861 5B

Stream Temperatures in Washington State,
W74-06962 7C

WASTE BURIAL
A Critical Review of Solid Radioactive Waste Practices at Nuclear Power Plants,
W74-06825 5B

WASTE DILUTION
Mathematical Model for Barged Ocean Disposal of Wastes,
W74-06837 5B

WASTE DISPOSAL
A Study of Hazardous Waste Materials, Hazardous Effects and Disposal Methods. Volume I.
W74-06555 5C

A Study of Hazardous Waste Materials, Hazardous Effects and Disposal Methods. Volume II.
W74-06556 5C

A Study of Hazardous Waste Materials, Hazardous Effects and Disposal Methods. Volume III.
W74-06557 5C

A Critical Review of Solid Radioactive Waste Practices at Nuclear Power Plants,
W74-06825 5B

Mathematical Model for Barged Ocean Disposal of Wastes,
W74-06837 5B

The Effects of Waste Disposal in the New York Bight. Section 3: Zooplankton Studies.
W74-06866 5C

The Effects of Waste Disposal in the New York Bight. Section 5: Chemical Studies.
W74-06867 5C

The Effects of Waste Disposal in the New York Bight. Sections 7, 8, and 9.
W74-06868 5C

Nitric Oxide Sorption by Calcareous Soils: II. Effect of Moisture on Capacity, Rate, and Sorption Products,
W74-06894 5B

Powers of the Water Pollution Control Board: Powers of Director of Environmental Protection.
W74-06975 6E

WASTE DISPOSAL WELLS
Ground Water Pollution from Subsurface Excavations: Part II--Pollution from Wells.
W74-06933 5B

Effects of Sewage Disposal and Reclamation on Ground Water Quality,
W74-06948 5D

WASTE WATER OZONATION
Laboratory Ozonation of Muncipal Wastewaters,
W74-06840 5D

WASTE WATER TREATMENT
Intermittent Sand Filtration to Upgrade Existing Wastewater Treatment Facilities,
W74-06506 5D

Utilization of Trickling Filters for Dual Treatment of Dry and Wet Weather Flows,
W74-06508 5D

Physical-Chemical Treatment of Raw Municipal Wastewater,
W74-06509 5D

Technical and Economic Evaluation of Cooling System Blowdown Control Techniques,
W74-06510 5D

Packinghouse Waste Treatment.
W74-06511 5D

An Appraisal of Neutralization Processes to Treat Coal Mine Drainage.
W74-06512 5D

Treatment of Domestic Wastewater and NSSC Pulp and Paper Mill Wastes.
W74-06513 5D

Recovery of Fatty Materials from Edible Oil Refinery Effluents,
W74-06514 5D

A Design and Economic Evaluation of Catalytic Oxidation of Phenols in Wastewater.
W74-06516 5D

Demonstration of a Non-Aqueous Sewage Disposal System,
W74-06519 5D

Coliform Bacteria Growth and Control in Aerated Stabilization Basins.
W74-06520 5D

Color Removal from Kraft Mill Effluents by Ultrafiltration,
W74-06521 5D

Investigation of Treating Electroplaters Cyanide Waste by Electrodialysis,
W74-06522 5D

Tertiary Treatment with a Controlled Ecological System.
W74-06524 5D

Emergency Planning for Municipal Wastewater Treatment Facilities,
W74-06577 5D

Start-Up of Municipal Wastewater Treatment Facilities,
W74-06578 5D

Nitrogen Elimination by Bogus Alternation of Aerobic/'Anoxic' Conditions in 'Orbal' Activated Sludge Plants,
W74-06605 5D

Efficient Pricing for Urban Waste Water Renovation,
W74-06828 5D

Quality Improvement of Feedlot Lagoon Water by Percolation Through Soil Under Native Pasture,
W74-06830 5D

The Selective Removal of Nitrate and Nitrite from Polluted Water,
W74-06833 5G

Ammonia-Nitrogen Removal by Breakpoint Chlorination,
W74-06838 5D

Activated Sludge Treatment Systems with Oxygen,
W74-06839 5D

Laboratory Ozonation of Muncipal Wastewaters,
W74-06840 5D

Nitrogen Removal by Ammonia Stripping,
W74-06842 5D

Biological Treatment of Feedlot Runoff,
W74-06847 5D

Production Function Theory and the Optimal Design of Waste Treatment Facilities,
W74-06997 6D

ıvestigation of Brewing Water Treatment,
/74-07023 5A

STES
ewage Collection Facilities.
/74-06980 6E

STEWATER TREATMENT
laintenance Management Systems for Mu-
icipal Wastewater Facilities,
/74-06579 5D

TER ANALYSIS
hosphorimetric Determination of Traces of
oron,
/74-06755 5A

Universal Ion-Selective Electrode Based on
raphite Paste,
/74-06758 2K

electrode - the Universal Ion-Selective Elec-
rode. Part VI. The Calcium (II) Selectrode Em-
loying a New Ion Exchanger in a Nonporous
lembrane and a Solid-State Reference
ystem,
/74-06764 5A

Selectrode - the Universal Ion-Selective Elec-
rode. Part VII. A Valinomycin-Based Potassi-
m Electrode with Nonporous Polymer Mem-
rane and Solid-State Inner Reference System,
/74-06765 5A

Evaluation of a Microwave-Induced Plasma
Spectrometer for Trace Analysis,
/74-06841 5A

Radiation Data, Section II. Water).
/74-06856 5A

ATER BALANCE MODELS
Evaluation of Influence of Available Soil Water
Storage Capacity on Growing Season Length
and Yield of Tropical Pastures Using Simple
Water Balance Models,
W74-06927 3F

ATER BIRDS
Geography of Waterfowl Resources of the
Soviet Union. Condition of Reserves.
W74-06559 6B

ATER CHEMISTRY
Changes in Water Chemistry Accompanying
Summer Fish Kills in Shallow Eutrophic Lakes
of Southwest Manitoba,
W74-06541 5C

Nitrogen Mineralization-Water Relations in
Soils,
W74-06897 5B

Buffer Intensities and Equilibrium pH of
Minerals and Soils: 1. The Contribution of
Minerals and Aqueous Carbonate to pH Buffer-
ing,
W74-06904 2G

Buffer Intensities and Equilibrium pH of
Minerals and Soils: II. Theoretical and Actual
pH of Minerals and Soils,
W74-06905 2G

Transformation of Iron in a Waterlogged Soil
as Influenced by Redox Potential and pH,
W74-06934 5B

Thermodynamics of Ion Exchange,
W74-06936 2G

WATER CONSERVATION
Soil and Water Losses as Affected by Tillage
Practices,
W74-06595 3F

WATER DEMAND
Water Supply Management Alternatives for
Rhode Island,
W74-06827 6D

Exploring Energy Choices.
W74-06879 6D

WATER FLOW
Influence of Some Hydrological Parameters on
Changes in the Radioactivity of the Waters of
the Rivers Czarna Przemsza and Przemsza,
W74-07019 5B

WATER HYACINTH
Processing, Chemical Composition and Nutri-
tive Value of Aquatic Weeds,
W74-06502 4A

WATER LAW
A Chart of New York Water Law,
W74-06614 6E

Industrial Development--Pollution.
W74-06976 6E

WATER LEVEL FLUCTUATIONS
Walden's Way Revealed,
W74-06925 2H

Eight Years of Observations on the Water
Level at Quebec and Grondines 1962-1969: Part
I--Analysis of the Tidal Signal,
W74-06926 2E

WATER MANAGEMENT (APPLIED)
Bibliography of Water Management.
W74-06854 3F

WATER POLICY
Techniques for Identifying and Evaluating Mar-
ket and Nonmarket Benefits and Costs of
Water Resource Systems.
W74-06852 6B

WATER POLLUTION
Water Quality Control,
W74-06603 5G

The Effect of Pollution on the Vaal River Bar-
rage and the Quest for Water Quality,
W74-06607 5B

Factors in the Transformation of Mercury to
Methylmercury,
W74-06794 5B

Stream Pollution and a Simplified Diversity
Index,
W74-06876 5A

Exploring Energy Choices.
W74-06879 6D

Will Municipal Sewage Continue to Threaten
Primary Water-Contact Recreation: An Ap-
praisal of the 1972 Water Pollution Control Act,
W74-06969 5G

Industrial Development--Pollution.
W74-06976 6E

Cleaning Agents.
W74-06977 6E

Water Pollution--Summer Intern Program.
W74-06982 6E

Water Pollution and Biology, (In Polish),
W74-07020 5B

WATER POLLUTION ABATEMENT
Industrial Development--Pollution.
W74-06976 6E

WATER POLLUTION CONTROL
Co-operation for Water Protection: Eutrophica-
tion Control,
W74-06543 5C

Freshwater Biology and Pollution Ecology:
Training Manual.
W74-06558 5A

Emergency Planning for Municipal Wastewater
Treatment Facilities,
W74-06577 5D

The Effect of Pollution on the Vaal River Bar-
rage and the Quest for Water Quality,
W74-06607 5B

Basic Research in the Aquatic Environment:
Effects of Eutrophication on Phytoplankton
Populations and Selected Species of Aquatic
Vascular Plants,
W74-06835 5C

Quantitative Methods for Preliminary Design of
Water Quality Surveillance Systems,
W74-06885 5A

Procedings Ninth Biennial Conference on
Ground Water.
W74-06942 5B

Protecting Ground Water Quality--Some
Problems and Solutions,
W74-06946 5B

The Federal Role and Legislative Trends in
Control of Ground Water Quality,
W74-06952 5G

Current State Board Activities in Ground
Water Quality Management,
W74-06953 5G

Impact of Water Pollution Control Legislation
on Meeting Future Water Needs in California,
W74-06954 5G

Ground Water Pollution--From the Waste
Discharger's Viewpoint,
W74-06955 5G

Environmental Quality: As an Objective of
Ground Water Management,
W74-06956 5B

Powers of the Water Pollution Control Board:
Powers of Director of Environmental Protec-
tion.
W74-06975 6E

Industrial Development--Pollution.
W74-06976 6E

Sewer Construction.
W74-06978 6E

Sewage Treatment Facilities, State Grants.
W74-06979 6E

WATER POLLUTION EFFECTS
Oxidation of Organic Matter in Sediments,
W74-06528 5C

Survival in Maturation Ponds of Coliform Bac-
teria With Transferable Drug Resistance,
W74-06748 5C

WATER POLLUTION EFFECTS

Basic Research in the Aquatic Environment: Effects of Eutrophication on Phytoplankton Populations and Selected Species of Aquatic Vascular Plants,
W74-06835 5C

The Effects of Waste Disposal in the New York Bight. Section 3: Zooplankton Studies.
W74-06866 5C

The Effects of Waste Disposal in the New York Bight. Section 5: Chemical Studies.
W74-06867 5C

The Effects of Waste Disposal in the New York Bight. Sections 7, 8, and 9.
W74-06868 5C

WATER POLLUTION SOURCES

Mercury in the Environment,
W74-06523 5B

The Effect of Pollution on the Vaal River Barrage and the Quest for Water Quality,
W74-06607 5B

Unrecorded Pollution and Dynamics of Biochemical Oxygen Demand,
W74-06613 5B

Sources of Mercury in the Environment,
W74-06771 5B

The Mercury Pollution Problem in Michigan,
W74-06773 5B

Mercury in Fish in the Great Lakes,
W74-06774 5B

Aerial Radiological Measuring Survey of the Fort Calhoun Station, Fort Calhoun, Nebraska, August 9-10, 1972.
W74-06815 5A

Aerial Radiological Measuring Survey of the Area Surrounding the Palisades Plant, South Haven, Michigan, July 29, 1970.
W74-06816 5A

The EXREM III Computer Code for Estimating External Radiation Doses to Populations from Environmental Releases,
W74-06818 5B

241-T-106 Tank Leak Investigation.
W74-06861 5B

Distribution of Metals in Baltimore Harbor Sediments,
W74-06924 5B

Ground Water Pollution from Subsurface Excavations: Part II--Pollution from Wells.
W74-06933 5B

Effects of Solid Waste Disposal on Ground Water Quality,
W74-06949 5B

Sludge Disposal to Land,
W74-06950 5B

Agricultural Wastes and Ground Water Quality,
W74-06951 5B

WATER QUALITY

Survey of Reservoirs in Bohemia and Their Water Quality,
W74-06537 5C

An Ecological Account of the Past and Future of South African Rivers,
W74-06606 5C

Stormwater Runoff Quality for Urban and Semi-Urban/Rural Watersheds,
W74-06851 5B

Ground-Water Hydrology of Northern Napa Valley, California,
W74-06880 2F

Materials Input of Lake Champlain: A Synoptic Appraisal,
W74-06882 2H

Quantitative Methods for Preliminary Design of Water Quality Surveillance Systems,
W74-06885 5A

Wando River Environmental Quality Studies, An Interim Report.
W74-06919 5B

Ground Water Quality Models: What They Can and Cannot Do,
W74-06944 5B

Ground Water Quality Data for Planning, Monitoring and Surveillance,
W74-06947 5A

Effects of Sewage Disposal and Reclamation on Ground Water Quality,
W74-06948 5D

Quality of Ground Water in the Lower Colorado River Region, Arizona, Nevada, New Mexico, and Utah,
W74-06960 7C

WATER QUALITY CONTROL

Water Quality Control,
W74-06603 5G

Modeling and Optimization of Transient Cooling Water Discharge from Power Generating Plants,
W74-06832 5B

WATER QUALITY MODELS

Unrecorded Pollution and Dynamics of Biochemical Oxygen Demand,
W74-06613 5B

Ground Water Quality Models: What They Can and Cannot Do,
W74-06944 5B

WATER QUALITY STANDARDS

Chemical Aspects of Bioassay Techniques for Establishing Water Quality Criteria,
W74-06747 5A

WATER RESOURCES

Exploring Energy Choices.
W74-06879 6D

An Expanding Role for Subarctic Watershed Research,
W74-06884 4D

Hydrology and Water Resources of the Hoosic River Basin, Massachusetts,
W74-06958 7C

Water Resources of Northwestern Missouri,
W74-06961 7C

Division of Water: Powers and Duties.
W74-06974 6E

WATER RESOURCES DEVELOPMENT

Intergovernmental Relations as seen by Florida State Legislators: Land Use and Water Resource Problems,
W74-06845 6B

Area Financing of Water Resource Development in West Minnesota,
W74-06846 6B

Procedings Ninth Biennial Conference on Ground Water
W74-06942 5B

Three-Year Evolution,
W74-06970 6G

WATER RESOURCES INSTITUTE

Ninth Annual Report of the Oklahoma Water Resources Research Institute, Fiscal Year 1974
W74-06515 9A

Annual Report, FY 1973
W74-06617 9A

WATER RESOURCES RESEARCH ACT

Annual Report, FY 1973.
W74-06617 9A

WATER REUSE

Demonstration of a Non-Aqueous Sewage Disposal System,
W74-06519 5D

Color Removal from Kraft Mill Effluents by Ultrafiltration,
W74-06521 5D

Ecological and Physiological Implications of Greenbelt Irrigation,
W74-06608 5D

Quality Improvement of Feedlot Lagoon Water by Percolation Through Soil Under Native Pasture,
W74-06830 5D

Effects of Sewage Disposal and Reclamation on Ground Water Quality,
W74-06948 5D

WATER RIGHTS

A Chart of New York Water Law,
W74-06614 6E

WATER SUPPLY

Network Analysis of Conjunctively Operated Ground Water-Surface Water Systems,
W74-06504 4B

Water Supply Management Alternatives for Rhode Island,
W74-06827 6D

WATER TABLE

On the Solution of Transient Free-Surface Flow Problems in Porous Media by the Finite Element Method,
W74-06890 2F

WATER TEMPERATURE

Temperature Control of Reproduction and Productivity in a Subarctic Coralline Alga,
W74-06751 5C

Stream Temperatures in Washington State,
W74-06962 7C

WATER TREATMENT

Information Resource: Final Report Water Pollution Control in Water Utilities,
W74-06527 5F

WATER UTILITY SLUDGE

Information Resource: Final Report Water Pollution Control in Water Utilities,
W74-06527 5F

WATER VAPOR
Computed Atmospheric Effects on ERTS Observations,
W74-06694 2B

WATER WELLS
Hydrologic Data from the Piceance Basin, Colorado.
W74-06714 4B

Ground Water Pollution from Subsurface Excavations: Part II--Pollution from Wells.
W74-06933 5B

Protecting Ground Water Quality--Some Problems and Solutions,
W74-06946 5B

WATERFOWL
Mercury in Wild Animals, Lake St. Clair, 1970,
W74-06776 5B

WATERSHED MANAGEMENT
Hurricane Creek Watershed Project, Humphreys and Dickson Counties, Tennessee (Final Environmental Impact Statement).
W74-06988 4D

Nutwood Watershed, Illinois (Final Environmental Statement).
W74-06990 4A

WATERSHED PROTECTION AND FLOOD PREVENTION ACT
Hurricane Creek Watershed Project, Humphreys and Dickson Counties, Tennessee (Final Environmental Impact Statement).
W74-06988 4D

WATERSHEDS (BASINS)
The Occurrence of Mercury in the Environment and Man, Discussion Paper,
W74-06784 5B

The Runoff of Water and Nutrients from Watersheds Tributary to Cayuga Lake, New York,
W74-06848 5B

Nutwood Watershed, Illinois (Final Environmental Statement).
W74-06990 4A

WEATHER DATA
Automatic Processing of Rainfall Data,
W74-06732 2B

WEATHER MODIFICATION
University of Chicago Contribution to Project Metromex-I.
W74-06937 2B

Radar Studies of Urban Precipitation Anomaly,
W74-06938 2B

Observations of the Cloud Nucleus Concentration Around the St. Louis Urban Complex,
W74-06939 2B

Upwind and Downwind Cloud-Base Microstructure,
W74-06940 2B

Metromex Temperature and Aerosol Data Reduction: Analysis of the Urban Anomaly,
W74-06941 2B

WEATHERING
Buffer Intensities and Equilibrium pH of Minerals and Soils: 1. The Contribution of Minerals and Aqueous Carbonate to pH Buffering,
W74-06904 2G

Buffer Intensities and Equilibrium pH of Minerals and Soils: II. Theoretical and Actual pH of Minerals and Soils,
W74-06905 2G

WEST LAFAYETTE (IND)
Stormwater Runoff Quality for Urban and Semi-Urban/Rural Watersheds,
W74-06851 5B

WEST VIRGINIA
Micro-Ecosystems Simulation of Primary Production in Thermal and Acid Mine Water Loadings Related to Water Use of the Monongahela River,
W74-06507 5C

WETLANDS
The Use of ERTS-1 Data for the Inventory of Critical Land Resources for Regional Land Use Planning,
W74-06634 4A

Applicability of ERTS-1 Imagery to the Study of Suspended Sediment and Aquatic Fronts,
W74-06666 2L

The Present and Future Status of Eastern North Carolina Wetlands,
W74-06850 2L

Coastal Wetlands in New England,
W74-06967 5G

WETLANDS PROTECTION
The Present and Future Status of Eastern North Carolina Wetlands,
W74-06850 2L

WHEAT
Wheat and Grain Sorghum Irrigation in a Wide Bed-Furrow System,
W74-06580 3F

WHEAT (SPRING)
Baking Quality of Spring Wheat as Affected by Rain During Drying After Reaping (In Polish),
W74-06548 3F

WHEAT YIELDS
Estimates of Prairie Provincial Wheat Yields Based on Precipitation and Potential Evapotranspiration,
W74-07027 3F

WIND EROSION
An Isokinetic Sampler for Wind Erosible Silt and Clay Particle Measurement,
W74-06902 2J

WINNIPESAUKEE LAKE (N
Phytoplankton Populations in Relation to Different Trophic Levels at Winnipesaukee Lake, New Hampshire, U.S.A.,
W74-06529 5C

WISCONSIN
The Use of ERTS-1 Data for the Inventory of Critical Land Resources for Regional Land Use Planning,
W74-06634 4A

Mercury Contents of Bottom Sediments from Wisconsin Rivers and Lakes,
W74-06777 5B

Mercury Levels in Wisconsin Fish,
W74-06778 5B

WYOMING
Remote Sensing Applied to Land-Use Studies in Wyoming,
W74-06631 4A

XENON
1972 Operation of the ICPP Rare Gas Recovery Facility,
W74-06822 5D

YAMADAPHYCUS CARNOSUS
Yamadaphycus, a New Genus of the Delesseriaceae (Rhodophyta),
W74-06753 5A

YELLOWSTONE NATIONAL PARK
Terrain Classification Maps of Yellowstone National Park,
W74-06645 4A

ZINC
Semimicrodetermination of Mercury(II) and Zinc(II) by Precipitation from Homogeneous Solution, Using Cation Generation Technique,
W74-06869 5A

ZOOPLANKTON
Annual Cycle of Zooplankton in Backwaters of the Flood Area of the Dyje,
W74-06536 5C

The Effects of Waste Disposal in the New York Bight. Section 3: Zooplankton Studies.
W74-06866 5C

The Effects of Waste Disposal in the New York Bight. Section 5: Chemical Studies.
W74-06867 5C

ZOOPLANKTON (LIMNETIC)
Effects of Alewives (Alosa pseudoharengus) on the Zooplankton of Lake Wononskopomus, Connecticut,
W74-07033 2H

AUTHOR INDEX

ABNERT, B.
U.S. Deepwater Port Study, Vol. 2. Commodity Studies and Projections,
W74-06863 6D

U.S. Deepwater Port Study, Vol 3. Physical Coast and Port Characteristics, and Selected Deepwater Port Alternatives,
W74-06864 6D

ACKLEY, S.
Mesoscale Strain Measurements on the Beaufort Sea Pack Ice,
W74-06717 2C

Structure of a Multiyear Pressure Ridge,
W74-06718 2C

ACKLEY, S. F.
Data on Morphological and Physical Characteristics of Sea Ice in the Beaufort Sea,
W74-06721 2C

Investigations Performed on the Arctic Ice Dynamics Joint Experiment, March 1971,
W74-06716 2C

Top and Bottom Roughness of a Multiyear Ice Floe,
W74-06719 2C

ADAMI, L.
Computer Monitoring of Precipitation in Hungary,
W74-06726 2B

ADAMS, J. E.
Field Measurement of Evaporation from Soil Shrinkage Cracks,
W74-06900 2D

ADAMS, W. J.
Survival and Reproduction of Ring-Necked Pheasants Consuming Two Mercurial Fungicides,
W74-06808 5C

ADEY, W. H.
Temperature Control of Reproduction and Productivity in a Subarctic Coralline Alga,
W74-06751 5C

AHMAD, M. U.
Mapping of Spoil Banks Using ERTS-1 Pictures,
W74-06695 5A

AITKEN, A. P.
Assessing Systematic Errors in Rainfall-Runoff Models,
W74-06893 2A

ALABASTER, J. S.
Oxygen in Estuaries: Requirements for Fisheries,
W74-06542 5C

ALBERTYN, J.
Method of Preparing Washed Suspensions of Anaerobic Bacteria for Metabolic Studies,
W74-06875 5A

ALEXANDER, R. H.
ERTS Regional-Scale Overview Linking Land Use and Environmental Processes in Carets,
W74-06626 4A

Land Use Classification and Change Analysis Using ERTS-1 Imagery in Carets,
W74-06625 4A

ALGAZI, V. R.
Digital Enhancement of Multispectral MSS Data for Maximum Image Visibility,
W74-06654 7C

ALLEN, R. R.
Wheat and Grain Sorghum Irrigation in a Wide Bed-Furrow System,
W74-06580 3F

ALYEA, F. N.
Analysis of the Feasibility of an Experiment to Measure Carbon Monoxide in the Atmosphere,
W74-06917 5A

AMAR, A. C.
Ground-Water Recharge Strip Basin-Experiments,
W74-06740 4B

AMBRASHKA, K. A.
Effect of Sodium-Potassium Chloride Mineral Water from the Splais Spring (Druskininkai Health Resort) on the Pseudocholinesterase Activity of Blood Serum and Protein-Synthesizing Function of the Liver in Experimental Acute Toxic Hepatitis, (In Russian),
W74-07005 5C

ANCAJAS, R. R.
Nitrogen-Fixing Activity in Upland and Flooded Rice Fields,
W74-07024 5B

ANDERSON, A. C.
Significant Techniques in the Processing and Interpretation of ERTS-1 Data,
W74-06652 7C

ANDERSON, D. M.
Sediment Distribution and Coastal Processes in Cook Inlet, Alaska,
W74-06671 2L

ANTALOVICH, J. W.
Mapping of Spoil Banks Using ERTS-1 Pictures,
W74-06695 5A

ANTONIK, B.
Automatic Check and Correction of Meteorological Data in East Germany,
W74-06725 2B

APOSTOLOV, S.
Production and Biogenic Activity of Distillates, Filtrates and Extracts from the Pomorie and Atanasovo Lagoon Mud, (In Bulgarian),
W74-07003 2H

APPLEGATE, D. N.
Investigations of an Urban Area and its Locale Using ERTS-1 Data Supported by U-Photography,
W74-06635 4A

The Use of the Temporal Dimension in Classifying and Mapping ERTS-1 Mss Data,
W74-06641 4A

ARAI, S.
Qualitative Requirements of Young Eels Anguilla japonica for Water-Soluble Vitamins and Their Deficiency Symptoms,
W74-07006 5C

ARCHIBALD, P. A.
The Genus Neochloris Starr (Chlorophyceae, Chlorococcales),
W74-06760 5A

ARKIN, G. F.
An Isokinetic Sampler for Wind Erosible Silt and Clay Particle Measurement,
W74-06902 2J

ARMIJO, J. D.
A Large Undisturbed, Weighing Lysimeter for Grassland Studies,
W74-06581 2G

ARMITAGE, K. B.
Energetics of Daphnia Ambigua,
W74-06831 5C

ASH, C. G.
Three-Year Evolution,
W74-06970 6G

AUERBACH, S. I.
Environmental Sciences Division Annual Progress Report for Period Ending September 30, 1973,
W74-06826 5B

AVASTHI, P. K.
Electro-Osmotic Effects in a Bentonite-Water System,
W74-06910 2K

AYERS, R. S.
Agricultural Wastes and Ground Water Quality,
W74-06951 5B

BACKHAUS, D.
Benthic Algae in Water of the Neouvielle Massif (Hautes-Pyrenees),
W74-07013 2H

BAGNALL, L. O.
Processing, Chemical Composition and Nutritive Value of Aquatic Weeds,
W74-06502 4A

BAILS, J.
The Occurrence of Mercury in the Environment and Man, Discussion Paper,
W74-06784 5B

BAILS, J. D.
Mercury in Fish in the Great Lakes,
W74-06774 5B

BAKACS, T.
Urbanization and Human Health,
W74-07017 5G

BAKER, E. T. JR.
Effects of Ground-Water Development on the Proposed Palmetto Bend Dam and Reservoir in Southeast Texas,
W74-06920 4B

BAKSHI, K.
Semimicrodetermination of Mercury(II) and Zinc(II) by Precipitation from Homogeneous Solution, Using Cation Generation Technique,
W74-06869 5A

BALE, J. B.
Land Use in Northern Coachella Valley,
W74-06624 4A

BARATZ, D.
Technical and Economic Evaluation of Cooling System Blowdown Control Techniques,
W74-06510 5D

BARICA, J.
Changes in Water Chemistry Accompanying Summer Fish Kills in Shallow Eutrophic Lakes of Southwest Manitoba,
W74-06541 5C

BARKS, J. H.
Water Resources of Northwestern Missouri,
W74-06961 7C

BARNES, H.
Geologic and Hydrologic Background for Selecting Site of Pilot-Plant Repository for Radioactive Waste,
W74-06820 5B

BARNES, J. C.
Use of ERTS Data for Mapping Arctic Sea Ice,
W74-06676 2C

BARNES, P. W.
New Insights into the Influence of Ice on the Coastal Marine Environment of the Beaufort Sea, Alaska,
W74-06669 2C

BARRETT, M. J.
Utilization of Oxygen in Estuaries,
W74-06540 5C

BASSETT, D. L.
Mathematical Model of Water Advance in Border Irrigation,
W74-06582 3F

BECKERS, C. V.
Quantitative Methods for Preliminary Design of Water Quality Surveillance Systems,
W74-06885 5A

BELILOVSKIY, E. L.
Degree of Local Saturation of a Flow by Suspended Matter and Its Relation to the Volume Concentration,
W74-06913 8B

BELL, J. M.
Stormwater Runoff Quality for Urban and Semi-Urban/Rural Watersheds,
W74-06851 5B

BELON, A. E.
A Multidisciplinary Survey for the Management of Alaskan Resources Utilizing ERTS Imagery,
W74-06633 4A

BENDIXSEN, C. L.
1972 Operation of the ICPP Rare Gas Recovery Facility,
W74-06822 5D

BENEDICT, H. M.
Analytical Methodology for Mercury-Discussion Paper,
W74-06793 5A

BENIGNO, J. A.
Relationships Between Remotely Sensed Fisheries Distribution Information and Selected Oceanographic Parameters in the Mississippi Sound,
W74-06708 7B

BENSON, C. S.
Snow Cover Surveys in Alaska From ERTS-1 Data,
W74-06697 2C

BERG, D. W.
Application of ERTS-1 Imagery in Coastal Studies,
W74-06709 2L

BERLIN, I. A.
Automatic Method of Monitoring the Quality of Mean Monthly Meteorological Data,
W74-06728 2B

BERNSTEIN, R.
Results of Precision Processing (Scene Correction) of ERTS-1 Images Using Digital Image Processing Techniques,
W74-06651 7C

BESCH, W. K.
Benthic Algae in Water of the Neouvielle Massif (Hautes-Pyrenees),
W74-07013 2H

BESPALOV, D. P.
Automatic Method of Monitoring the Quality of Mean Monthly Meteorological Data,
W74-06728 2B

BHAGWAT, A.
Oxidation of Organic Matter in Sediments,
W74-06528 5C

BHARGAVA, T. N.
Some Aspects of Phosphorus Dynamics of the Twin Lakes Watershed,
W74-06565 5C

BIERMAN, V. J. JR.
Multi-Nutrient Dynamic Models of Algal Growth and Species Competition in Eutrophic Lakes,
W74-06568 5C

BILLINGSLEY, F. C.
Computer Techniques Used for Some Enhancements of ERTS Images,
W74-06653 7C

BIRMAN, B. A.
Some Principles of Objective Control of Marine Meteorological Information,
W74-06731 2B

BISHOP, A. B.
Activity Analysis and the Management of Resources: A Model for Control of Eutrophication,
W74-06574 5C

BISHOP, D. F.
Activated Sludge Treatment Systems with Oxygen,
W74-06839 5D

Ammonia-Nitrogen Removal by Breakpoint Chlorination,
W74-06838 5D

Laboratory Ozonation of Muncipal Wastewaters,
W74-06840 5D

Nitrogen Removal by Ammonia Stripping,
W74-06842 5D

Physical-Chemical Treatment of Raw Municipal Wastewater,
W74-06509 5D

BISHOP, J. N.
Analytical Methodology for Mercury-Discussion Paper,
W74-06793 5A

BISQUE, R. E.
Distribution of Mercury in Residual Soils,
W74-06797 5B

BLACK, R. J.
A Multichannel Syringe Pump for Steady State Flow in Soil Columns,
W74-07028 2G

BLAKE, G. R.
Mineral Nitrogen Movement into Subsoils Following Continued Annual Fertilization for Corn,
W74-06898 5B

BLOOMFIELD, J. A.
Aquatic Modeling in the Eastern Deciduous Forest Biome, U S -International Biological Program,
W74-06572 5C

BOBBITT, J. M.
A Universal Ion-Selective Electrode Based on Graphite Paste,
W74-06758 2K

BOBEE, B.
Determination of the Confidence Intervals of the Pearson III Law Using Order Statistics (Determination des intervalles de confiance de la loi Pearson III par les statistiques d'ordre),
W74-06906 2E

BOCK, B. R.
Quality Improvement of Feedlot Lagoon Water by Percolation Through Soil Under Native Pasture,
W74-06830 5D

BOHN, H. L.
Nitric Oxide Sorption by Calcareous Soils: II. Effect of Moisture on Capacity, Rate, and Sorption Products,
W74-06894 5B

BOIES, D. B.
Technical and Economic Evaluation of Cooling System Blowdown Control Techniques,
W74-06510 5D

BOLLING, N.
Investigations of an Urban Area and its Locale Using ERTS-1 Data Supported by U-Photography,
W74-06635 4A

BOLTON, W. R.
Buffer Capacity in Aquatic Ecosystems,
W74-06829 5B

BOND, J. J.
Deep Plowing and Chemical Amendment Effect on a Sodic Claypan Soil,
W74-06598 3F

BORDEN, F. Y.
Classification of ERTS-1 MSS Data by Canonical Analysis,
W74-06662 7C

Identification and Mapping of Coal Refuse Banks and Other Targets in the Anthracite Region,
W74-06642 4A

Investigations of an Urban Area and its Locale Using ERTS-1 Data Supported by U-Photography,
W74-06635 4A

The Use of the Temporal Dimension in Classifying and Mapping ERTS-1 Mss Data,
W74-06641 4A

BORTNER, M. H.
Analysis of the Feasibility of an Experiment to Measure Carbon Monoxide in the Atmosphere,
W74-06917 5A

BOUMA, J.
A Comparison of Hydraulic Conductivities Calculated with Morphometric and Physical Methods,
W74-06899 2G

BOWDEN, L. W.
Assessment of Southern California Environment From ERTS-1,
W74-06685 4A

Land Use in Northern Coachella Valley,
W74-06624 4A

BOWKER, D. E.
Correlation of ERTS Multispectral Imagery with Suspended Matter and Chlorophyll in Lower Chesapeake Bay,
W74-06667 2L

BOWLEY, C. J.
Use of ERTS Data for Mapping Arctic Sea Ice,
W74-06676 2C

BRACH, E. J.
Cancellation of Spectrophotometer System Characteristics Using an Analog Computer,
W74-06874 2K

BRAKEL, W. H.
Stream Pollution and a Simplified Diversity Index,
W74-06876 5A

BRECKENRIDGE, R. M.
Remote Sensing Applied to Land-Use Studies in Wyoming,
W74-06631 4A

BREUER, F.
Behavior of Radioiodine in the Environment and in Man,
W74-06862 5B

BRITZ, S. J.
Endogenous and Photoperiodic Diurnal Rhythms of in Vivo Light Absorption and Scattering in the Green Alga Ulva Lactuca L.,
W74-06547 5C

BROCK, R. R.
Ground-Water Recharge Strip Basin-Experiments,
W74-06740 4B

BROWN, D.
ERTS-1 Applications to Minnesota Land Use Mapping,
W74-06632 4A

BRUCH, J. C. JR.
Solution of Equation for Vertical Unsaturated Flow of Soil Water,
W74-06736 2G

BUGLIARI, J. B.
A Chart of New York Water Law,
W74-06614 6E

BULL, C.
Analysis of the Concentration of Microparticles in the Long Ice Core from Byrd Station,
W74-06931 2C

BULTOT, F.
The Evaporation from a Water Pan--Its Limited Significance (L'evaporation d'un bac d'eau libre--sa signification restreinte),
W74-06908 2D

BURBANK, D. C.
ERTS-1 Observations of Sea Surface Circulation and Sediment Transport, Cook Inlet, Alaska,
W74-06670 2L

BURCH, L. A.
Effects of Solid Waste Disposal on Ground Water Quality,
W74-06949 5B

BURMAN, R. D.
A Large Undisturbed, Weighing Lysimeter for Grassland Studies,
W74-06581 2G

BURNS, C. A.
Analytical Methodology for Mercury-Discussion Paper,
W74-06793 5A

BUTCHER, R. D.
Conservationists Go to Court--Part 1,
W74-06971 4D

CALDERON, G.
Oceanographic Mapping of Structure and Dynamics of the Northern Gulf of California by the Use of Spectral Modeling and ERTS-1,
W74-06673 2L

CAMPBELL, W. J.
Mesoscale Strain Measurements on the Beaufort Sea Pack Ice,
W74-06717 2C

CANNEY, P. J.
New Methods of Nitrite and Nitrate Analysis for Natural Waters,
W74-06836 5A

CAPBLANQ, J.
Benthic Algae in Water of the Neouvielle Massif (Hautes-Pyrenees),
W74-07013 2H

CARDIN, J. A.
Using Artemia to Assay Oil Dispersant Toxicities,
W74-06877 5A

CARSON, R. J.
Multidisciplinary Application of ERTS-1 Data to North Carolina Natural Resource Management,
W74-06682 4C

CASSEL, A. F.
Ammonia-Nitrogen Removal by Breakpoint Chlorination,
W74-06838 5D

Nitrogen Removal by Ammonia Stripping,
W74-06842 5D

Physical-Chemical Treatment of Raw Municipal Wastewater,
W74-06509 5D

CASSEL, D. K.
Solute Movement Through Disturbed and Undisturbed Soil Cores,
W74-06935 5B

CASSINIS, R.
A Preliminary Evaluation of ERTS-1 Images on the Volcanic Areas of Southern Italy (NASA Contract FO-013),
W74-06691 7C

CEHAK, K.
On Flood Probabilities of East Alpine Rivers,
W74-06909 2E

CHAFFIN, D. B.
Surface Electromyography in Chronic Inorganic Mercury Intoxication,
W74-06801 5C

CHAMBERLAIN, S. G.
Quantitative Methods for Preliminary Design of Water Quality Surveillance Systems,
W74-06885 5A

CHANG, Y. C.
Mathematical Model for Barged Ocean Disposal of Wastes,
W74-06837 5B

CHASE, P. E.
Utilization of ERTS-1 Data to Monitor and Classify Eutrophication of Inland Lakes,
W74-06698 5A

CHEFRANOVA, YU. A.
Search for a Method for Sanitizing Sewage from Helminth Eggs Using Agrochemical Means. (Preliminary Communication), (In Russian),
W74-07018 5D

CHENG, R. T-S.
On the Solution of Transient Free-Surface Flow Problems in Porous Media by the Finite Element Method,
W74-06890 2F

CHENIAE, G. M.
Absence of Oxygen-Evolving Capacity in Dark-Grown Chlorella: The Photoactivation of Oxygen-Evolving Centers,
W74-06544 5C

CHESNUTWOOD, C. M.
A Comparison of Land-Use Determinations Using Data from ERTS-1 and High Altitude Aircraft,
W74-06638 4A

CHEVEY, P.
U.S. Deepwater Port Study, Vol. 2. Commodity Studies and Projections,
W74-06863 6D

U.S. Deepwater Port Study, Vol 3. Physical Coast and Port Characteristics, and Selected Deepwater Port Alternatives,
W74-06864 6D

CHILTON, R.
The Role of Dew in the Seasonal Moisture Balance of a Summer-Dry Climate,
W74-07037 2B

CHIU, K-C.
Digital Control Algorithms. Part III. Tuning PI and PID Controllers,
W74-06750 7C

CHOW, V. T.
Application of DDDP in Water Resources Planning,
W74-06503 6A

CHRISTENSEN, B. A.
A Physical Model for Prediction and Control of Saltwater Intrusion in the Floridan Aquifer,
W74-06609 2F

CHU, S. T.
Hydraulics of a Center Pivot System,
W74-06583 3F

CHUTTER, F. M.
An Ecological Account of the Past and Future of South African Rivers,
W74-06606 5C

CIRELLO, J.
Unrecorded Pollution and Dynamics of Biochemical Oxygen Demand,
W74-06613 5B

CLANTON, D. C.
Pasture Irrigation with a Center-Pivot Sprinkler System,
W74-06601 3F

CLAPP, J. L.
The Use of ERTS-1 Data for the Inventory of Critical Land Resources for Regional Land Use Planning,
W74-06634 4A

CLARK, B. D.
The Federal Role and Legislative Trends in Control of Ground Water Quality,
W74-06952 5G

CLARKSON, T. W.
Biological Effects of Mercury Compounds, Discussion Paper,
W74-06814 5C

Biotransformation of Organo-Mercurials in Mammals,
W74-06802 5C

Environmental Dynamics of Mercury: Discussion Paper,
W74-06799 5B

The Occurrence of Mercury in the Environment and Man, Discussion Paper,
W74-06784 5B

CLINGENPEEL, W. H.
Maintenance Management Systems for Municipal Wastewater Facilities,
W74-06579 5D

COBLE, A. J.
Environmental Dynamics of Mercury: Discussion Paper,
W74-06799 5B

COKER, A. E.
Detection of Turbidity Dynamics in Tampa Bay, Florida Using Multispectral Imagery from ERTS-1,
W74-06711 2L

COLARUOTOLO, J. F.
A Universal Ion-Selective Electrode Based on Graphite Paste,
W74-06758 2K

COLLINGS, M. R.
Stream Temperatures in Washington State,
W74-06962 7C

COLLINS, H. F.
Effects of Sewage Disposal and Reclamation on Ground Water Quality,
W74-06948 5D

COLVOCORESSES, A. P.
Progress in Cartography, Eros Program,
W74-06621 7C

Unique Characteristics of ERTS,
W74-06689 7B

COLWICK, R. F.
A Simulated Environmental Model of Temperature, Evaporation, Rainfall, and Soil Moisture,
W74-06591 3F

CONROD, A. C.
Digital Data Processing of ERTS-1 Imagery of Delaware Bay,
W74-06703 2L

COOKE, G. D.
Some Aspects of Phosphorus Dynamics of the Twin Lakes Watershed,
W74-06565 5C

COONEY, J. J.
Oxidation of n-Alkanes by Cladosporium resinae,
W74-06763 5C

COPELAND, R. A.
Determination of Mercury by Non-Destructive Neutron Activation Analysis,
W74-06789 5A

Mercury in the Lake Michigan Environment,
W74-06779 5B

CORDEIRO, C. F.
Rates of Carbon, Oxygen, Nitrogen, and Phosphorus Cycling Through Microbial Populations in Stratified Lakes,
W74-06569 5C

CORRIPIO, A. B.
Digital Control Algorithms. Part III. Tuning PI and PID Controllers,
W74-06750 7C

CORTES-RIVERA, G.
Application of DDDP in Water Resources Planning,
W74-06503 6A

COSTANTINI, E.
The Environmental Impulse and its Competitors: Attitudes, Interests, and Institutions at Lake Tahoe,
W74-06843 6E

COUSIN, S. B.
Significant Techniques in the Processing and Interpretation of ERTS-1 Data,
W74-06652 7C

COWAN, P. A.
Biological Response to Detergent and Nondetergent Phosphorus in Sewage - Part II,
W74-06873 5C

CRAGIN, J. H.
Chemical Profile of the Ross Ice Shelf at Little America V, Antarctica,
W74-06921 2C

CRAM, R.
Oceanographic Features in the Lee of the Windward and Leeward Islands: ERTS and Ship Data,
W74-06674 2E

CROOKSHANK, N. L.
Numerical Model of St. Lawrence River Estuary,
W74-06738 2L

CROW, F. R.
Evaporation from Brine Storage Reservoirs,
W74-06517 2D

CUMMING, K. B.
An Evaluation of Striped Bass Fingerling Culture,
W74-07002 8I

CUNNINGHAM, H. M.
Mercury Content of Canadian Foods and Cereals Determined by Different Methods,
W74-06787 5A

The Occurrence of Mercury in the Environment and Man, Discussion Paper,
W74-06784 5B

CURRAN, R. J.
Biomass in the Upwelling Areas Along the Northwest Coast of Africa as Viewed with ERTS 1,
W74-06677 5A

D'ITRI, F. M.
Sources of Mercury in the Environment
W74-06771 5B

D'ITRI, F. M.
Environmental Dynamics of Mercury Discussion Paper,
W74-06799 5B

DAVIS, J. H. JR.
Establishment of Mean High Water Lines in Florida Lakes,
W74-06610 2H

DAVIS, J. T.
Determination of Mercury in Biological Tissues,
W74-06790 5A

DE SOUSA, A.
Complexiметric Determination of Phosphate,
W74-06757 5A

DE VILLIERS, R.
Sample Sizes Required for Two-Sided Comparisons of Two Treatments With a Control,
W74-06746 7C

DEACON, J. E.
Phytoplankton Successions and Lake Dynamics in Las Vegas Bay, Lake Mead, Nevada,
W74-07001 5C

DEBOCK, J.
Thermodynamics of Ion Exchange,
W74-06936 2G

DEBORTOLI, M.
Behavior of Radioiodine in the Environment and in Man,
W74-06862 5B

DEHMANN, E. H.
Simulation of Urban Runoff, Nutrient Loading, and Biotic Response of a Shallow Eutrophic Lake,
W74-06564 5C

DENNING, J. L.
A Comparison of Hydraulic Conductivities Calculated with Morphometric and Physical Methods,
W74-06899 2G

DEROVER, J.
U.S. Deepwater Port Study, Vol. 2. Commodity Studies and Projections,
W74-06863 6D

U.S. Deepwater Port Study, Vol 3. Physical Coast and Port Characteristics, and Selected Deepwater Port Alternatives,
W74-06864 6D

DERRYBERRY, O. M.
Investigation of Mercury Contamination in the Tennessee Valley Region,
W74-06780 5B

DILLMAN, R. D.
Digital Land Use Mapping in Oakland County, Michigan,
W74-06639 4A

DINMAN, B. D.
Biological Effects of Mercury Compounds, Discussion Paper,
W74-06814 5C

The Dose-Response Relationship Resulting from Exposure to Alkyl Mercury Compounds,
W74-06805 5C

Surface Electromyography in Chronic Inorganic Mercury Intoxication,
W74-06801 5C

DIRKSEN, C.
Measurement of Hydraulic Conductivity By Means of Steady, Spherically Symmetric Flows,
W74-06735 2G

DOLAN, R.
Evaluation of Land Use Mapping from ERTS in the Shore Zone of Carets,
W74-06627 4A

DORIN, G.
Co-operation for Water Protection: Eutrophication Control,
W74-06543 5C

DREWS, R. J. L. C.
Nitrogen Elimination by Bogus Alternation of Aerobic/'Anoxic' Conditions in 'Orbal' Activated Sludge Plants,
W74-06605 5D

DUKE, H. R.
Capillary Properties of Soils - Influence upon Specific Yield,
W74-06584 2F

DUNGEY, M.
Radar Studies of Urban Precipitation Anomaly,
W74-06938 2B

DUNSTAN, W. M.
Growth Comparisons of Oysters, Mussels and Scallops Cultivated on Algae Growth With Artificial Medium and Treated Sewage Effluent,
W74-07035 5C

DUPRIEZ, G. L.
The Evaporation from a Water Pan--Its Limited Significance (L'evaporation d'un bac d'eau libre--sa signification restreinte),
W74-06908 2D

DUSTMAN, E. H.
Mercury in Wild Animals, Lake St. Clair, 1970,
W74-06776 5B

DYBBS, A.
Conservation Equations for Nonisothermal Flow in Porous Media,
W74-06892 2F

DYTCH, H. E.
Metromex Temperature and Aerosol Data Reduction: Analysis of the Urban Anomaly,
W74-06941 2B

DYUBKIN, I. A.
An Algorithm for Monitoring Hydrometeorological Information,
W74-06733 2B

EATON, S.K. JR.
Seamounts and Guyots: A Unique Resource,
W74-06966 6E

EBTEHADJ, K.
Application of ERTS-1 Imagery in the Fields of Geology, Agriculture, Forestry, and Hydrology to Selected Test Sites in Iran,
W74-06710 4A

ECHELBERGER, W. F. JR.
Rates of Carbon, Oxygen, Nitrogen, and Phosphorus Cycling Through Microbial Populations in Stratified Lakes,
W74-06569 5C

ECONOMY, R.
First Look Analyses of Five Cycles of ERTS-1 Imagery Over County of Los Angeles: Assessment of Data Utility for Urban Development and Regional Planning,
W74-06636 4A

EDWARDS, D. M.
A Computerized Solution for Bench Leveling Design,
W74-06600 4A

Design Criteria for Irrigation Systems with Complex Pipe Loops,
W74-06585 3F

EFFORD, I. E.
Systems Analysis in the Marion Lake IBP Project,
W74-07010 5C

EGLOFF, D. A.
Stream Pollution and a Simplified Diversity Index,
W74-06876 5A

EL-ABYAD, M. S.
Competitive Saprophytic Colonization by Fusarium oxysporum F. Sp. vasinfectum,
W74-07011 3F

ELDER, J. B.
Mercury in Wild Animals, Lake St. Clair, 1970,
W74-06776 5B

ENGLISH, D. K.
Balantidiasis Outbreak in Truk,
W74-07031 5C

EPSTEIN, E.
Nitrogen Mineralization-Water Relations in Soils,
W74-06897 5B

ERB, R. B.
A Comparison of Land-Use Determinations Using Data from ERTS-1 and High Altitude Aircraft,
W74-06638 4A

ESTES, J. E.
Land Use Investigations in the Central Valley and Central Coastal Test Sites, California,
W74-06623 4A

EVANS, A. J. JR.
A Physical Model for Prediction and Control of Saltwater Intrusion in the Floridan Aquifer,
W74-06609 2F

EVANS, S. D.
Mineral Nitrogen Movement into Subsoils Following Continued Annual Fertilization for Corn,
W74-06898 5B

EVANS, W. E.
Analysis of ERTS Imagery Using Special Electronic Viewing/Measuring Equipment,
W74-06659 7C

EVENSON, D. E.
Ground Water Quality Models: What They Can and Cannot Do,
W74-06944 5B

FABER, H. A.
Information Resource: Final Report Water Pollution Control in Water Utilities,
W74-06527 5F

FALCO, J. W.
A Physical Model for Simulation of Aquatic Ecosystems,
W74-06573 5C

FAN, L. T.
Modeling and Optimization of Transient Cooling Water Discharge from Power Generating Plants,
W74-06832 5B

FARRELL, P. J.
Treatment of Domestic Wastewater and NSSC Pulp and Paper Mill Wastes,
W74-06513 5D

FAYE, R. E.
Ground-Water Hydrology of Northern Napa Valley, California,
W74-06880 2F

FERGUSON, W. S.
Analytical Methodology for Mercury-Discussion Paper,
W74-06793 5A

FICKE, H. H.
A Design and Economic Evaluation of Catalytic Oxidation of Phenols in Wastewater,
W74-06516 5D

FIEDLER, U.
Selectrode - the Universal Ion-Selective Electrode. Part VII. A Valinomycin-Based Potassium Electrode with Nonporous Polymer Membrane and Solid-State Inner Reference System,
W74-06765 5A

FIEREK, P.
Dynamics of Changes in the Concentration of Fluorine Compounds Emitted by the Phosphorus Fertilizer Manufacturing Establishment in Pozan, and Their Influence on Surface and Underground Waters and on the Atmosphere Within th e Limits of the City of Poznan, (In Polish),
W74-07021 5B

FIKSINSKA, O.
Dynamics of Changes in the Concentration of Fluorine Compounds Emitted by the Phosphorus Fertilizer Manufacturing Establishment in Pozan, and Their Influence on Surface and Underground Waters and on the Atmosphere Within th e Limits of the City of Poznan, (In Polish),
W74-07021 5B

FILIPPOV, V. V.
Fundamentals of Automatic Control of Meteorological Data,
W74-06724 2B

FINSTEIN, M. S.
Distribution of Autotrophic Nitrifying Bacteria in a Polluted Stream,
W74-06834 5C

FISCHER, R. C.
Development of Asphalt Moisture Barrier Equipment,
W74-06586 3F

FITZSIMMONS, D. W.
Unsteady Radial Flow in Partially Saturated Soils,
W74-06587 2G

FLEISCHER, P.
Correlation of ERTS Multispectral Imagery with Suspended Matter and Chlorophyll in Lower Chesapeake Bay,
W74-06667 2L

FLORES, L. M.
Unsupervised Classification and Areal Measurement of Land and Water Coastal Features on the Texas Coast,
W74-06706 2L

FLYNN, E. H.
Culture Studies of Enteromorpha Linza (L.) J.AG. and Ulvaria Oxysperma (Kutzing) Bliding (Chlorophyceae, Ulvales) From Central America,
W74-06749 5C

FOLLETT, C. R.
Effects of Ground-Water Development on the Proposed Palmetto Bend Dam and Reservoir in Southeast Texas,
W74-06920 4B

FONTANEL, A.
First ERTS-1 Results in Southeastern France: Geology, Sedimentology, Pollution at Sea,
W74-06687 4A

FOULK, H. R.
Using Artemia to Assay Oil Dispersant Toxicities,
W74-06877 5A

FOUSS, J. L.
Comparison of Strength Test Methods for Corrugated Plastic Drainage Tubing,
W74-06602 8A

FRANK, D. G.
Thermal Surveillance of Cascade Range Volcanoes Using ERTS-1 Multispectral Scanner, Aircraft Imaging Systems, and Ground-Based Data Communication Platforms,
W74-06692 7C

FRASER, R. S.
Computed Atmospheric Effects on ERTS Observations,
W74-06694 2B

FREI, R. W.
Electron-Donor-Acceptor Complexing Reagents in the Analysis of Pesticides. VI. Influence of Structure in Detection and Identification,
W74-06871 5A

FREMONT, H. A.
Color Removal from Kraft Mill Effluents by Ultrafiltration,
W74-06521 5D

FRIEDMAN, J. D.
Thermal Surveillance of Cascade Range Volcanoes Using ERTS-1 Multispectral Scanner, Aircraft Imaging Systems, and Ground-Based Data Communication Platforms,
W74-06692 7C

FULKERSON, W.
The Occurrence of Mercury in the Environment and Man, Discussion Paper,
W74-06784 5B

GAGE, J. C.
Analytical Methodology for Mercury-Discussion Paper,
W74-06793 5A

Biological Effects of Mercury Compounds, Discussion Paper,
W74-06814 5C

The Determination of Ethylmercury in Blood,
W74-06791 5A

Environmental Dynamics of Mercury: Discussion Paper,
W74-06799 5B

GAMBA, G.
Phosphorimetric Determination of Traces of Boron,
W74-06755 5A

GAMBLE, J.
ERTS-1 Applications to Minnesota Land Use Mapping,
W74-06632 4A

GANDOLFI, G.
Predation on the Freshwater Bivalve Unio pictorum by the Rat, Rattus norvegicus, (In Italian),
W74-07008 2I

GANN, E. E.
Water Resources of Northwestern Missouri,
W74-06961 7C

GARCIA, J. G.
A Comparison of Land-Use Determinations Using Data from ERTS-1 and High Altitude Aircraft,
W74-06638 4A

GARTON, J. E.
Effect of Roughness Elements on Hydraulic Resistance for Overland Flow,
W74-06594 8B

GATTO, L. W.
Sediment Distribution and Coastal Processes in Cook Inlet, Alaska,
W74-06671 2L

GAY, F. B.
Hydrology and Water Resources of the Hoosic River Basin, Massachusetts,
W74-06958 7C

GAY, L. W.
Studies of the Forest Energy Budget,
W74-06518 2D

GENTNER, S. R.
Aquatic Vegetation of the Ottowa River Near Chalk River Nuclear Laboratories (CRNL),
W74-06819 5C

GEORGESON, D.
Conjunctive Operation of Southern California Ground Water Basins with the State Water Project,
W74-06943 4B

GERMAN, F. O.
1972 Operation of the ICPP Rare Gas Recovery Facility,
W74-06822 5D

GILBERT, J. B.
Ground Water Pollution--From the Waste Discharger's Viewpoint,
W74-06955 5G

GILL, W. R.
Evaluation of a Furrow Modifying Device
W74-06588 3F

GIRTON, R. C.
The Stack Monitoring System at the Idaho Chemical Processing Plant,
W74-06824 5A

GLEASON, V.
Conjunctive Operation of Southern California Ground Water Basins with the State Water Project,
W74-06943 4B

GODBEE, H. W.
A Critical Review of Solid Radioactive Waste Practices at Nuclear Power Plants,
W74-06825 5B

GODIN, G.
Eight Years of Observations on the Water Level at Quebec and Grondines 1962-1969 Part I--Analysis of the Tidal Signal,
W74-06926 2E

GOETZ, A. F. H.
Computer Techniques Used for Some Enhancements of ERTS Images,
W74-06653 7C

GOLDSMITH, R. L.
Color Removal from Kraft Mill Effluents by Ultrafiltration,
W74-06521 5D

GOLDWATER, L.
Environmental Dynamics of Mercury: Discussion Paper,
W74-06799 5B

The Occurrence of Mercury in the Environment and Man, Discussion Paper,
W74-06784 5B

GOLDWATER, L. J.
Biological Effects of Mercury Compounds, Discussion Paper,
W74-06814 5C

Detection and Appraisal of Subclinical Intoxications,
W74-06810 5C

GOODWIN, C. R.
Detection of Turbidity Dynamics in Tampa Bay, Florida Using Multispectral Imagery from ERTS-1,
W74-06711 2L

GOSINK, T. A.
Correlation of ERTS Multispectral Imagery with Suspended Matter and Chlorophyll in Lower Chesapeake Bay,
W74-06667 2L

GOSWAMI, K. P.
A Simple Automatic Soil Percolator,
W74-06531 7B

GOTOH, S.
Transformation of Iron in a Waterlogged Soil as Influenced by Redox Potential and pH,
W74-06934 5B

GOWER, J. F. R.
Use of ERTS-1 Pictures in Coastal Oceanography in British Columbia,
W74-06707 2L

GRABACKA, E.
Protozoans in Ponds Filled with Sugar Factory Wastes,
W74-06552 5C

GRABOW, W. O. K.
Survival in Maturation Ponds of Coliform Bacteria With Transferable Drug Resistance,
W74-06748 5C

GRAMENOPOULOS, N.
Terrain Type Recognition Using ERTS-1 MSS Images,
W74-06661 7C

GRANMO, A.
Effects of Oil Dispersants and Oil Emulsions on Marine Animals,
W74-06745 5C

GRASS, L. B.
Performance of a Tile Drainage System: An Evaluation of a Tile Design and Management,
W74-06596 3F

GREEFF, A. M.
Nitrogen Elimination by Bogus Alternation of Aerobic/'Anoxic' Conditions in 'Orbal' Activated Sludge Plants,
W74-06605 5D

GREEN, K. P.
A Simple Automatic Soil Percolator,
W74-06531 7B

GREEN, R. L.
Emergency Planning for Municipal Wastewater Treatment Facilities,
W74-06577 5D

Maintenance Management Systems for Municipal Wastewater Facilities,
W74-06579 5D

Start-Up of Municipal Wastewater Treatment Facilities,
W74-06578 5D

GREENBLATT, G. D.
Recent Developments in the Law of the Sea IV: A Synopsis,
W74-06965 6E

GREIG, R. A.
Survey of Mercury Concentrations in Fishes of Lakes St. Clair, Erie, and Huron,
W74-06775 5B

GRENDA, R. N.
Analysis of the Feasibility of an Experiment to Measure Carbon Monoxide in the Atmosphere,
W74-06917 5A

GRENNEY, W. J.
Activity Analysis and the Management of Resources: A Model for Control of Eutrophication,
W74-06574 5C

GRIFFIN, R. A.
Kinetics of the Phosphate Interaction with Calcite,
W74-06895 5B

GRIGGS, M.
Determination of Aerosol Content in the Atmosphere,
W74-06647 7C

GRIMSRUD, G. P.
Quantitative Methods for Preliminary Design of Water Quality Surveillance Systems,
W74-06885 5A

GROENEVELT, P. H.
Soil Moisture Distribution During Two-Dimensional Absorption from a Cylindrical Source,
W74-07042 2G

GUILLEMOT, J.
First ERTS-1 Results in Southeastern France: Geology, Sedimentology, Pollution at Sea,
W74-06687 4A

GUIRGIS, H.
Biological Effects of Mercury Compounds, Discussion Paper,
W74-06814 5C

GUIRGIS, H. A.
The Binding of Inorganic and Organic Mercury Compounds (Hg 203) to Constituents of Normal Human Blood,
W74-06803 5C

GUY, M.
First ERTS-1 Results in Southeastern France: Geology, Sedimentology, Pollution at Sea,
W74-06687 4A

HAINARD, P.
Climatic Data of the High Altitude Meteorological Stations of the Geneva Region For 1970, (In French),
W74-06532 7C

HAIS, A. B.
Activated Sludge Treatment Systems with Oxygen,
W74-06839 5D

HALL, J. D.
Social Interaction Between Juvenile Coho (Oncorhynchus kisutch) and Fall Chinook Salmon (O. tshawytscha) in Sixes River, Oregon,
W74-07040 2I

HALLERMEIER, R. J.
Application of ERTS-1 Imagery in Coastal Studies,
W74-06709 2L

HAMAKER, P.
Upward Flow from Shallow Water Tables,
W74-06844 2F

HAMDAN, A. S.
Network Analysis of Conjunctively Operated Ground Water-Surface Water Systems,
W74-06504 4B

HAMILTON, W. L.
Analysis of the Concentration of Microparticles in the Long Ice Core from Byrd Station,
W74-06931 2C

HAMM, K. E.
Intergovernmental Relations as seen by Florida State Legislators: Land Use and Water Resource Problems,
W74-06845 6B

HAMMER, R. R.
1972 Operation of the ICPP Rare Gas Recovery Facility,
W74-06822 5D

HANF, K.
The Environmental Impulse and its Competitors: Attitudes, Interests, and Institutions at Lake Tahoe,
W74-06843 6E

HANNA, W. J.
Correlation of ERTS Multispectral Imagery with Suspended Matter and Chlorophyll in Lower Chesapeake Bay,
W74-06667 2L

HANSEN, B. P.
Hydrology and Water Resources of the Hoosic River Basin, Massachusetts,
W74-06958 7C

HANSEN, E. H.
Selectrode - the Universal Ion-Selective Electrode. Part VI. The Calcium (II) Selectrode Employing a New Ion Exchanger in a Nonporous Membrane and a Solid-State Reference System,
W74-06764 5A

HANSON, K. J.
Oceanographic Features in the Lee of the Windward and Leeward Islands: ERTS and Ship Data,
W74-06674 2E

HARALICK, R. M.
Combined Spectral and Spatial Processing of ERTS Imagery Data,
W74-06660 7C

HARRIS, L. F.
The Use of Photographic Methods in Contrast Enhancement of ERTS-1 Images,
W74-06704 7C

HARTUNG, R.
The Determination of Mono- and Dimethylmercury Compounds by Gas Chromatography,
W74-06792 5A

Research Needs: Study of the Environmental Dynamics of Mercury,
W74-06798 5B

The Role of Food Chains in Environmental Mercury Contamination,
W74-06795 5B

HARTWELL, A.
Investigations Performed on the Arctic Ice Dynamics Joint Experiment, March 1971,
W74-06716 2C

HARTWELL, A. D.
Airphoto Analysis of Ice Deformation in the Beaufort Sea,
W74-06720 2C

HARVEY, E. J.
Water Resources of Northwestern Missouri,
W74-06961 7C

HASHIMOTO, Y.
Qualitative Requirements of Young Eels Anguilla japonica for Water-Soluble Vitamins and Their Deficiency Symptoms,
W74-07006 5C

HASSAN, S. S. M.
New Spot Tests for Nitrates and Nitrites,
W74-06878 5A

HAUG, A.
Studies on the Phytoplankton Ecology of the Trondheimsfjord. I. The Chemical Composition of Phytoplankton Populations,
W74-06545 5C

HAVEY, K. A.
Relative Recoveries of Hatchery-Reared Landlocked Salmon Planted at Different Ages at Schoodic Lake, Maine,
W74-06865 8I

HAWLEY, A. J.
The Present and Future Status of Eastern North Carolina Wetlands,
W74-06850 2L

HEALY, G. R.
Balantidiasis Outbreak in Truk,
W74-07031 5C

HEATH, R. T.
Some Aspects of Phosphorus Dynamics of the Twin Lakes Watershed,
W74-06565 5C

HEBARD, F.
Oceanographic Features in the Lee of the Windward and Leeward Islands: ERTS and Ship Data,
W74-06674 2E

HEBLE, L. R.
Treatment of Domestic Wastewater and NSSC Pulp and Paper Mill Wastes,
W74-06513 5D

HECKER, L. H.
The Dose-Response Relationship Resulting from Exposure to Alkyl Mercury Compounds,
W74-06805 5C

HEERMANN, D. F.
Hydrodynamics of Border Irrigation Advance,
W74-06592 3F

HELLING, C. S.
Azide and Ethylenethiourea Mobility in Soils,
W74-06896 5B

HELMERS, A. E.
An Expanding Role for Subarctic Watershed Research,
W74-06884 4D

HENDRICKS, E. L.
Recent Activity of Glaciers of Mount Rainier, Washington,
W74-06713 2C

HENDRICKSON, J. R.
Oceanographic Mapping of Structure and Dynamics of the Northern Gulf of California by the Use of Spectral Modeling and ERTS-1,
W74-06673 2L

HENSON, E. B.
Materials Input of Lake Champlain: A Synoptic Appraisal,
W74-06882 2H

HENTGES, J. F.
Processing, Chemical Composition and Nutritive Value of Aquatic Weeds,
W74-06502 4A

HERKERT, E.
Utilization of Trickling Filters for Dual Treatment of Dry and Wet Weather Flows,
W74-06508 5D

HERRON, M.
Chemical Profile of the Ross Ice Shelf at Little America V, Antarctica,
W74-06921 2C

HERZOG, J. H.
Natural Resource Inventory and Monitoring in Oregon With ERTS Imagery,
W74-06683 4A

HESS, C. T.
A Radioactive Isotopic Characterization of the Environment Near Wiscasset, Maine: A Preoperational Survey in the Vicinity of the Maine Yankee Atomic Power Plant,
W74-06855 5A

HETESA, J.
The Effect of Mineral Fertilization and of Carp Fry on the Composition and Dynamics of Plankton,
W74-06535 5C

HEWITT, J. P.
Unrecorded Pollution and Dynamics of Biochemical Oxygen Demand,
W74-06613 5B

HEYRAUD, M.
Mercury as a Hydrospheric Pollutant II. Biological Half-Time of Methyl Mercury in Four Mediterranean Species: A Fish, a Crab, and Two Molluscs,
W74-06767 5C

HIBLER, W. D. III.
Data on Morphological and Physical Characteristics of Sea Ice in the Beaufort Sea,
W74-06721 2C

Investigations Performed on the Arctic Ice Dynamics Joint Experiment, March 1971,
W74-06716 2C

Mesoscale Strain Measurements on the Beaufort Sea Pack Ice,
W74-06717 2C

Structure of a Multiyear Pressure Ridge,
W74-06718 2C

Top and Bottom Roughness of a Multiyear Ice Floe,
W74-06719 2C

HIGER, A.
Detection of Turbidity Dynamics in Tampa Bay, Florida Using Multispectral Imagery from ERTS-1,
W74-06711 2L

HIGGINS, G. T.
Stream Temperatures in Washington State,
W74-06962 7C

HIGGINS, I. T. T.
Epidemiological Approaches to the Study of Subclinical Effects of Mercury Intoxication,
W74-06813 5B

HILL, D. P.
Coastal Wetlands in New England,
W74-06967 5G

HILL, J. IV
Component Description and Analysis of Environmental Systems: Oxygen Utilization in Aquatic Microcosms,
W74-06575 5C

HINMAN, A.
Organic Mercury Poisoning in Alamogordo, New Mexico,
W74-06807 5C

HIXON, S. B.
Unsupervised Classification and Areal Measurement of Land and Water Coastal Features on the Texas Coast,
W74-06706 2L

HOLBO, H. R.
Studies of the Forest Energy Budget,
W74-06518 2D

HOMACK, P.
Utilization of Trickling Filters for Dual Treatment of Dry and Wet Weather Flows,
W74-06508 5D

HOOPER, F. F.
Organic Phosphorus Compounds of a Northern Michigan Bog, Bog-Lake System,
W74-06742 5C

Preliminary Report of the Role of Sphagnum in the Cycling of Phosphorus in a Bog Lake System,
W74-06743 5C

HOWITT, R. E.
A Simulation Approach to Recreation Planning (A Case of Changing Quality),
W74-06996 6B

HUFF, D. D.
Simulation of Urban Runoff, Nutrient Loading, and Biotic Response of a Shallow Eutrophic Lake,
W74-06564 5C

HUGHES, B. C.
The Challenge of Military Nuclear Construction,
W74-06859 8H

HUK, W.
Epiphytic Microphytes in a Pond Polluted with Beet Sugar Factory Wastes,
W74-06551 5C

HUMPHRIES, E. T.
An Evaluation of Striped Bass Fingerling Culture,
W74-07002 8I

HUNTER, J. V.
Unrecorded Pollution and Dynamics of Biochemical Oxygen Demand,
W74-06613 5B

HUNTER, R. E.
Distribution and Movement of Suspended Sediment in the Gulf of Mexico off the Texas Coast,
W74-06672 2L

HUTZINGER, O.
Electron-Donor-Acceptor Complexing Reagents in the Analysis of Pesticides. VI. Influence of Structure in Detection and Identification,
W74-06871 5A

HWANG, C. L.
Modeling and Optimization of Transient Cooling Water Discharge from Power Generating Plants,
W74-06832 5B

INOUE, Y.
On the Selection of a Ground Disposal Site by Sensitivity Analysis,
W74-06858 5B

IRWIN, R. W.
Hydraulic Roughness of Corrugated Plastic Tubing,
W74-06589 8B

IVANOV, V. A.
The Problem of Direct Groundwater Discharge to the Seas,
W74-06881 2F

VARSON, W. R.
Simulation of Urban Runoff, Nutrient Loading, and Biotic Response of a Shallow Eutrophic Lake,
W74-06564 5C

WAKI, M.
An Epidemiological Study on Clonorchiasis in Kyoto City, (In Japanese),
W74-07050 5C

ACKSON, J. W.
An Examination of Three Strains of the Blue-Green Algal Genus, Fremyella,
W74-06759 5C

ACKSON, T. V.
Legal Impediments to the Use of Interstate Agreements in Coordinated Fisheries Management Programs: States in the N.M.F.S. Southeast Region,
W74-06991 6E

AMES, P. E.
Deep Plowing - An Engineering Appraisal,
W74-06590 3F

ANKOWIAK, A.
Dynamics of Changes in the Concentration of Fluorine Compounds Emitted by the Phosphorus Fertilizer Manufacturing Establishment in Pozan, and Their Influence on Surface and Underground Waters and on the Atmosphere Within th e Limits of the City of Poznan, (In Polish),
W74-07021 5B

ENNINGS, J. D.
Digital Interactive Image Analysis by Array Processing,
W74-06657 7C

ENNINGS, J. J. JR.
Maintenance Management Systems for Municipal Wastewater Facilities,
W74-06579 5D

ERNELOV, A.
Factors in the Transformation of Mercury to Methylmercury,
W74-06794 5B

Mercury and Food Chains,
W74-06796 5B

ESTER, W. A.
Groundwater Tracing with Post Sampling Activation Analysis,
W74-06889 2F

OHNSON, G. R.
Automatic Interpretation of ERTS Data for Forest Management,
W74-06643 4A

OHNSON, P. G.
Distribution of Metals in Baltimore Harbor Sediments,
W74-06924 5B

OHNSON, W. M.
Maintenance Management Systems for Municipal Wastewater Facilities,
W74-06579 5D

OHRI, K. N.
Semimicrodetermination of Mercury(II) and Zinc(II) by Precipitation from Homogeneous Solution, Using Cation Generation Technique,
W74-06869 5A

JONES, D. R. IV.
Atomic Absorption Detector for Liquid-Liquid Chromatography,
W74-06998 5A

JONES, J. D.
A Simple, Rapid Method for the Determination of Trace Mercury in Fish Via Neutron Activation Analysis,
W74-06788 5A

JONES, J. W.
A Simulated Environmental Model of Temperature, Evaporation, Rainfall, and Soil Moisture,
W74-06591 3F

JONES, R. S.
Oxidation of Organic Matter in Sediments,
W74-06528 5C

JUDD, J. B.
The Effects of Ecological Changes on Buckeye Lake, Ohio, with Emphasis on Largemouth Bass and Aquatic Vascular Plants,
W74-06546 5C

JUDSON, F. N.
Balantidiasis Outbreak in Truk,
W74-07031 5C

JUDY, J.
Seamounts and Guyots: A Unique Resource,
W74-06966 6E

JURINAK, J. J.
Kinetics of the Phosphate Interaction with Calcite,
W74-06895 5B

JUSTYN, J.
Uptake of Natural Radioisotopes by Aquatic Organisms,
W74-06534 5C

KAGAN, R. L.
Automatic Processing of Rainfall Data,
W74-06732 2B

KAGANSKII, A. S.
Some Principles of Objective Control of Marine Meteorological Information,
W74-06731 2B

KANTNER, D. A.
Mapping of Spoil Banks Using ERTS-1 Pictures,
W74-06695 5A

KAPRAUN, D. F.
Culture Studies of Enteromorpha Linza (L.) J.AG. and Ulvaria Oxysperma (Kutzing) Bliding (Chlorophyceae, Ulvales) From Central America,
W74-06749 5C

KARASIK, V. M.
The Influence of Clay Fraction on the Basic Parameters of the Hydro-Transport of Fine Free-Flowing Materials,
W74-06914 8B

KARDESTUNCER, H.
Efficient Pricing for Urban Waste Water Renovation,
W74-06828 5D

KASE, H.
Automatic Check and Correction of Meteorological Data in East Germany,
W74-06725 2B

KASVINSKY, R.
A Chart of New York Water Law,
W74-06614 6E

KAYE, S. V.
The EXREM III Computer Code for Estimating External Radiation Doses to Populations from Environmental Releases,
W74-06818 5B

KEARNS, D. K.
Phytoplankton Population Changes and Nutrient Fluctuations in a Simple Aquatic Ecosystem Model,
W74-06571 5C

KECKES, S.
Mercury as a Hydrospheric Pollutant II. Biological Half-Time of Methyl Mercury in Four Mediterranean Species: A Fish, a Crab, and Two Molluscs,
W74-06767 5C

KEDAR, E. Y.
ERTS-1 Applied for Structural and Morphological Investigations Case Studies: (1) Los Angeles, California and (2) Coastal Plain, New Jersey,
W74-06690 7C

KELLER, EDWARD C. JR.
Micro-Ecosystems Simulation of Primary Production in Thermal and Acid Mine Water Loadings Related to Water Use of the Monongahela River,
W74-06507 5C

KELLEY, H. A.
A Radioactive Isotopic Characterization of the Environment Near Wiscasset, Maine: A Preoperational Survey in the Vicinity of the Maine Yankee Atomic Power Plant,
W74-06855 5A

KEMMERER, A. J.
Relationships Between Remotely Sensed Fisheries Distribution Information and Selected Oceanographic Parameters in the Mississippi Sound,
W74-06708 7B

KERHIN, R. T.
Recognition of Beach and Nearshore Depositional Features of Chesapeake Bay,
W74-06665 2L

KEWALRAMANI, H. G.
Observations on Comparative Propensities for Carp Fry Destruction by Adults and Last Instar Preimaginal Stages of Predatory Aquatic Insects,
W74-07044 2I

KHALIFA, H.
On the Reaction Between Iodide and Mercury(II),
W74-06870 5A

KHANEVSKAYA, I. V.
Automatic Monitoring of Processing of Daily Radiosonde Data on Temperature and Geopotential,
W74-06729 2B

KHANTULEV, A. A.
Gray Forest Soils in the Spruce-Fir Forests in the Sub-Ural Region (Vyatka-Kama Province), (In Russian),
W74-07004 2G

KIBBEY, A. H.
A Critical Review of Solid Radioactive Waste Practices at Nuclear Power Plants,
W74-06825 5B

KIEFER, R. W.
The Use of ERTS-1 Data for the Inventory of Critical Land Resources for Regional Land Use Planning,
W74-06634 4A

KINCAID, D. C.
Hydrodynamics of Border Irrigation Advance,
W74-06592 3F

KIRVIDA, L.
Automatic Interpretation of ERTS Data for Forest Management,
W74-06643 4A

KISTER, L. R.
Quality of Ground Water in the Lower Colorado River Region, Arizona, Nevada, New Mexico, and Utah,
W74-06960 7C

KISTNER, A.
Method of Preparing Washed Suspensions of Anaerobic Bacteria for Metabolic Studies,
W74-06875 5A

KLEEREKOPER, H.
Interaction of Temperature and Copper Ions as Orienting Stimuli in the Locomotor Behavior of the Goldfish (Carassius auratus),
W74-06769 5C

KLEIN, D. H.
Mercury in the Environment,
W74-06523 5B

Some Estimates of Natural Levels of Mercury in the Environment,
W74-06772 5B

KLEINERT, S. J.
Mercury Levels in Wisconsin Fish,
W74-06778 5B

KLEMAS, V.
Applicability of ERTS-1 Imagery to the Study of Suspended Sediment and Aquatic Fronts,
W74-06666 2L

KLYUKIN, N. K.
Machine Control of the Quality of Observations in Automated Hydrometeorological-Data Processing,
W74-06723 2B

KNIGHT, H. G.
Legal Impediments to the Use of Interstate Agreements in Coordinated Fisheries Management Programs: States in the N.M.F.S. Southeast Region,
W74-06991 6E

KOENIG, E. R.
Phytoplankton Successions and Lake Dynamics in Las Vegas Bay, Lake Mead, Nevada,
W74-07001 5C

KOENINGS, J. P.
Ionic State and Coordination of Iron in Bog Lakes,
W74-06744 5C

Organic Phosphorus Compounds of a Northern Michigan Bog, Bog-Lake System,
W74-06742 5C

KOH, C. Y.
Mathematical Model for Barged Ocean Disposal of Wastes,
W74-06837 5B

KOHL, R. A.
Sprinkler Precipitation Gage Errors,
W74-06593 3F

KOLLBERG, S.
Effects of Oil Dispersants and Oil Emulsions on Marine Animals,
W74-06745 5C

KOMUYAMA, Y.
Investigation of Brewing Water Treatment,
W74-07023 5A

KONDAKOV, V. N.
The Influence of Clay Fraction on the Basic Parameters of the Hydro-Transport of Fine Free-Flowing Materials,
W74-06914 8B

KONRAD, J. G.
Mercury Contents of Bottom Sediments from Wisconsin Rivers and Lakes,
W74-06777 5B

KOONCE, J. F.
Simulation of Urban Runoff, Nutrient Loading, and Biotic Response of a Shallow Eutrophic Lake,
W74-06564 5C

KORNS, R. F.
Mercury Concentrations in Human Tissues Among Heavy Fish Eaters,
W74-06812 5B

KOTTLOWSKI, F. E.
Initial Evaluation of the Geologic Applications of ERTS-1 Imagery for New Mexico,
W74-06693 4A

KOVACS, A.
Data on Morphological and Physical Characteristics of Sea Ice in the Beaufort Sea,
W74-06721 2C

Investigations Performed on the Arctic Ice Dynamics Joint Experiment, March 1971,
W74-06716 2C

Mesoscale Strain Measurements on the Beaufort Sea Pack Ice,
W74-06717 2C

Structure of a Multiyear Pressure Ridge,
W74-06718 2C

Top and Bottom Roughness of a Multiyear Ice Floe,
W74-06719 2C

KOWOBARI, T. S.
Effect of Roughness Elements on Hydraulic Resistance for Overland Flow,
W74-06594 8B

KRIL', S. I.
Degree of Local Saturation of a Flow by Suspended Matter and Its Relation to the Volume Concentration,
W74-06913 8B

KRIVENKO, YU. N.
Distribution of Average Longitudinal Velocities in Flows with Coarse-Grained Materials,
W74-06915 8B

Energy Losses in a Two-Phase Flow Containing Coarse-Grain Material,
W74-06916 8B

KRIZ, G. J.
Application of Monte Carlo Method to Soil Water Movement,
W74-06599 2G

KRUEGER, T. H.
Solute Movement Through Disturbed and Undisturbed Soil Cores,
W74-06935 5B

KRULL, J. D.
Long-Term Lake Recovery Related to Available Phosphorus,
W74-06562 5C

KRUSE, E. G.
Hydrodynamics of Border Irrigation Advance,
W74-06592 3F

KUCHENBECKER, D. J.
Will Municipal Sewage Continue to Threaten Primary Water-Contact Recreation: An Appraisal of the 1972 Water Pollution Control Act,
W74-06969 5G

KUNKEL, R.
An Atomic Absorption Analysis Method for Cyanide,
W74-06999 5A

KWAPULINSKI, J.
Influence of Some Hydrological Parameters on Changes in the Radioactivity of the Waters of the Rivers Czarna Przemsza and Przemsza,
W74-07019 5B

LAAK, R.
Efficient Pricing for Urban Waste Water Renovation,
W74-06828 5D

LABURN, R. J.
The Effect of Pollution on the Vaal River Barrage and the Quest for Water Quality,
W74-06607 5B

LACHOWSKI, H. M.
Classification of ERTS-1 MSS Data by Canonical Analysis,
W74-06662 7C

Identification and Mapping of Coal Refuse Banks and Other Targets in the Anthracite Region,
W74-06642 4A

LADAS, A. S.
Organic Functional Group Analysis Via Gas Chromatograpy. III. Determination of Carbamates by Reaction with Alkali,
W74-06872 5A

LAI, K. K.
Developing Region in Self-Aerated Flows,
W74-06739 8B

LAKEY, L. T.
The Stack Monitoring System at the Idaho Chemical Processing Plant,
W74-06824 5A

LAMAR, J.
Pseudocolor Transformation of ERTS Imagery,
W74-06656 7C

LAMMI, J. O.
Multidisciplinary Application of ERTS-1 Data to North Carolina Natural Resource Management,
W74-06682 4C

LANGLEY, P. G.
Precision Annotation of Predetermined Primary Sampling Units on ERTS-1 MSS Images,
W74-06705 4A

LANGWAY, C. C. JR.
Chemical Profile of the Ross Ice Shelf at Little America V, Antarctica,
W74-06921 2C

LARSEN, D. P.
Modeling Algal Growth Dynamics in Shagawa Lake, Minnesota, with Comments Concerning Projected Restoration of the Lake,
W74-06563 5C

LASSITER, R. R.
Phytoplankton Population Changes and Nutrient Fluctuations in a Simple Aquatic Ecosystem Model,
W74-06571 5C

LAVANDIER, P.
Benthic Algae in Water of the Neouvielle Massif (Hautes-Pyrenees),
W74-07013 2H

LAWRENCE, R. D.
Natural Resource Inventory and Monitoring in Oregon With ERTS Imagery,
W74-06683 4A

LAYLIN, J. G.
The Law to Govern Deepsea Mining Until Superseded by International Agreement,
W74-06964 6E

LE FEVRE-LEHOERFF, G.
Distribution and Seasonal Variations of the Plankton in 'Riviere de Morlaix,' (In French),
W74-07012 5C

LECHI, G. M.
A Preliminary Evaluation of ERTS-1 Images on the Volcanic Areas of Southern Italy (NASA Contract FO-013),
W74-06691 7C

LEE, G. F.
Chemical Aspects of Bioassay Techniques for Establishing Water Quality Criteria,
W74-06747 5A

The Role of Thermocline Migration in Regulating Algal Blooms,
W74-06566 5C

LEGRAND, H. E.
Karst Hydrology--A Review,
W74-06907 2F

LEMON, R. A.
Emergency Planning for Municipal Wastewater Treatment Facilities,
W74-06577 5D

LEONARD, R.
Efficient Pricing for Urban Waste Water Renovation,
W74-06828 5D

LEPLY, L. K.
Oceanographic Mapping of Structure and Dynamics of the Northern Gulf of California by the Use of Spectral Modeling and ERTS-1,
W74-06673 2L

LEVIN, J. E.
Technical and Economic Evaluation of Cooling System Blowdown Control Techniques,
W74-06510 5D

LEVY, G. M.
Analysis of the Feasibility of an Experiment to Measure Carbon Monoxide in the Atmosphere,
W74-06917 5A

LEWIN, R. A.
Influence of Iodine on Growth and Development of the Brown Alga Ectocarpus Siliculosus in Axenic Cultures,
W74-06752 5C

LI, C-Y.
On the Solution of Transient Free-Surface Flow Problems in Porous Media by the Finite Element Method,
W74-06890 2F

LIEBLING, G. R.
Analysis of the Feasibility of an Experiment to Measure Carbon Monoxide in the Atmosphere,
W74-06917 5A

LIKENS, G. E.
The Runoff of Water and Nutrients from Watersheds Tributary to Cayuga Lake, New York,
W74-06848 5B

Water and Nutrient Budgets for Cayuga Lake, New York,
W74-06849 5B

LINDALL, W. H. JR.
Cooperative Gulf of Mexico Estuarine Inventory and Study, Florida: Phase 1 Area Description,
W74-06995 2L

LINDGREN, D. T.
Land Use of Northern Megalopolis,
W74-06630 4A

LINKLETTER, G. O.
Silver Concentrations in Antarctic Snow and Firn,
W74-06930 5A

LITTLETON, R. T.
Geothermal Development and Southwest Storage Basins,
W74-06945 4B

LONG, D. E.
Will Municipal Sewage Continue to Threaten Primary Water-Contact Recreation: An Appraisal of the 1972 Water Pollution Control Act,
W74-06969 5G

LORENZEN, M. W.
Predicting the Effects of Nutrient Diversion on Lake Recovery,
W74-06576 5C

LOSOS, B.
The Effect of Mineral Fertilization and of Carp Fry on the Composition and Dynamics of Plankton,
W74-06535 5C

LOUIE, N. A.
Quasi-Continuous Explosive Concepts for Hard Rock Excavations,
W74-06860 8H

LOVELL, H. L.
An Appraisal of Neutralization Processes to Treat Coal Mine Drainage,
W74-06512 5D

LUDWICK, J.
Correlation of ERTS Multispectral Imagery with Suspended Matter and Chlorophyll in Lower Chesapeake Bay,
W74-06667 2L

LUELING, K. H.
The Laguna de Vegueta on the Mid-Peruvian Coast and Its Fishes, Particularly Aequidens rivulatus (Guenther 1859), (In German),
W74-07007 2H

LUHDORFF, E. E. JR.
Protecting Ground Water Quality--Some Problems and Solutions,
W74-06946 5B

LUNDELIUS, M. A.
A Comparison of Land-Use Determinations Using Data from ERTS-1 and High Altitude Aircraft,
W74-06638 4A

LYONS, T. C.
Ground Water Quality Models: What They Can and Cannot Do,
W74-06944 5B

LYZENGA, D. R.
Calculations of Water Depth From ERTS-MSS Data,
W74-06681 2E

MA, T. S.
Organic Functional Group Analysis Via Gas Chromatograpy. III. Determination of Carbamates by Reaction with Alkali,
W74-06872 5A

MACGREGOR, J. M.
Mineral Nitrogen Movement into Subsoils Following Continued Annual Fertilization for Corn,
W74-06898 5B

MACKENZIE, A. J.
Performance of a Tile Drainage System: An Evaluation of a Tile Design and Management,
W74-06596 3F

MACLEOD, N. H.
Applications of Remote Sensing (ERTS) to Resource Management and Development in Sahelien Africa (Republic of Mali),
W74-06686 4A

MACNEIL, J. D.
Electron-Donor-Acceptor Complexing Reagents in the Analysis of Pesticides. VI. Influence of Structure in Detection and Identification,
W74-06871 5A

MAGOON, O. T.
Application of ERTS-1 Imagery in Coastal Studies,
W74-06709 2L

MAKHOVER, Z. M.
Automatic Monitoring and Processing of Hourly Hydrometeorological Information,
W74-06730 2B

MAKI, W. R.
Area Financing of Water Resource Development in West Minnesota,
W74-06846 6B

MALILA, W. A.
Atmospheric Effects in ERTS-1 Data, and Advanced Information Extraction Techniques,
W74-06646 7C

MALLON, H. J.
Use of ERTS-1 Data for Regional Planning in the Metropolitan Washington Council of Governments--A Short Brief,
W74-06700 4A

MALUEG, K. W.
Modeling Algal Growth Dynamics in Shagawa Lake, Minnesota, with Comments Concerning Projected Restoration of the Lake,
W74-06563 5C

MALYSHEV, A. A.
Changes in Rate and Rhythms of Development of Perennial Polycarpic Plants at Different Altitudes in Humid High Mountains, (In Russian),
W74-07014 2I

MANAHAN, S. E.
An Atomic Absorption Analysis Method for Cyanide,
W74-06999 5A

Atomic Absorption Detector for Liquid-Liquid Chromatography,
W74-06998 5A

MANZ, P.
A Multichannel Syringe Pump for Steady State Flow in Soil Columns,
W74-07028 2G

MARCANTONATOS, M.
Phosphorimetric Determination of Traces of Boron,
W74-06755 5A

MARINO, M. A.
A Discrete Space Continuous Time Modeling Approach to Nonsteady Flow in a Leaky Aquifer System of Finite Configuration,
W74-06887 2F

MARK, H. B. JR.
A Simple, Rapid Method for the Determination of Trace Mercury in Fish Via Neutron Activation Analysis,
W74-06788 5A

MARMELSTEIN, A. D.
Application of ERTS-1 Imagery to the Harvest Model of the U.S. Menhaden Fishery,
W74-06678 2L

MARRS, R. W.
Remote Sensing Applied to Land-Use Studies in Wyoming,
W74-06631 4A

MARSDEN, J. R.
Production Function Theory and the Optimal Design of Waste Treatment Facilities,
W74-06997 6D

MARSHALL, G. R.
Intermittent Sand Filtration to Upgrade Existing Wastewater Treatment Facilities,
W74-06506 5D

MARTEL, R. J.
Water Supply Management Alternatives for Rhode Island,
W74-06827 6D

MARTIN, I. F.
Absence of Oxygen-Evolving Capacity in Dark-Grown Chlorella: The Photoactivation of Oxygen-Evolving Centers,
W74-06544 5C

MARTIN, T. C.
An Examination of Three Strains of the Blue-Green Algal Genus, Fremyella,
W74-06759 5C

MASTROMATTEO, E.
Mercury in Humans in the Great Lakes Region,
W74-06783 5B

MATHIESON, A. C.
Phytoplankton Populations in Relation to Different Trophic Levels at Winnipesaukee Lake, New Hampshire, U.S.A.,
W74-06529 5C

MATIS, J.
Interaction of Temperature and Copper Ions as Orienting Stimuli in the Locomotor Behavior of the Goldfish (Carassius auratus),
W74-06769 5C

MATSUNO, K.
An Epidemiological Study on Clonorchiasis in Kyoto City, (In Japanese),
W74-07050 5C

MATTHEW, F. L.
Demonstration of a Non-Aqueous Sewage Disposal System,
W74-06519 5D

MATULEWICH, V. A.
Distribution of Autotrophic Nitrifying Bacteria in a Polluted Stream,
W74-06834 5C

MAUGHAN, P. M.
Application of ERTS-1 Imagery to the Harvest Model of the U.S. Menhaden Fishery,
W74-06678 2L

MAUL, G. A.
Remote Sensing of Ocean Currents using ERTS Imagery,
W74-06675 2L

MAUSEL, P.
Preparation of Urban Land Use Inventories by Machine-Processing of ERTS MSS Data,
W74-06637 4A

MAY, G. A.
Mapping of Agricultural Land Use from ERTS-1 Digital Data,
W74-06640 4A

MCCARTHY, M. M.
The Use of ERTS-1 Data for the Inventory of Critical Land Resources for Regional Land Use Planning,
W74-06634 4A

MCCOMAS, M. R.
Some Aspects of Phosphorus Dynamics of the Twin Lakes Watershed,
W74-06565 5C

MCCOWN, R. L.
Evaluation of Influence of Available Soil Water Storage Capacity on Growing Season Length and Yield of Tropical Pastures Using Simple Water Balance Models,
W74-06927 3F

MCDONALD, I. J.
Growth of Streptococcus cremoris and Streptococcus lactis in a Chemostat. Production of Cells and Survival of Bacteria during Frozen Storage,
W74-06762 5C

MCELROY III, F. T. R.
Stormwater Runoff Quality for Urban and Semi Urban/Rural Watersheds,
W74-06851 5B

MCEWEN, R. B.
Progress in Cartography, Eros Program,
W74-06621 7C

MCGAUHEY, P. H.
Synopsis of Workshop on Modeling of the Eutrophication Process,
W74-06561 5C

MCHENRY, J. R.
Estimating Soil Erosion from the Redistribution of Fallout Cs-137,
W74-06901 2J

Reservoir Sedimentation,
W74-06883 2J

MCKIM, H. L.
Sediment Distribution and Coastal Processes in Cook Inlet, Alaska,
W74-06671 2L

MCKNIGHT, J.
First Look Analyses of Five Cycles of ERTS-1 Imagery Over County of Los Angeles: Assessment of Data Utility for Urban Development and Regional Planning,
W74-06636 4A

MCLAUGHLIN, D. K.
Distribution and Mixing of Inflow into Stratified Lakes: A Hydraulic Model Study, (Phase I),
W74-06618 2H

MCNULTY, J. K.
Cooperative Gulf of Mexico Estuarine Inventory and Study, Florida: Phase 1 Area Description,
W74-06995 2L

MCSAVENEY, M. J.
Folding of Cold Ice,
W74-06928 2C

MELOAN, C. E.
The Selective Removal of Nitrate and Nitrite from Polluted Water,
W74-06833 5G

MERANGER, J. C.
Mercury Content of Canadian Foods and Cereals Determined by Different Methods,
W74-06787 5A

MERCIER, H. T.
Modeling Algal Growth Dynamics in Shagawa Lake, Minnesota, with Comments Concerning Projected Restoration of the Lake,
W74-06563 5C

MEREDITH, D. D.
Network Analysis of Conjunctively Operated Ground Water-Surface Water Systems,
W74-06504 4B

MERIFIELD, P. M.
Pseudocolor Transformation of ERTS Imagery,
W74-06656 7C

MESKHETELI, A. V.
The Problem of Direct Groundwater Discharge to the Seas,
W74-06881 2F

IEYER, M.
ERTS-1 Applications to Minnesota Land Use Mapping,
W74-06632 4A

IEYERS, J. T.
The Mercury Content of Prehistoric Fish,
W74-07026 5A

IDDENDORFF, I. G.
Survival in Maturation Ponds of Coliform Bacteria With Transferable Drug Resistance,
W74-06748 5C

IDDLEBROOKS, E. J.
Biological Response to Detergent and Nondetergent Phosphorus in Sewage - Part II,
W74-06873 5C

Intermittent Sand Filtration to Upgrade Existing Wastewater Treatment Facilities,
W74-06506 5D

IEGE, J.
Climatic Data of the High Altitude Meteorological Stations of the Geneva Region For 1970, (In French),
W74-06532 7C

IETTINEN, J. K.
Mercury as a Hydrospheric Pollutant II. Biological Half-Time of Methyl Mercury in Four Mediterranean Species: A Fish, a Crab, and Two Molluscs,
W74-06767 5C

IKAMI, H.
Yamadaphycus, a New Genus of the Delesseriaceae (Rhodophyta),
W74-06753 5A

ILLER, E. M.
Flood of October 1972 at Petersburg and Colonial Heights, Virginia,
W74-06957 7C

ILLER, J. M.
A Multidisciplinary Survey for the Management of Alaskan Resources Utilizing ERTS Imagery,
W74-06633 4A

ILLER, J. R.
Recent Developments in the Law of the Sea IV: A Synopsis,
W74-06965 6E

IYAMOTO, S.
Nitric Oxide Sorption by Calcareous Soils: II. Effect of Moisture on Capacity, Rate, and Sorption Products,
W74-06894 5B

OE, D. L.
Hydraulics of a Center Pivot System,
W74-06583 3F

OLDENHAUER, W. C.
Effect of Varying the On-Off Time of Rainfall Simulator Nozzles on Surface Sealing and Intake Rate,
W74-06903 2J

ONAHAN, T. J.
Lead Inhibition of Hormotila blennista (Chlorophyceae, Chlorococcales),
W74-06761 5C

ONNIER, D.
Phosphorimetric Determination of Traces of Boron,
W74-06755 5A

MONTHOUX, O.
Climatic Data of the High Altitude Meteorological Stations of the Geneva Region For 1970, (In French),
W74-06532 7C

MONTOUR, M.
Cancellation of Spectrophotometer System Characteristics Using an Analog Computer,
W74-06874 2K

MOORE, C. V.
A Simulation Approach to Recreation Planning (A Case of Changing Quality),
W74-06996 6B

MOORE, S. F.
A Simulation Approach to Recreation Planning (A Case of Changing Quality),
W74-06996 6B

MORETTI, P. M.
Distribution and Mixing of Inflow into Stratified Lakes: A Hydraulic Model Study, (Phase I),
W74-06618 2H

MORIN, G.
Determination of the Confidence Intervals of the Pearson III Law Using Order Statistics (Determination des intervalles de confiance de la loi Pearson III par les statistiques d'ordre),
W74-06906 2E

MORISAWA, S.
On the Selection of a Ground Disposal Site by Sensitivity Analysis,
W74-06858 5B

MORRIS, T. R.
Radar Studies of Urban Precipitation Anomaly,
W74-06938 2B

MOSS, B.
The Influence of Environmental Factors on the Distribution of Freshwater Algae: An Experimental Study. III. Effects of Temperature, Vitamin Requirements and Inorganic Nitrogen Compounds on Growth,
W74-06549 5C

MOTOKI, M.
Observations on Gambusia affinis Introduced into Tokushima as a Natural Enemy of Mosquitoes, (In Japanese),
W74-07048 5G

MUKHERJEE, A. K.
Ecological Aspects Along the Shores of the Burabalanga Tidal Estuary Balasore District, Orissa State,
W74-07049 2L

MULLIGAN, H. F.
Basic Research in the Aquatic Environment: Effects of Eutrophication on Phytoplankton Populations and Selected Species of Aquatic Vascular Plants,
W74-06835 5C

MURFEE, G.
Hypolimnion Aeration with Commercial Oxygen - Vol. I - Dynamics of Bubble Plume,
W74-06525 5D

Hypolimnion Aeration with Commercial Oxygen - Vol. II - Bubble Plume Gas Transfer,
W74-06526 5D

MURPHY, A. W.
The National Environmental Policy Act and the Licensing Process: Environmentalist Magna Carta or Agency Coup de Grace,
W74-06963 5G

MURPHY, D. J.
Remote Sensing Applied to Land-Use Studies in Wyoming,
W74-06631 4A

MURPHY, K. B.
Balantidiasis Outbreak in Truk,
W74-07031 5C

MURPHY, L. S.
Quality Improvement of Feedlot Lagoon Water by Percolation Through Soil Under Native Pasture,
W74-06830 5D

MUSICK, J. T.
Wheat and Grain Sorghum Irrigation in a Wide Bed-Furrow System,
W74-06580 3F

MUZIK, I.
Laboratory Experiments with Surface Runoff,
W74-06737 2E

MYERS, V. I.
Identification of Soil Associations in Western South Dakota on ERTS-1 Imagery,
W74-06629 2G

MYKLESTAD, S.
Studies on the Phytoplankton Ecology of the Trondheimsfjord. I. The Chemical Composition of Phytoplankton Populations,
W74-06545 5C

NAGAHANA, M.
An Epidemiological Study on Clonorchiasis in Kyoto City, (In Japanese),
W74-07050 5C

NALEPKA, R. F.
Atmospheric Effects in ERTS-1 Data, and Advanced Information Extraction Techniques,
W74-06646 7C

NAMBA, Y.
Investigation of Brewing Water Treatment,
W74-07023 5A

NARDOZZI, A. D.
Information Resource: Final Report Water Pollution Control in Water Utilities,
W74-06527 5F

NAZAROVA, I. V.
Automatic Monitoring of Daily Results of Basic Meteorological Observations,
W74-06727 2B

NELSON, D. J.
Environmental Sciences Division Annual Progress Report for Period Ending September 30, 1973,
W74-06826 5B

NELSON, D. W.
Denitrification as a Pathway for Nitrate Removal in Aquatic Systems,
W74-06612 5B

NESHEIM, E. E.
Demonstration of a Non-Aqueous Sewage Disposal System,
W74-06519 5D

NICHOLS, J. D.
Combining Human and Computer Interpretation Capabilities to Analyze ERTS Imagery,
W74-06658 7C

NICHOLSON, D. G.
Determination of Mercury in Biological Tissues,
W74-06790 5A

NIEMANN, B. J. JR.
The Use of ERTS-1 Data for the Inventory of Critical Land Resources for Regional Land Use Planning,
W74-06634 4A

NORDYKE, M. D.
A Review of Soviet Data on the Peaceful Uses of Nuclear Explosions,
W74-06823 6B

NORUM, E. B.
Solute Movement Through Disturbed and Undisturbed Soil Cores,
W74-06935 5B

NOSE, T.
Qualitative Requirements of Young Eels Anguilla japonica for Water-Soluble Vitamins and Their Deficiency Symptoms,
W74-07006 5C

NUNN, J. R.
A Large Undisturbed, Weighing Lysimeter for Grassland Studies,
W74-06581 2G

NUNUA, N. SH.
Atlantic Sturgeon (Acipenser sturio) in Waters of Georgia, (In Russian),
W74-07016 2H

O'FARRELL, T. P.
Nitrogen Removal by Ammonia Stripping,
W74-06842 5D

Physical-Chemical Treatment of Raw Municipal Wastewater,
W74-06509 5D

O'NEAL, M. V.
Biological Treatment of Feedlot Runoff,
W74-06847 5D

ODA, K.
An Epidemiological Study on Clonorchiasis in Kyoto City, (In Japanese),
W74-07050 5C

OGINO, H.
Investigation of Brewing Water Treatment,
W74-07023 5A

OKUBO, S.
Observations on Gambusia affinis Introduced into Tokushima as a Natural Enemy of Mosquitoes, (In Japanese),
W74-07048 5G

OLAH, J.
Studies on the Photosynthetic Pigments and Their Decomposition in the Sediment of Lake Balaton and Lake Belso,
W74-06741 5C

ONSTAD, C. A.
Soil and Water Losses as Affected by Tillage Practices,
W74-06595 3F

ORLOB, G. T.
Ground Water Quality Models: What They Can and Cannot Do,
W74-06944 5B

OSMERA, S.
Annual Cycle of Zooplankton in Backwaters of the Flood Area of the Dyje,
W74-06536 5C

OTLEY, M.
Applicability of ERTS-1 Imagery to the Study of Suspended Sediment and Aquatic Fronts,
W74-06666 2L

OVSYANNIKOV, V. V.
Automatic Monitoring and Processing of Hourly Hydrometeorological Information,
W74-06730 2B

OWENS, L. B.
Denitrification as a Pathway for Nitrate Removal in Aquatic Systems,
W74-06612 5B

OWENS, M.
Sources of Oxygen in Estuaries,
W74-06539 5C

OWENS, M. S.
Analysis of Iodine in Antarctic Snow,
W74-06929 5B

OWOSEYE, A. J.
An Ecological Study of Vellozia schnitzleinia, a Drought-Enduring Plant of Northern Nigeria,
W74-06768 2I

PADAN, E.
Cyanophages - Viruses Attacking Blue-Green Algae,
W74-06754 5C

PAGE, G. L. JR.
Emergency Planning for Municipal Wastewater Treatment Facilities,
W74-06577 5D

Maintenance Management Systems for Municipal Wastewater Facilities,
W74-06579 5D

Start-Up of Municipal Wastewater Treatment Facilities,
W74-06578 5D

PAINE, D. P.
Natural Resource Inventory and Monitoring in Oregon With ERTS Imagery,
W74-06683 4A

PAINTER, J. E.
Thermal Surveillance of Cascade Range Volcanoes Using ERTS-1 Multispectral Scanner, Aircraft Imaging Systems, and Ground-Based Data Communication Platforms,
W74-06692 7C

PAMATMAT, M. M.
Oxidation of Organic Matter in Sediments,
W74-06528 5C

PARIS, J. F.
Significant Techniques in the Processing and Interpretation of ERTS-1 Data,
W74-06652 7C

Unsupervised Classification and Areal Measurement of Land and Water Coastal Features on the Texas Coast,
W74-06706 2L

PARISI, V.
Predation on the Freshwater Bivalve Unio pictorum by the Rat, Rattus norvegicus, (In Italian),
W74-07008 2I

PARIZEK, R. R.
Groundwater Tracing with Post Sampling Activation Analysis,
W74-06889 2F

PARK, R. A.
Aquatic Modeling in the Eastern Deciduous Forest Biome, U S -International Biological Program,
W74-06572 5C

PARKER, R. A.
Capabilities and Limitations of Nutrient-Plankton Model,
W74-06570 5C

PARLANGE, J-Y.
Gravity Correction Due to a Variation of Pressure Head Within a Cavity,
W74-06734 2G

One-Dimensional Vertical Infiltration,
W74-07034 2G

Soil Moisture Distribution During Two-Dimensional Absorption from a Cylindrical Source,
W74-07042 2G

PATRICK, W. H. JR.
Transformation of Iron in a Waterlogged Soil as Influenced by Redox Potential and pH,
W74-06934 5B

PATTEN, B. C.
Need for an Ecosystem Perspective in Eutrophication Modeling,
W74-06567 5C

PAWLAK, L.
Dynamics of Changes in the Concentration of Fluorine Compounds Emitted by the Phosphorus Fertilizer Manufacturing Establishment in Pozan, and Their Influence on Surface and Underground Waters and on the Atmosphere Within th e Limits of the City of Poznan, (In Polish),
W74-07021 5B

PEACOCK, K.
A Technique for Correcting ERTS Data for Solar and Atmospheric Effects,
W74-06648 7C

PEASE, R. W.
ERTS-1 Image Enhancement by Optically Combining Density Slices,
W74-06655 7C

PENCE, D. T.
The Stack Monitoring System at the Idaho Chemical Processing Plant,
W74-06824 5A

PERRIER, E. R.
An Isokinetic Sampler for Wind Erosible Silt and Clay Particle Measurement,
W74-06902 2J

Performance of a Tile Drainage System: An Evaluation of a Tile Design and Management,
W74-06596 3F

PETERSON, G. W.
Mapping of Agricultural Land Use from ERTS-1 Digital Data,
W74-06640 4A

PETRONE, A.
Sediment Distribution and Coastal Processes in Cook Inlet, Alaska,
W74-06671 2L

PILE, D. R.
Determination of Land Use in Minnesota by Automatic Interpretation of ERTS MSS Data,
W74-06702 4A

PILLAY, K. K. S.
Preparation of Biological Samples for Neutron Activation Analysis of Mercury,
W74-06786 5A

PINGRY, D. E.
Production Function Theory and the Optimal Design of Waste Treatment Facilities,
W74-06997 6D

PINTO, A. P.
Ammonia-Nitrogen Removal by Breakpoint Chlorination,
W74-06838 5D

Physical-Chemical Treatment of Raw Municipal Wastewater,
W74-06509 5D

PLACE, J. L.
Change in Land Use in the Phoenix (1:250,000) Quadrangle, Arizona between 1970 and 1972: Successful Use of a Proposed Land Use Classification System,
W74-06622 4A

POHLAND, F. G.
Buffer Capacity in Aquatic Ecosystems,
W74-06829 5B

POLCYN, F. C.
Calculations of Water Depth From ERTS-MSS Data,
W74-06681 2E

POLISHCHUK, A. I.
Automatic Processing of Rainfall Data,
W74-06732 2B

POPOVSKA, P.
Contribution to the Investigation of Odours in Water,
W74-06538 5C

PORCELLA, D. B.
Activity Analysis and the Management of Resources: A Model for Control of Eutrophication,
W74-06574 5C

Biological Response to Detergent and Nondetergent Phosphorus in Sewage - Part II,
W74-06873 5C

Component Description and Analysis of Environmental Systems: Oxygen Utilization in Aquatic Microcosms,
W74-06575 5C

POTASH, M.
Materials Input of Lake Champlain: A Synoptic Appraisal,
W74-06882 2H

POTTER, J. F.
Significant Techniques in the Processing and Interpretation of ERTS-1 Data,
W74-06652 7C

POULSON, T. L.
Multi-Nutrient Dynamic Models of Algal Growth and Species Competition in Eutrophic Lakes,
W74-06568 5C

POULTON, C. E.
Natural Resource Inventory and Monitoring in Oregon With ERTS Imagery,
W74-06683 4A

POWERS, W. L.
Quality Improvement of Feedlot Lagoon Water by Percolation Through Soil Under Native Pasture,
W74-06830 5D

PRAGER, J. C.
Using Artemia to Assay Oil Dispersant Toxicities,
W74-06877 5A

PRANDLE, D.
Numerical Model of St. Lawrence River Estuary,
W74-06738 2L

PRATHER, R. J.
Nitric Oxide Sorption by Calcareous Soils: II. Effect of Moisture on Capacity, Rate, and Sorption Products,
W74-06894 5B

PRATT, P. F.
Sludge Disposal to Land,
W74-06950 5B

PREBLE, D.
Thermal Surveillance of Cascade Range Volcanoes Using ERTS-1 Multispectral Scanner, Aircraft Imaging Systems, and Ground-Based Data Communication Platforms,
W74-06692 7C

PRESSLEY, T. A.
Ammonia-Nitrogen Removal by Breakpoint Chlorination,
W74-06838 5D

Laboratory Ozonation of Muncipal Wastewaters,
W74-06840 5D

PRESTIN, S.
ERTS-1 Applications to Minnesota Land Use Mapping,
W74-06632 4A

PRINCE, H. H.
Survival and Reproduction of Ring-Necked Pheasants Consuming Two Mercurial Fungicides,
W74-06808 5C

RADER, R. D.
Start-Up of Municipal Wastewater Treatment Facilities,
W74-06578 5D

RAJE, S.
First Look Analyses of Five Cycles of ERTS-1 Imagery Over County of Los Angeles: Assessment of Data Utility for Urban Development and Regional Planning,
W74-06636 4A

RAO, T. A.
Ecological Aspects Along the Shores of the Burabalanga Tidal Estuary Balasore District, Orissa State,
W74-07049 2L

RAVERA, O.
Radioecological Researches in Freshwater and Terrestrial Environment, (In Italian),
W74-07009 5B

RAVINA, I.
Thermodynamics of Ion Exchange,
W74-06936 2G

RAYYAN, F.
Hypolimnion Aeration with Commercial Oxygen - Vol. I - Dynamics of Bubble Plume,
W74-06525 5D

Hypolimnion Aeration with Commercial Oxygen - Vol. II - Bubble Plume Gas Transfer,
W74-06526 5D

REED, L.
Utilization of ERTS-1 Data to Monitor and Classify Eutrophication of Inland Lakes,
W74-06698 5A

REEVES, C. A.
Unsupervised Classification and Areal Measurement of Land and Water Coastal Features on the Texas Coast,
W74-06706 2L

REGINATO, R. J.
Gamma Radiation Measurements of Bulk Density Changes in a Soil Pedon Following Irrigation,
W74-06715 2G

REHDER, J. B.
Geographic Applications of ERTS-1 Data to Landscape Change,
W74-06628 4A

REICHMAN, G. A.
Deep Plowing and Chemical Amendment Effect on a Sodic Claypan Soil,
W74-06598 3F

REIMERS, P. E.
Social Interaction Between Juvenile Coho (Oncorhynchus kisutch) and Fall Chinook Salmon (O. tshawytscha) in Sixes River, Oregon,
W74-07040 2I

REIMNITZ, E.
New Insights into the Influence of Ice on the Coastal Marine Environment of the Beaufort Sea, Alaska,
W74-06669 2C

REITER, B.
Growth of Streptococcus cremoris and Streptococcus lactis in a Chemostat. Production of Cells and Survival of Bacteria during Frozen Storage,
W74-06762 5C

REMY, M. H.
Environmental Quality: As an Objective of Ground Water Management,
W74-06956 5B

RICE, C. E.
Effect of Roughness Elements on Hydraulic Resistance for Overland Flow,
W74-06594 8B

RICHARDSON, C. W.
Changes in Water Yield of Small Watersheds by Agricultural Practices,
W74-06597 2E

RIFMAN, S. S.
Digital Rectification of ERTS Multispectral Imagery,
W74-06650 7C

RILEY, E. L.
Air Quality Indices from ERTS-1 MSS Information, PR 568,
W74-06696 5A

RITCHIE, J. C.
Estimating Soil Erosion from the Redistribution of Fallout Cs-137,
W74-06901 2J

RITCHIE, J. T.
Field Measurement of Evaporation from Soil Shrinkage Cracks,
W74-06900 2D

ROAN, S. G.
Laboratory Ozonation of Muncipal Wastewaters,
W74-06840 5D

ROBISON, J. H.
Availability of Ground Water in the Grants Pass Area, Josephine County, Oregon,
W74-06959 7C

ROCHE, C.
Method of Preparing Washed Suspensions of Anaerobic Bacteria for Metabolic Studies,
W74-06875 5A

ROCK, C. A.
Long-Term Lake Recovery Related to Available Phosphorus,
W74-06562 5C

ROCK, F. C.
A Radioactive Isotopic Characterization of the Environment Near Wiscasset, Maine: A Preoperational Survey in the Vicinity of the Maine Yankee Atomic Power Plant,
W74-06855 5A

ROGERS, P. A.
Current State Board Activities in Ground Water Quality Management,
W74-06953 5G

ROGERS, P. L.
Growth of Streptococcus cremoris and Streptococcus lactis in a Chemostat. Production of Cells and Survival of Bacteria during Frozen Storage,
W74-06762 5C

ROGERS, R. H.
A Technique for Correcting ERTS Data for Solar and Atmospheric Effects,
W74-06648 7C

ROLLER, N. E. G.
Terrain Classification Maps of Yellowstone National Park,
W74-06645 4A

ROSS, D. S.
Experimental Masking of RBV Images to Reduce Stationary Residual Inaccuracies in Radiometric Correction,
W74-06649 7C

Water Depth Estimation with ERTS-1 Imagery,
W74-06680 2L

ROTTSCHAFTER, J. M.
A Simple, Rapid Method for the Determination of Trace Mercury in Fish Via Neutron Activation Analysis,
W74-06788 5A

ROZMAJZLOVA-REHACKOVA, V.
Survey of Reservoirs in Bohemia and Their Water Quality,
W74-06537 5C

RUDD, T. R.
The Impact of Slimes-Dam Formation on Water Quality and Pollution,
W74-06604 5B

RUGGLES, F. H. JR.
Plume Development in Long Island Sound Observed by Remote Sensing (ERTS-1),
W74-06668 2L

RUZICKA, J.
Selectrode - the Universal Ion-Selective Electrode. Part VI. The Calcium (II) Selectrode Employing a New Ion Exchanger in a Nonporous Membrane and a Solid-State Reference System,
W74-06764 5A

Selectrode - the Universal Ion-Selective Electrode. Part VII. A Valinomycin-Based Potassium Electrode with Nonporous Polymer Membrane and Solid-State Inner Reference System,
W74-06765 5A

SABELS, B. E.
Digital Interactive Image Analysis by Array Processing,
W74-06657 7C

SAKHLEH, S. N.
Sensitivity of Surface Runoff to Variations of Watershed Parameters in Small Urban Areas-A Kinematic Model,
W74-06853 4C

SAKSHAUG, E.
Studies on the Phytoplankton Ecology of the Trondheimsfjord. I. The Chemical Composition of Phytoplankton Populations,
W74-06545 5C

SALEH, Y. E.
Competitive Saprophytic Colonization by Fusarium oxysporum F. Sp. vasinfectum,
W74-07011 3F

SANAK, J.
PB-210 Concentration in Ice Measured at South Pole Station,
W74-06932 5A

SANBORN, H.
Oxidation of Organic Matter in Sediments,
W74-06528 5C

SANDERS, D. C.
Use of Waste Heat for Soil Warming in North Carolina,
W74-07000 5D

SANDERS, W. M. III.
A Physical Model for Simulation of Aquatic Ecosystems,
W74-06573 5C

SANDOVAL, F. M.
Deep Plowing and Chemical Amendment Effect on a Sodic Claypan Soil,
W74-06598 3F

SANFORD, W. W.
An Ecological Study of Vellozia schnitzleinia, a Drought-Enduring Plant of Northern Nigeria,
W74-06768 2I

SAPIO, J. P.
A Universal Ion-Selective Electrode Based on Graphite Paste,
W74-06758 2K

SASA, M.
Observations on Gambusia affinis Introduced into Tokushima as a Natural Enemy of Mosquitoes. (In Japanese).
W74-07048 5G

SATO, H.
Observations on Gambusia affinis Introduced into Tokushima as a Natural Enemy of Mosquitoes. (In Japanese).
W74-07048 5G

SATTINGER, I. J.
Digital Land Use Mapping in Oakland County, Michigan,
W74-06639 4A

SAVAGE, T.
Florida Mangroves as Shoreline Stabilizers.
W74-07047 4A

SCAVIA, D.
Aquatic Modeling in the Eastern Deciduous Forest Biome. U S -International Biological Program,
W74-06572 5C

SCHASTNAYA, A. S.
Gray Forest Soils in the Spruce-Fir Forests in the Sub-Ural Region (Vyatka-Kama Province). (In Russian),
W74-07004 2G

SCHEIDEGGER, A. E.
Hydrogeomorphology,
W74-06891 2A

SCHIEMER, E. W.
The CBI Pogo Stick Corer,
W74-06923 7B

SCHMOTZER, J. K.
Groundwater Tracing with Post Sampling Activation Analysis,
W74-06889 2F

SCHROER, F. W.
Solute Movement Through Disturbed and Undisturbed Soil Cores,
W74-06935 5B

SCHUBEL, J. R.
The CBI Pogo Stick Corer,
W74-06923 7B

Some Comments on Seagrasses and Sedimentary Processes,
W74-06922 2J

SCHULERT, A. R.
Determination of Mercury in Biological Tissues,
W74-06790 5A

SCHWAB, G. O.
Comparison of Strength Test Methods for Corrugated Plastic Drainage Tubing,
W74-06602 8A

SCHWEITZER, S.
Conservation Equations for Nonisothermal Flow in Porous Media,
W74-06892 2F

SEAGRAN, H. L.
Survey of Mercury Concentrations in Fishes of Lakes St. Clair, Erie, and Huron,
W74-06775 5B

SEITZ, W. R.
Evaluation of a Microwave-Induced Plasma Spectrometer for Trace Analysis,
W74-06841 5A

SELIGER, H. H.
Endogenous and Photoperiodic Diurnal Rhythms of in Vivo Light Absorption and Scattering in the Green Alga Ulva Lactuca L.,
W74-06547 5C

SELLMAN, B.
Land Resources Survey for the State of Michigan,
W74-06644 4A

SENG, W. C.
Recovery of Fatty Materials from Edible Oil Refinery Effluents,
W74-06514 5D

SEREBRENY, S. M.
Analysis of ERTS Imagery Using Special Electronic Viewing/Measuring Equipment,
W74-06659 7C

SEYDEL, I. S.
Distribution and Circulation of Arsenic Through Water, Organisms and Sediments of Lake Michigan,
W74-07046 5B

SHANMUGAM, K. S.
Combined Spectral and Spatial Processing of ERTS Imagery Data,
W74-06660 7C

SHARMA, G. D.
ERTS-1 Observations of Sea Surface Circulation and Sediment Transport, Cook Inlet, Alaska,
W74-06670 2L

SHAW, R. H.
Dry and Wet, July-August Rainfall Areas in Iowa,
W74-07045 2B

SHIH, S-F.
Application of Monte Carlo Method to Soil Water Movement,
W74-06599 2G

SHILO, M.
Cyanophages - Viruses Attacking Blue-Green Algae,
W74-06754 5C

SHIRGUR, G. A.
Observations on Comparative Propensities for Carp Fry Destruction by Adults and Last Instar Preimaginal Stages of Predatory Aquatic Insects,
W74-07044 2I

SHIRLEY, R. L.
Processing, Chemical Composition and Nutritive Value of Aquatic Weeds,
W74-06502 4A

SHULL, H. H.
Performance of a Tile Drainage System: An Evaluation of a Tile Design and Management,
W74-06596 3F

SHULL, R. D.
Quantitative Methods for Preliminary Design of Water Quality Surveillance Systems,
W74-06885 5A

SIGAFOOS, R. S.
Recent Activity of Glaciers of Mount Rainier, Washington,
W74-06713 2C

SILIN, N. A.
The Influence of Clay Fraction on the Basic Parameters of the Hydro-Transport of Fine Free-Flowing Materials,
W74-06914 8B

SIM, L. K.
Interception Loss in the Humid Forested Areas (With Special Reference to Sungai Lui Catchment, West Malaysia),
W74-07015 2D

SIMONSON, G. H.
Natural Resource Inventory and Monitoring in Oregon With ERTS Imagery,
W74-06683 4A

SIMPSON, R. B.
Land Use of Northern Megalopolis,
W74-06630 4A

SKAGGS, R. W.
Use of Waste Heat for Soil Warming in North Carolina,
W74-07000 5D

SKRIPACHEV, V. V.
On Squire's Theorem in the Study of Hydrodynamic Stability of Plane-Parallel Flows of Incompressible Fluids about Deforming Boundaries,
W74-06911 8B

SLATYER, R. O.
Energy Flows in the Biosphere: The Impact of Man,
W74-07043 2B

SLAUGHTER, C. W.
An Expanding Role for Subarctic Watershed Research,
W74-06884 4D

SLAUGHTER, T. H.
Seasonal Changes of Littoral Transport and Beach Width and Resulting Effect on Protective Structures,
W74-06664 2L

SLONEKER, L. L.
Effect of Varying the On-Off Time of Rainfall Simulator Nozzles on Surface Sealing and Intake Rate,
W74-06903 2J

SMITH, C. L.
Digital Control Algorithms. Part III. Tuning PI and PID Controllers,
W74-06750 7C

SMITH, C. W.
A Radioactive Isotopic Characterization of the Environment Near Wiscasset, Maine: A Preoperational Survey in the Vicinity of the Maine Yankee Atomic Power Plant,
W74-06855 5A

SMITH, E. F.
A Computerized Solution for Bench Leveling Design,
W74-06600 4A

SMITH, R. G.
Dose-Response Relationship Associated with Known Mercury Absorption at Low Dose Levels of Inorganic Mercury,
W74-06800 5C

Methods of Analysis for Mercury and its Compounds: A Review,
W74-06785 5A

SMITH, V. E.
Utilization of ERTS-1 Data to Monitor and Classify Eutrophication of Inland Lakes,
W74-06698 5A

SNOW, N. B.
The Effect of Season and Animal Size on the Caloric Content of Daphnia pulicaria Forbes,
W74-07038 2H

SNYDER, J. H.
A Simulation Approach to Recreation Planning (A Case of Changing Quality),
W74-06996 6B

SOMERHALDER, B. R.
Pasture Irrigation with a Center-Pivot Sprinkler System,
W74-06601 3F

SOMSAK, L.
Natural Phytocenoses of the River Littoral in the Lower Reaches of the River Hron,
W74-06550 2I

SORIBE, F. I.
Comparison of Strength Test Methods for Corrugated Plastic Drainage Tubing,
W74-06602 8A

SPEECE, R. E.
Hypolimnion Aeration with Commercial Oxygen - Vol. I - Dynamics of Bubble Plume,
W74-06525 5D

Hypolimnion Aeration with Commercial Oxygen - Vol. II - Bubble Plume Gas Transfer,
W74-06526 5D

SPENCER, B.
Design Criteria for Irrigation Systems with Complex Pipe Loops,
W74-06585 3F

SPRABERRY, J. A.
Estimating Soil Erosion from the Redistribution of Fallout Cs-137,
W74-06901 2J

SPYERS-DURAN, P.
Observations of the Cloud Nucleus Concentration Around the St. Louis Urban Complex,
W74-06939 2B

Upwind and Downwind Cloud-Base Microstructure,
W74-06940 2B

SRIVASTAVA, R. C.
Electro-Osmotic Effects in a Bentonite-Water System,
W74-06910 2K

SRNA, R.
Applicability of ERTS-1 Imagery to the Study of Suspended Sediment and Aquatic Fronts,
W74-06666 2L

ST, G.
Cancellation of Spectrophotometer System Characteristics Using an Analog Computer,
W74-06874 2K

STAMBERG, J. B.
Activated Sludge Treatment Systems with Oxygen,
W74-06839 5D

STANFORD, G.
Nitrogen Mineralization-Water Relations in Soils,
W74-06897 5B

STARMACH, K.
Water Pollution and Biology, (In Polish),
W74-07020 5B

STAUFFER, R. E.
The Role of Thermocline Migration in Regulating Algal Blooms,
W74-06566 5C

STEFANSON, R. C.
Effect of Plant Growth and Form of Nitrogen Fertilizer on Dentrification from Four South Australian Soils,
W74-07039 2G

STEFFENS, F. E.
Sample Sizes Required for Two-Sided Comparisons of Two Treatments With a Control,
W74-06746 7C

STEIN, R. A.
Social Interaction Between Juvenile Coho (Oncorhynchus kisutch) and Fall Chinook Salmon (O. tshawytscha) in Sixes River, Oregon,
W74-07040 2I

STEUHSER, A. G.
Treatment of Domestic Wastewater and NSSC Pulp and Paper Mill Wastes,
W74-06513 5D

STEWART, W. K.
The Binding of Inorganic and Organic Mercury Compounds (Hg 203) to Constituents of Normal Human Blood,
W74-06803 5C

STICKEL, L. F.
Mercury in Wild Animals, Lake St. Clair, 1970,
W74-06776 5B

STRANGE, J. R.
Utilization of Phosphorus by Phytoplankton in Phosphorus-Rich Environments,
W74-06611 5C

STRELTSOVA, T. D.
On the Leakage Assumption Applied to Equations of Groundwater Flow,
W74-06888 2F

STRINGFIELD, V. T.
Karst Hydrology--A Review,
W74-06907 2F

STRONG, A. E.
ERTS-1 Observes Algal Bloom in Lake Erie and Utah Lake,
W74-06699 5A

STRUXNESS, E. G.
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W74-06826 5B

STRYKER, S.
Air Quality Indices from ERTS-1 MSS Information, PR 568,
W74-06696 5A

SUMIKAWA, T.
Investigation of Brewing Water Treatment,
W74-07023 5A

SURTEES, G.
Control of Mosquitoes Breeding in Rice-Fields,
W74-07041 5G

SUTHERLAND, R. B.
Mercury in Humans in the Great Lakes Region,
W74-06783 5B

SWEDMARK, M.
Effects of Oil Dispersants and Oil Emulsions on Marine Animals,
W74-06745 5C

SWEET, D. C.
Resource Management Implications of ERTS-1 Data to Ohio,
W74-06684 4A

SYKES, J. E.
Cooperative Gulf of Mexico Estuarine Inventory and Study, Florida: Phase 1 Area Description,
W74-06995 2L

SZEKIELDA, K-H.
Biomass in the Upwelling Areas Along the Northwest Coast of Africa as Viewed with ERTS-1,
W74-06677 5A

SZULCZEWSKI, Z.
Dynamics of Changes in the Concentration of Fluorine Compounds Emitted by the Phosphorus Fertilizer Manufacturing Establishment in Pozan, and Their Influence on Surface and Underground Waters and on the Atmosphere Within th e Limits of the City of Poznan, (In Polish),
W74-07021 5B

TAKEUCHI, T.
Approaches to the Detection of Subclinical Mercury Intoxications: Experience in Minamata, Japan,
W74-06811 5C

Biological Reactions and Pathological Changes in Human Beings and Animals Caused by Organic Mercury Contamination,
W74-06804 5C

Distribution of Mercury in the Environment of Minamata Bay and the Inland Ariake Sea,
W74-06781 5B

The Relationship Between Mercury Concentration in Hair and the Onset of Minamata Disease,
W74-06806 5C

TALSMA, T.
One-Dimensional Vertical Infiltration,
W74-07034 2G

Soil Moisture Distribution During Two-Dimensional Absorption from a Cylindrical Source,
W74-07042 2G

TAMAS, G.
Horizontal Phytoplankton Studies in Lake Balaton Based on Scooped Samples and Filtrates Taken in 1967,
W74-06756 5C

TAPPER, G. O.
ERTS-1 Image Enhancement by Optically Combining Density Slices,
W74-06655 7C

TARAS, M. J.
Information Resource: Final Report Water Pollution Control in Water Utilities,
W74-06527 5F

TATE, D. C.
Color Removal from Kraft Mill Effluents by Ultrafiltration,
W74-06521 5D

TAUB, S. H.
The Effects of Ecological Changes on Buckeye Lake, Ohio, with Emphasis on Largemouth Bass and Aquatic Vascular Plants,
W74-06546 5C

TAYLOR, W.
The Binding of Inorganic and Organic Mercury Compounds (Hg 203) to Constituents of Normal Human Blood,
W74-06803 5C

TCHEREMISSINOFF, G.
Climatic Data of the High Altitude Meteorological Stations of the Geneva Region For 1970 (In French),
W74-06532 7C

TEERINK, J. R.
Impact of Water Pollution Control Legislation on Meeting Future Water Needs in California,
W74-06954 5G

TEMPLE, O. R.
Application of ERTS-1 Imagery to the Harvest Model of the U.S. Menhaden Fishery,
W74-06678 2L

TENNEY, M. W.
Multi-Nutrient Dynamic Models of Algal Growth and Species Competition in Eutrophic Lakes,
W74-06568 5C

TENORE, K. R.
Growth Comparisons of Oysters, Mussels and Scallops Cultivated on Algae Growth With Artificial Medium and Treated Sewage Effluent,
W74-07035 5C

TERESHENKOVA, I. A.
Gray Forest Soils in the Spruce-Fir Forests in the Sub-Ural Region (Vyatka-Kama Province), (In Russian),
W74-07004 2G

TERRY, R. E.
Denitrification as a Pathway for Nitrate Removal in Aquatic Systems,
W74-06612 5B

TEW, R. W.
Phytoplankton Successions and Lake Dynamics in Las Vegas Bay, Lake Mead, Nevada,
W74-07001 5C

THOMPSON, D. N.
Identification and Mapping of Coal Refuse Banks and Other Targets in the Anthracite Region,
W74-06642 4A

THOMPSON, L. G.
Analysis of the Concentration of Microparticles in the Long Ice Core from Byrd Station,
W74-06931 2C

THOMPSON, M. P. JR.
An Annotated List of the Summer Vertebrate Fauna of Upper Lusk Creek, Pope County, Illinois,
W74-07036 2I

THOMPSON, S. M.
Azide and Ethylenethiourea Mobility in Soils,
W74-06896 5B

THOMSON, F. J.
Terrain Classification Maps of Yellowstone National Park,
W74-06645 4A

HREADGILL, E. D.
A Simulated Environmental Model of Temperature, Evaporation, Rainfall, and Soil Moisture,
W74-06591 3F

JELL, J. C.
Selectrode - the Universal Ion-Selective Electrode. Part VI. The Calcium (II) Selectrode Employing a New Ion Exchanger in a Nonporous Membrane and a Solid-State Reference System,
W74-06764 5A

ODD, W.
Preparation of Urban Land Use Inventories by Machine-Processing of ERTS MSS Data,
W74-06637 4A

OETZ, D. W.
Nitrogen Turnover in Impoundments,
W74-06505 5C

OLER, L. G.
Hydrology and Water Resources of the Hoosic River Basin, Massachusetts,
W74-06958 7C

OTSUKA, A.
Investigation of Brewing Water Treatment,
W74-07023 5A

REASURE, W.
Applicability of ERTS-1 Imagery to the Study of Suspended Sediment and Aquatic Fronts,
W74-06666 2L

RIMBLE, G. M.
Legal and Administrative Aspects of an Aquaculture Policy for Hawaii, An Assessment,
W74-06992 6E

RIPPLER, D.
ERTS-1 Applications to Minnesota Land Use Mapping,
W74-06632 4A

RISKO, R. L.
U.S. Deepwater Port Study, Vol. 2. Commodity Studies and Projections,
W74-06863 6D

U.S. Deepwater Port Study, Vol 3. Physical Coast and Port Characteristics, and Selected Deepwater Port Alternatives,
W74-06864 6D

ROST, P. B.
Distribution of Mercury in Residual Soils,
W74-06797 5B

RUBEY, D. K.
The EXREM III Computer Code for Estimating External Radiation Doses to Populations from Environmental Releases,
W74-06818 5B

RYPHONAS, L.
Dose-Response Relationships after Exposure of Swine to Organo-Mercurial Compounds,
W74-06809 5C

SANG, G.
Hydraulic Roughness of Corrugated Plastic Tubing,
W74-06589 8B

ULLER, S. E.
The Role of Dew in the Seasonal Moisture Balance of a Summer-Dry Climate,
W74-07037 2B

TURNEY, W. G.
The Mercury Pollution Problem in Michigan,
W74-06773 5B

TUWINER, S. B.
Investigation of Treating Electroplaters Cyanide Waste by Electrodialysis,
W74-06522 5D

TWITCHELL, G. A.
A Large Undisturbed, Weighing Lysimeter for Grassland Studies,
W74-06581 2G

ULIN, J. C.
U.S. Deepwater Port Study, Vol. 2. Commodity Studies and Projections,
W74-06863 6D

U.S. Deepwater Port Study, Vol 3. Physical Coast and Port Characteristics, and Selected Deepwater Port Alternatives,
W74-06864 6D

VAN BREEMEN, N.
Buffer Intensities and Equilibrium pH of Minerals and Soils: II. Theoretical and Actual pH of Minerals and Soils,
W74-06905 2G

Buffer Intensities and Equilibrium pH of Minerals and Soils: 1. The Contribution of Minerals and Aqueous Carbonate to pH Buffering,
W74-06904 2G

VAN DUUREN, F. A.
Water Quality Control,
W74-06603 5G

VAN ROESSEL, J. W.
Precision Annotation of Predetermined Primary Sampling Units on ERTS-1 MSS Images,
W74-06705 4A

VERDUIN, J.
Correlation Between CO2 and O2 Concentrations in Lake Erie, USA,
W74-07025 5C

VERHOFF, F. H.
Multi-Nutrient Dynamic Models of Algal Growth and Species Competition in Eutrophic Lakes,
W74-06568 5C

Rates of Carbon, Oxygen, Nitrogen, and Phosphorus Cycling Through Microbial Populations in Stratified Lakes,
W74-06569 5C

VIELLENAVE, J. H.
Assessment of Southern California Environment From ERTS-1,
W74-06685 4A

VILLA, O. JR.
Distribution of Metals in Baltimore Harbor Sediments,
W74-06924 5B

VINCENT, L.
Evaluation of Land Use Mapping from ERTS in the Shore Zone of Carets,
W74-06627 4A

VITOSHKIN, YU. K.
Structure of the Velocity Profile of a Suspension-Bearing Flow,
W74-06912 8B

VONDER, LINDEN K.
Initial Evaluation of the Geologic Applications of ERTS-1 Imagery for New Mexico,
W74-06693 4A

WADA, Y.
Observations on Gambusia affinis Introduced into Tokushima as a Natural Enemy of Mosquitoes, (In Japanese),
W74-07048 5G

WAITE, P. J.
Dry and Wet, July-August Rainfall Areas in Iowa,
W74-07045 2B

WALDCHEN, A. J.
Recent Developments in the Law of the Sea IV: A Synopsis,
W74-06965 6E

WALKER, E. H.
Walden's Way Revealed,
W74-06925 2H

WALKER, J. D.
Oxidation of n-Alkanes by Cladosporium resinae,
W74-06763 5C

WALKER, P. H.
Seasonal and Stratigraphic Controls in Coastal Floodplain Soils,
W74-07030 2G

WALKER, P. N.
Flood of October 1972 at Petersburg and Colonial Heights, Virginia,
W74-06957 7C

WALTERS, C. J.
Systems Analysis in the Marion Lake IBP Project,
W74-07010 5C

WALZER, P. D.
Balantidiasis Outbreak in Truk,
W74-07031 5C

WARBURTON, J. A.
Analysis of Iodine in Antarctic Snow,
W74-06929 5B

Silver Concentrations in Antarctic Snow and Firn,
W74-06930 5A

WARD, E. A.
Air Quality Indices from ERTS-1 MSS Information, PR 568,
W74-06696 5A

WARNER, K.
Spring Food of Chain Pickerel (Esox niger) in Maine Lakes,
W74-07032 2H

WARSHAW, S. J.
Effects of Alewives (Alosa pseudoharengus) on the Zooplankton of Lake Wononskopomus, Connecticut,
W74-07033 2H

WATKINS, S. H.
Coliform Bacteria Growth and Control in Aerated Stabilization Basins,
W74-06520 5D

WAXMAN, J. B.
Interaction of Temperature and Copper Ions as Orienting Stimuli in the Locomotor Behavior of the Goldfish (Carassius auratus),
W74-06769 5C

WEBER, F. P.
DCP-Collected Absolute Target Reflectance Signatures Assist Accurate Interpretation of ERTS-1 Imagery,
W74-06688 7C

WEEDEN, H. A.
Investigations of an Urban Area and its Locale Using ERTS-1 Data Supported by U-Photography,
W74-06635 4A

WEEKS, W. F.
Data on Morphological and Physical Characteristics of Sea Ice in the Beaufort Sea,
W74-06721 2C

Investigations Performed on the Arctic Ice Dynamics Joint Experiment, March 1971,
W74-06716 2C

Mesoscale Strain Measurements on the Beaufort Sea Pack Ice,
W74-06717 2C

Structure of a Multiyear Pressure Ridge,
W74-06718 2C

Top and Bottom Roughness of a Multiyear Ice Floe,
W74-06719 2C

WEILER, P. R.
Simulation of Urban Runoff, Nutrient Loading, and Biotic Response of a Shallow Eutrophic Lake,
W74-06564 5C

WEIN, R. W.
Physical Microclimates of Erosion-Control Structures in a Salt Desert Area,
W74-07029 2G

WELBY, C. W.
Multidisciplinary Application of ERTS-1 Data to North Carolina Natural Resource Management,
W74-06682 4C

WELCH, E. B.
Long-Term Lake Recovery Related to Available Phosphorus,
W74-06562 5C

WELCH, R.
Cartographic Quality of ERTS-1 Images,
W74-06620 7C

WELLS, T. L.
Resource Management Implications of ERTS-1 Data to Ohio,
W74-06684 4A

WELSH, J. L.
Ground Water Quality Data for Planning, Monitoring and Surveillance,
W74-06947 5A

WENNER, K.
Preparation of Urban Land Use Inventories by Machine-Processing of ERTS MSS Data,
W74-06637 4A

WEST, N. E.
Physical Microclimates of Erosion-Control Structures in a Salt Desert Area,
W74-07029 2G

WESTON, F. C.
Identification of Soil Associations in Western South Dakota on ERTS-1 Imagery,
W74-06629 2G

WETZEL, R. G.
Productivity Investigations of Interconnected Marl Lakes (I). The Eight Lakes of the Oliver and Walters Chains, Northeastern Indiana,
W74-06533 5C

WEYMAN, D. R.
Measurements of the Downslope Flow of Water in a Soil,
W74-06886 2G

WHINSTON, A.
Production Function Theory and the Optimal Design of Waste Treatment Facilities,
W74-06997 6D

WHIPPLE, W. JR.
Unrecorded Pollution and Dynamics of Biochemical Oxygen Demand,
W74-06613 5B

WIELEMAKER, W. G.
Buffer Intensities and Equilibrium pH of Minerals and Soils: II. Theoretical and Actual pH of Minerals and Soils,
W74-06905 2G

Buffer Intensities and Equilibrium pH of Minerals and Soils: 1. The Contribution of Minerals and Aqueous Carbonate to pH Buffering,
W74-06904 2G

WIERENGA, P. J.
A Multichannel Syringe Pump for Steady State Flow in Soil Columns,
W74-07028 2G

WILCOX, K. R. JR.
Mercury Levels in a Sample of Michigan Residents,
W74-06782 5B

WILKINS, D. E.
Deep Plowing - An Engineering Appraisal,
W74-06590 3F

WILLEY, C. R.
Use of Waste Heat for Soil Warming in North Carolina,
W74-07000 5D

WILLIAMS, G. D. V.
Estimates of Prairie Provincial Wheat Yields Based on Precipitation and Potential Evapotranspiration,
W74-07027 3F

WILLIAMS, R. S. JR.
Coastal and Submarine Features on MSS Imagery of Southeastern Massachusetts: Comparison with Conventional Maps,
W74-06679 2L

WILLIAMS, T. E.
Ecological and Physiological Implications of Greenbelt Irrigation,
W74-06608 5D

WILMS, R. P.
Land Use Mapping and Change Detection Using ERTS Imagery in Montgomery County, Alabama,
W74-06701 4A

WILMSEN, E. N.
The Mercury Content of Prehistoric Fish,
W74-07026 5A

WILSON, A. D.
Mapping of Agricultural Land Use from ERTS-1 Digital Data,
W74-06640 4A

WILSON, M. C.
Some Aspects of Phosphorus Dynamics of the Twin Lakes Watershed,
W74-06565 5C

WOOD, I. R.
Developing Region in Self-Aerated Flows,
W74-06739 8B

WOOD, K. G.
Correlation Between CO2 and O2 Concentrations in Lake Erie, USA,
W74-07025 5C

WOOLERY, M. L.
Influence of Iodine on Growth and Development of the Brown Alga Ectocarpus Siliculosus in Axenic Cultures,
W74-06752 5C

WRIGHT, F. F.
ERTS-1 Observations of Sea Surface Circulation and Sediment Transport, Cook Inlet, Alaska,
W74-06670 2L

WUKELIC, G. E.
Resource Management Implications of ERTS-1 Data to Ohio,
W74-06684 4A

WYATT, J. T.
An Examination of Three Strains of the Blue-Green Algal Genus, Fremyella,
W74-06759 5C

YAMAGUCHI, A.
An Epidemiological Study on Clonorchiasis in Kyoto City, (In Japanese),
W74-07050 5C

YEH, W. W-G.
A Discrete Space Continuous Time Modeling Approach to Nonsteady Flow in a Leaky Aquifer System of Finite Configuration,
W74-06887 2F

YEN, C. L.
Sensitivity of Surface Runoff to Variations of Watershed Parameters in Small Urban Areas-A Kinematic Model,
W74-06853 4C

YEO, H. W.
Phytoplankton Populations in Relation to Different Trophic Levels at Winnipesaukee Lake, New Hampshire, U.S.A.,
W74-06529 5C

YOSHIDA, T.
Nitrogen-Fixing Activity in Upland and Flooded Rice Fields,
W74-07024 5B

YOST, E. F.
In Situ Spectroradiometric Quantification of ERTS Data,
W74-06663 2G

YOUNG, G.
Whatever Happened to TVA,
W74-06968 6E

YOUNG, L. G.
Silver Concentrations in Antarctic Snow and Firn,
W74-06930 5A

YOUNGNER, V. B.
Ecological and Physiological Implications of Greenbelt Irrigation,
W74-06608 5D

YU, S. L.
Unrecorded Pollution and Dynamics of Biochemical Oxygen Demand,
W74-06613 5B

ZAHOREAK, C. S.
Aquatic Modeling in the Eastern Deciduous Forest Biome, U.S.-International Biological Program,
W74-06572 5C

ZAMORSKA, M.
Baking Quality of Spring Wheat as Affected by Rain During Drying After Reaping (In Polish),
W74-06548 3F

ZEKTZER, I. S.
The Problem of Direct Groundwater Discharge to the Seas,
W74-06881 2F

ZIEBA, J.
Macrobenthos of Ponds with Sugar Factory Wastes,
W74-06553 5C

ZIEMAN, J. C. JR.
Origin of Circular Beds of Thalassia (Spermatophyta:Hydrocharitaceae) in South Biscayne Bay, Florida, and Their Relationship to Mangrove Hammocks,
W74-07022 5A

ZILLIOUX, E. J.
Using Artemia to Assay Oil Dispersant Toxicities,
W74-06877 5A

ZIPPLER, K.
Utilization of Trickling Filters for Dual Treatment of Dry and Wet Weather Flows,
W74-06508 5D

ZIRKLE, R. E.
Determination of Land Use in Minnesota by Automatic Interpretation of ERTS MSS Data,
W74-06702 4A

ZUBIK, T.
Influence of Some Hydrological Parameters on Changes in the Radioactivity of the Waters of the Rivers Czarna Przemsza and Przemsza,
W74-07019 5B

ZYVOLOSKI, G.
Solution of Equation for Vertical Unsaturated Flow of Soil Water,
W74-06736 2G

ORGANIZATIONAL INDEX

AGRICULTURAL RESEARCH SERVICE, AUBURN, ALA.
Evaluation of a Furrow Modifying Device,
W74-06588 3F

AGRICULTURAL RESEARCH SERVICE, BELTSVILLE, MD.
Deep Plowing - An Engineering Appraisal,
W74-06590 3F

AGRICULTURAL RESEARCH SERVICE, BELTSVILLE, MD. AGRICULTURAL ENVIRONMENTAL QUALITY INST.
Azide and Ethylenethiourea Mobility in Soils,
W74-06896 5B

Nitrogen Mineralization-Water Relations in Soils,
W74-06897 5B

AGRICULTURAL RESEARCH SERVICE, BROOKINGS, S. DAK. SOIL AND WATER CONSERVATION RESEARCH DIV.
Soil and Water Losses as Affected by Tillage Practices,
W74-06595 3F

AGRICULTURAL RESEARCH SERVICE, BUSHLAND, TEX.
Wheat and Grain Sorghum Irrigation in a Wide Bed-Furrow System,
W74-06580 3F

AGRICULTURAL RESEARCH SERVICE, FORT COLLINS, COLO.
Capillary Properties of Soils - Influence upon Specific Yield,
W74-06584 2F

AGRICULTURAL RESEARCH SERVICE, KIMBERLY, IDAHO. SNAKE RIVER CONSERVATION RESEARCH CENTER.
Sprinkler Precipitation Gage Errors,
W74-06593 3F

AGRICULTURAL RESEARCH SERVICE, MADISON, WIS. SOIL AND WATER CONSERVATION RESEARCH DIV.
Measurement of Hydraulic Conductivity By Means of Steady, Spherically Symmetric Flows,
W74-06735 2G

AGRICULTURAL RESEARCH SERVICE, MANDAN, N. DAK.
Deep Plowing and Chemical Amendment Effect on a Sodic Claypan Soil,
W74-06598 3F

AGRICULTURAL RESEARCH SERVICE, MORRIS, MINN. NORTH CENTRAL SOIL CONSERVATION RESEARCH CENTER.
Effect of Varying the On-Off Time of Rainfall Simulator Nozzles on Surface Sealing and Intake Rate,
W74-06903 2J

AGRICULTURAL RESEARCH SERVICE, OXFORD, MISS. SEDIMENTATION LAB.
Reservoir Sedimentation,
W74-06883 2J

Estimating Soil Erosion from the Redistribution of Fallout Cs-137,
W74-06901 2J

AGRICULTURAL RESEARCH SERVICE, PHOENIX, ARIZ. WATER CONSERVATION LAB.
Gamma Radiation Measurements of Bulk Density Changes in a Soil Pedon Following Irrigation,
W74-06715 2G

AGRICULTURAL RESEARCH SERVICE, RIESEL, TEX.
Changes in Water Yield of Small Watersheds by Agricultural Practices,
W74-06597 2E

AGRICULTURAL RESEARCH SERVICE, STATE COLLEGE, MISS.
A Simulated Environmental Model of Temperature, Evaporation, Rainfall, and Soil Moisture,
W74-06591 3F

AGRICULTURAL RESEARCH SERVICE, TEMPLE, TEX. BLACKLAND CONSERVATION RESEARCH CENTER.
Field Measurement of Evaporation from Soil Shrinkage Cracks,
W74-06900 2D

AGRICULTURAL RESEARCH SERVICE, URBANA, ILL.
Performance of a Tile Drainage System: An Evaluation of a Tile Design and Management,
W74-06596 3F

AGRICULTURAL UNIV., WAGENINGEN (NETHERLANDS). DEPT. OF SOIL SCIENCE AND GEOLOGY.
Buffer Intensities and Equilibrium pH of Minerals and Soils: 1. The Contribution of Minerals and Aqueous Carbonate to pH Buffering,
W74-06904 2G

Buffer Intensities and Equilibrium pH of Minerals and Soils: II. Theoretical and Actual pH of Minerals and Soils,
W74-06905 2G

AIN SHAMS UNIV., CAIRO (EGYPT). MICROANALYTICAL RESEARCH LABS.
New Spot Tests for Nitrates and Nitrites,
W74-06878 5A

AKADEMIYA NAUK SSSR, MOSCOW. INSTITUT VODNYKH PROBLEM.
The Problem of Direct Groundwater Discharge to the Seas,
W74-06881 2F

ALABAMA UNIV., UNIVERSITY. DEPT. OF CIVIL AND MINERAL ENGINEERING.
Land Use Mapping and Change Detection Using ERTS Imagery in Montgomery County, Alabama,
W74-06701 4A

ALASKA UNIV., COLLEGE.
A Multidisciplinary Survey for the Management of Alaskan Resources Utilizing ERTS Imagery,
W74-06633 4A

Snow Cover Surveys in Alaska From ERTS-1 Data,
W74-06697 2C

ALASKA UNIV., COLLEGE. INST. OF MARINE SCIENCE.
ERTS-1 Observations of Sea Surface Circulation and Sediment Transport, Cook Inlet, Alaska,
W74-06670 2L

ALBERTA DEPT. OF ENVIRONMENT, EDMONTON. DIV. OF TECHNICAL SERVICES.
Laboratory Experiments with Surface Runoff,
W74-06737 2E

ALBERTA UNIV., EDMONTON. DEPT. OF BOTANY.
Physical Microclimates of Erosion-Control Structures in a Salt Desert Area,
W74-07029 2G

ALFA MATERIALS TECHNOLOGY, INC., POTTSTOWN, PA. RESEARCH LAB.
Complexiметric Determination of Phosphate,
W74-06757 5A

ALLIED CHEMICAL CORP., IDAHO FALLS, IDAHO. IDAHO CHEMICAL PROGRAMS OPERATIONS OFFICE.
1972 Operation of the ICPP Rare Gas Recovery Facility,
W74-06822 5D

The Stack Monitoring System at the Idaho Chemical Processing Plant,
W74-06824 5A

AMERICAN UNIV., WASHINGTON, D.C. DEPT. OF BIOLOGY.
Applications of Remote Sensing (ERTS) to Resource Management and Development in Sahelien Africa (Republic of Mali),
W74-06686 4A

AMERICAN WATER WORKS ASSOCIATION RESEARCH FOUNDATION, NEW YORK.
Information Resource: Final Report Water Pollution Control in Water Utilities,
W74-06527 5F

ANALYTIC SCIENCES CORP., READING, MASS.
Water Supply Management Alternatives for Rhode Island,
W74-06827 6D

ARCHER DANIELS MIDLAND CO., LINCOLN, NEB.
A Computerized Solution for Bench Leveling Design,
W74-06600 4A

ARIZONA UNIV., TUCSON.
Oceanographic Mapping of Structure and Dynamics of the Northern Gulf of California by the Use of Spectral Modeling and ERTS-1,
W74-06673 2L

ARIZONA UNIV., TUCSON. DEPT. OF SOILS, WATER AND ENGINEERING.
Nitric Oxide Sorption by Calcareous Soils: II. Effect of Moisture on Capacity, Rate, and Sorption Products,
W74-06894 5B

ARMY ENGINEER DISTRICT, MOBILE, ALA.
Choctawhatchee River and Holmes Creek, Florida, Permit Application by Florida Game and Fresh Water Fish Commission (Final Environmental Impact Statement).
W74-06985 4A

ARMY ENGINEER DISTRICT, PITTSBURGH, PA.
Woodcock Creek Lake, French Creek Basin, Pennsylvania (Final Environmental Impact Statement).
W74-06986 8A

ARMY ENGINEER DISTRICT, SAN FRANCISCO, CALIF.
Lower Klamath River Flood Control Project, Del Norte County, California (Final Environmental Impact Statment).
W74-06989 4A

ARMY ENGINEER DIV. SOUTH PACIFIC, SAN FRANCISCO, CALIF. COASTAL ENGINEERING BRANCH.
Application of ERTS-1 Imagery in Coastal Studies,
W74-06709 2L

ARMY WAR COLL., PA. CARLISLE BARRACKS, PA.
The Challenge of Military Nuclear Construction,
W74-06859 8H

ATLANTIC RICHFIELD HANFORD CO., RICHLAND, WASH.
241-T-106 Tank Leak Investigation.
W74-06861 5B

ATOMIC ENERGY OF CANADA LTD., CHALK RIVER (ONTARIO). CHALK RIVER NUCLEAR LABS.
Aquatic Vegetation of the Ottowa River Near Chalk River Nuclear Laboratories (CRNL),
W74-06819 5C

AUSTRALIAN NATIONAL UNIV., CANBERRA. RESEARCH SCHOOL OF BIOLOGICAL SCIENCES.
Energy Flows in the Biosphere: The Impact of Man,
W74-07043 2B

BATTELLE PACIFIC NORTHWEST LAB., RICHLAND, WASH.
Predicting the Effects of Nutrient Diversion on Lake Recovery,
W74-06576 5C

BENDIX AEROSPACE SYSTEMS DIV. ANN ARBO, MICH.
A Technique for Correcting ERTS Data for Solar and Atmospheric Effects,
W74-06648 7C

BENDIX AEROSPACE SYSTEMS DIV., ANN ARBOR, MICH.
Digital Data Processing of ERTS-1 Imagery of Delaware Bay,
W74-06703 2L

BENDIX CORP., ANN ARBOR, MICH.
Utilization of ERTS-1 Data to Monitor and Classify Eutrophication of Inland Lakes,
W74-06698 5A

BIRMINGHAM UNIV. (ENGLAND). DEPT. OF CIVIL ENGINEERING.
On the Leakage Assumption Applied to Equations of Groundwater Flow,
W74-06888 2F

BLACK HILLS CONSERVANCY SUB-DISTRICT, RAPID CITY, S.DAK.
Demonstration of a Non-Aqueous Sewage Disposal System,
W74-06519 5D

BOOZ-ALLEN APPLIED RESEARCH, INC., BETHESDA, MD.
A Study of Hazardous Waste Materials, Hazardous Effects and Disposal Methods. Volume I.
W74-06555 5C

A Study of Hazardous Waste Materials, Hazardous Effects and Disposal Methods. Volume II.
W74-06556 5C

A Study of Hazardous Waste Materials, Hazardous Effects and Disposal Methods Volume III.
W74-06557 5C

BOTANICAL SURVEY OF INDIA, CALCUTTA.
Ecological Aspects Along the Shores of the Burabalanga Tidal Estuary Balasore District, Orissa State,
W74-07049 2L

BRISTOL UNIV. (ENGLAND). DEPT. OF GEOGRAPHY.
Measurements of the Downslope Flow of Water in a Soil,
W74-06886 2G

BRITISH COLUMBIA UNIV., VANCOUVER.
Systems Analysis in the Marion Lake IBP Project,
W74-07010 5C

BRNO UNIV., MUSOV (CZECHOSLOVAKIA). BIOLOGICAL STATION.
Annual Cycle of Zooplankton in Backwaters of the Flood Area of the Dyje,
W74-06536 5C

BROOKLYN COLL., N.Y. DEPT. OF CHEMISTRY.
Organic Functional Group Analysis Via Gas Chromatograpy. III. Determination of Carbamates by Reaction with Alkali,
W74-06872 5A

BUREAU OF COMMERCIAL FISHERIES, ANN ARBOR, MICH. TECHNOLOGICAL LAB.
Survey of Mercury Concentrations in Fishes of Lakes St. Clair, Erie, and Huron,
W74-06775 5B

BUREAU OF RECLAMATION, BOULDER CITY, NEV. REGION 3.
Geothermal Development and Southwest Storage Basins,
W74-06945 4B

BUREAU OF SPORT FISHERIES AND WILDLIFE, LAUREL, MD. PATUXENT WILDLIFE RESEARCH CENTER.
Mercury in Wild Animals, Lake St. Clair, 1970,
W74-06776 5B

BUREAU OF SPORT FISHERIES AND WILDLIFE, WASHINGTON, D.C.
The Effects of Ecological Changes on Buckeye Lake, Ohio, with Emphasis on Largemouth Bass and Aquatic Vascular Plants,
W74-06546 5C

CAIRO UNIV., GIZA (EGYPT). FACULTY OF SCIENCE.
On the Reaction Between Iodide and Mercury(II),
W74-06870 5A

CALIFORNIA STATE DEPT. OF PUBLIC HEALTH, SACRAMENTO. ENVIRONMENTAL SANITATION DIV.
Effects of Sewage Disposal and Reclamation on Ground Water Quality,
W74-06948 5D

CALIFORNIA STATE DEPT. OF WATER RESOURCES, SACRAMENTO.
Impact of Water Pollution Control Legislation on Meeting Future Water Needs in California,
W74-06954 5G

Environmental Quality As an Objective of Ground Water Management,
W74-06956 5B

CALIFORNIA STATE DEPT. OF WATER RESOURCES, SACRAMENTO. DIV. OF RESOURCES DEVELOPMENT.
Ground Water Quality Data for Planning, Monitoring and Surveillance,
W74-06947 5A

CALIFORNIA STATE UNIV., FULLERTON. DEPT. OF CIVIL ENGINEERING.
Ground-Water Recharge Strip Basin-Experiments,
W74-06740 4B

CALIFORNIA STATE WATER RESOURCES CONTROL BOARD, SCRAMENTO.
Current State Board Activities in Ground Water Quality Management,
W74-06953 5G

CALIFORNIA UNIV., BERKELEY. FORESTRY REMOTE SENSING LAB.
Combining Human and Computer Interpretation Capabilities to Analyze ERTS Imagery,
W74-06658 7C

CALIFORNIA UNIV., BERKELEY. SANITARY ENGINEERING RESEARCH LAB.
Synopsis of Workshop on Modeling of the Eutrophication Process,
W74-06561 5C

CALIFORNIA UNIV., DAVIS.
A Discrete Space Continuous Time Modeling Approach to Nonsteady Flow in a Leaky Aquifer System of Finite Configuration,
W74-06887 2F

Agricultural Wastes and Ground Water Quality,
W74-06951 5B

CALIFORNIA UNIV., DAVIS. DEPT. OF AGRICULTURAL ECONOMICS.
A Simulation Approach to Recreation Planning (A Case of Changing Quality),
W74-06996 6B

CALIFORNIA UNIV., DAVIS. DEPT. OF ELECTRICAL ENGINEERING.
Digital Enhancement of Multispectral MSS Data for Maximum Image Visibility,
W74-06654 7C

CALIFORNIA UNIV., DAVIS. DEPT. OF POLITICAL SCIENCE.
The Environmental Impulse and its Competitors: Attitudes, Interests, and Institutions at Lake Tahoe,
W74-06843 6E

CALIFORNIA UNIV., LIVERMORE. LAWRENCE LIVERMORE LAB.
A Review of Soviet Data on the Peaceful Uses of Nuclear Explosions,
W74-06823 6B

CALIFORNIA UNIV., RIVERSIDE. DEPT. OF GEOGRAPHY.
Land Use in Northern Coachella Valley,
W74-06624 4A

ERTS-1 Image Enhancement by Optically Combining Density Slices,
W74-06655 7C

Assessment of Southern California Environment From ERTS-1,
W74-06685 4A

CALIFORNIA UNIV., RIVERSIDE. DEPT. OF PLANT SCIENCES.
Ecological and Physiological Implications of Greenbelt Irrigation,
W74-06608 5D

CALIFORNIA UNIV., RIVERSIDE. DEPT. OF SOIL SCIENCE AND AGRICULTURAL ENGINEERING.
Sludge Disposal to Land,
W74-06950 5B

CALIFORNIA UNIV., SANTA BARBARA.
Solution of Equation for Vertical Unsaturated Flow of Soil Water,
W74-06736 2G

CALIFORNIA UNIV., SANTA BARBARA. GEOGRAPHY REMOTE SENSING UNIT.
Land Use Investigations in the Central Valley and Central Coastal Test Sites, California,
W74-06623 4A

CASE WESTERN RESERVE UNIV. CLEVELAND, OHIO. DIV. OF FLUID, THERMAL AND AEROSPACE SCIENCES.
Conservation Equations for Nonisothermal Flow in Porous Media,
W74-06892 2F

CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE, GIF-SUR-YVETTE (FRANCE). CENTRE DES FAIBLES RADIOACTIVITIES.
PB-210 Concentration in Ice Measured at South Pole Station,
W74-06932 5A

CESKOSLOVENSKA AKADEMIE VED, PRAGUE. HYDROBIOLOGICKA LAB.
Hydrobiological Studies 3.
W74-06530 5C

Uptake of Natural Radioisotopes by Aquatic Organisms,
W74-06534 5C

CHAMPION INTERNATIONAL CORP., HAMILTON, OHIO.
Color Removal from Kraft Mill Effluents by Ultrafiltration,
W74-06521 5D

CHICAGO UNIV., ILL. DEPT. OF THE GEOPHYSICAL SCIENCES.
University of Chicago Contribution to Project Metromex-I.
W74-06937 2B

Radar Studies of Urban Precipitation Anomaly,
W74-06938 2B

Observations of the Cloud Nucleus Concentration Around the St. Louis Urban Complex,
W74-06939 2B

Upwind and Downwind Cloud-Base Microstructure,
W74-06940 2B

Metromex Temperature and Aerosol Data Reduction: Analysis of the Urban Anomaly,
W74-06941 2B

COLD REGIONS RESEARCH AND ENGINEERING LAB., FAIRBANKS, ALASKA.
An Expanding Role for Subarctic Watershed Research,
W74-06884 4D

COLD REGIONS RESEARCH AND ENGINEERING LAB., HANOVER, N.H.
Sediment Distribution and Coastal Processes in Cook Inlet, Alaska,
W74-06671 2L

Investigations Performed on the Arctic Ice Dynamics Joint Experiment, March 1971,
W74-06716 2C

Mesoscale Strain Measurements on the Beaufort Sea Pack Ice,
W74-06717 2C

Structure of a Multiyear Pressure Ridge,
W74-06718 2C

Top and Bottom Roughness of a Multiyear Ice Floe,
W74-06719 2C

Data on Morphological and Physical Characteristics of Sea Ice in the Beaufort Sea,
W74-06721 2C

Chemical Profile of the Ross Ice Shelf at Little America V, Antarctica,
W74-06921 2C

COLORADO SCHOOL OF MINES, GOLDEN. DEPT. OF CHEMISTRY.
Distribution of Mercury in Residual Soils,
W74-06797 5B

COLORADO STATE UNIV., FORT COLLINS.
Upward Flow from Shallow Water Tables,
W74-06844 2F

COMITATO NAZIONALE PER L'ENERGIA NUCLEARE, ISPRA (ITALY). DIVISION PROTEZIONE SANITARIA E CONTROLLI.
Behavior of Radioiodine in the Environment and in Man,
W74-06862 5B

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, CANBERRA (AUSTRALIA). DIV OF ENVIRONMENTAL MECHANICS.
One-Dimensional Vertical Infiltration,
W74-07034 2G

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Soil Moisture Distribution During Two-Dimensional Absorption from a Cylindrical Source,
W74-07042 2G

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, CANBERRA (AUSTRALIA). DIV. OF SOILS.
Seasonal and Stratigraphic Controls in Coastal Floodplain Soils,
W74-07030 2G

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, TOWNSVILLE (AUSTRALIA). DIV. OF TROPICAL PASTURES.
Evaluation of Influence of Available Soil Water Storage Capacity on Growing Season Length and Yield of Tropical Pastures Using Simple Water Balance Models,
W74-06927 3F

CONNECTICUT AGRICULTURAL EXPERIMENT STATION, NEW HAVEN.
Gravity Correction Due to a Variation of Pressure Head Within a Cavity,
W74-06734 2G

CONNECTICUT UNIV., STORRS. DEPT. OF CHEMISTRY.
A Universal Ion-Selective Electrode Based on Graphite Paste,
W74-06758 2K

CONNECTICUT UNIV., STORRS. INST. OF WATER RESOURCES.
Efficient Pricing for Urban Waste Water Renovation,
W74-06828 5D

CONSERVATOIRE BOTANIQUE, GENEVA (SWITZERLAND).
Climatic Data of the High Altitude Meteorological Stations of the Geneva Region For 1970, (In French).
W74-06532 7C

CONSIGLIO NAZIONALE DELLE RICERCHE, MILAN (ITALY). LABORATORIO PER LA GEOFISICA DELLA LITOSFERA.
A Preliminary Evaluation of ERTS-1 Images on the Volcanic Areas of Southern Italy (NASA Contract FO-013),
W74-06691 7C

CORNELL UNIV., ITHACA, N.Y. DEPT. OF NATURAL RESOURCES.
A Chart of New York Water Law,
W74-06614 6E

CORNELL UNIV., ITHACA, N.Y. WATER RESOURCES AND MARINE SCIENCES CENTER.
Basic Research in the Aquatic Environment: Effects of Eutrophication on Phytoplankton Populations and Selected Species of Aquatic Vascular Plants,
W74-06835 5C

The Runoff of Water and Nutrients from Watersheds Tributary to Cayuga Lake, New York,
W74-06848 5B

Water and Nutrient Budgets for Cayuga Lake, New York,
W74-06849 5B

CREIGHTON UNIV., OMAHA, NEBR.
The Binding of Inorganic and Organic Mercury Compounds (Hg 203) to Constituents of Normal Human Blood,
W74-06803 5C

CROWN ZELLERBACH CORP., CAMAS, WASH. ENVIRONMENTAL SERVICES DIV.
Coliform Bacteria Growth and Control in Aerated Stabilization Basins,
W74-06520 5D

DALHOUSIE UNIV., HALIFAX (NOVA SCOTIA). TRACE ANALYSIS RESEARCH CENTRE.
Electron-Donor-Acceptor Complexing Reagents in the Analysis of Pesticides. VI. Influence of Structure in Detection and Identification,
W74-06871 5A

DARTMOUTH COLL., HANOVER, N. H.
Land Use of Northern Megalopolis,
W74-06630 4A

DAYTON UNIV., OHIO. DEPT. OF BIOLOGY.
Oxidation of n-Alkanes by Cladosporium resinae,
W74-06763 5C

DELAWARE UNIV., NEWARK.
A Design and Economic Evaluation of Catalytic Oxidation of Phenols in Wastewater,
W74-06516 5D

Biomass in the Upwelling Areas Along the Northwest Coast of Africa as Viewed with ERTS-1,
W74-06677 5A

DELAWARE UNIV., NEWARK. COLL. OF MARINE STUDIES.
Applicability of ERTS-1 Imagery to the Study of Suspended Sediment and Aquatic Fronts,
W74-06666 2L

DELHI UNIV. (INDIA). DEPT. OF CHEMISTRY.
Semimicrodetermination of Mercury(II) and Zinc(II) by Precipitation from Homogeneous Solution, Using Cation Generation Technique,
W74-06869 5A

DEPARTMENT OF AGRICULTURE, OTTAWA (ONTARIO). ENGINEERING RESEARCH SERVICE.
Cancellation of Spectrophotometer System Characteristics Using an Analog Computer,
W74-06874 2K

DEPARTMENT OF AGRICULTURE, OTTAWA (ONTARIO). PLANT RESEARCH INST.
Estimates of Prairie Provincial Wheat Yields Based on Precipitation and Potential Evapotranspiration,
W74-07027 3F

DEPARTMENT OF STATE, WASHINGTON, D.C.
Ratification of Proposed Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (Final Environmental Impact Statement).
W74-06994 6E

DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO). MARINE SCIENCES DIRECTORATE.
Eight Years of Observations on the Water Level at Quebec and Grondines 1962-1969: Part I--Analysis of the Tidal Signal,
W74-06926 2E

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Use of ERTS-1 Pictures in Coastal Oceanography in British Columbia,
W74-06707 2L

DEPARTMENT OF WATER AFFAIRS, PRETORIA (SOUTH AFRICA).
The Impact of Slimes-Dam Formation on Water Quality and Pollution,
W74-06604 5B

DIRECTORATE OF LICENSING (AEC), WASHINGTON, D. C.
Final Environmental Statement Related to the Proposed Alvin W. Vogtle Nuclear Plant Units 1, 2, 3, and 4.
W74-06821 5B

DISTRICT OF COLUMBIA DEPT. OF ENVIRONMENTAL SERVICES, WASHINGTON.
Physical-Chemical Treatment of Raw Municipal Wastewater,
W74-06509 5D

Ammonia-Nitrogen Removal by Breakpoint Chlorination,
W74-06838 5D

Activated Sludge Treatment Systems with Oxygen,
W74-06839 5D

Laboratory Ozonation of Muncipal Wastewaters,
W74-06840 5D

Nitrogen Removal by Ammonia Stripping,
W74-06842 5D

DUKE UNIV. MEDICAL CENTER, DURHAM, N.C.
Detection and Appraisal of Subclinical Intoxications,
W74-06810 5C

EARTH SATELLITE CORP., BERKELEY, CALIF.
Precision Annotation of Predetermined Primary Sampling Units on ERTS-1 MSS Images,
W74-06705 4A

EARTH SATELLITE CORP., WASHINGTON, D.C.
Application of ERTS-1 Imagery to the Harvest Model of the U.S. Menhaden Fishery,
W74-06678 2L

EAST TENNESSEE STATE UNIV., JOHNSON CITY. DEPT. OF BIOLOGY.
An Examination of Three Strains of the Blue-Green Algal Genus, Fremyella,
W74-06759 5C

EASTERN KENTUCKY UNIV., RICHMOND. DEPT. OF BIOLOGICAL SCIENCES.
An Annotated List of the Summer Vertebrate Fauna of Upper Lusk Creek, Pope County, Illinois,
W74-07036 2I

EG AND G, INC., LAS VEGAS, NEV.
Aerial Radiological Measuring Survey of the Fort Calhoun Station, Fort Calhoun, Nebraska, August 9-10, 1972.
W74-06815 5A

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W74-06816 5A

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W74-06817 5A

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Exploring Energy Choices.
W74-06879 6D

ENVIRONMENTAL PROTECTION AGENCY, ANNAPOLIS, MD. ANNAPOLIS FIELD OFFICE.
Distribution of Metals in Baltimore Harbor Sediments,
W74-06924 5B

ENVIRONMENTAL PROTECTION AGENCY, ATHENS, GA. SOUTHEAST ENVIRONMENTAL RESEARCH LAB.
Evaluation of a Microwave-Induced Plasma Spectrometer for Trace Analysis,
W74-06841 5A

ENVIRONMENTAL PROTECTION AGENCY, CINCINNATI, OHIO. OFFICE OF WATER PROGRAM OPERATIONS.
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W74-06558 5A

ENVIRONMENTAL PROTECTION AGENCY, SAN FRANCISCO, CALIF. REGION IX.
The Federal Role and Legislative Trends in Control of Ground Water Quality,
W74-06952 5G

ENVIRONMENTAL RESEARCH AND TECHNOLOGY, INC., LEXINGTON, MASS.
Use of ERTS Data for Mapping Arctic Sea Ice,
W74-06676 2C

ENVIRONMENTAL RESEARCH GROUP, ANN ARBOR, MICH.
Mercury in the Lake Michigan Environment,
W74-06779 5B

Determination of Mercury by Non-Destructive Neutron Activation Analysis,
W74-06789 5A

ENVIRONMENTAL RESEARCH INST. OF MICHIGAN, ANN ARBOR.
Digital Land Use Mapping in Oakland County, Michigan,
W74-06639 4A

Land Resources Survey for the State of Michigan,
W74-06644 4A

Terrain Classification Maps of Yellowstone National Park,
W74-06645 4A

Atmospheric Effects in ERTS-1 Data, and Advanced Information Extraction Techniques,
W74-06646 7C

Calculations of Water Depth From ERTS-MSS Data,
W74-06681 2E

ENVIRONMENTAL SCIENCE AND ENGINEERING CORP., NASHVILLE, TENN.
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W74-06790 5A

FEDERAL WATER QUALITY ADMINISTRATION, ATHENS, GA. NATIONAL POLLUTANTS FATE RESEARCH PROGRAM.
Phytoplankton Population Changes and Nutrient Fluctuations in a Simple Aquatic Ecosystem Model,
W74-06571 5C

A Physical Model for Simulation of Aquatic Ecosystems,
W74-06573 5C

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Changes in Water Chemistry Accompanying Summer Fish Kills in Shallow Eutrophic Lakes of Southwest Manitoba,
W74-06541 5C

The Effect of Season and Animal Size on the Caloric Content of Daphnia pulicaria Forbes,
W74-07038 2H

FLORIDA ATLANTIC UNIV., BOCA RATON.
Intergovernmental Relations as seen by Florida State Legislators: Land Use and Water Resource Problems,
W74-06845 6B

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W74-07047 4A

LORIDA UNIV., GAINESVILLE. DEPT. OF IVIL AND COASTAL ENGINEERING.
A Physical Model for Prediction and Control of Saltwater Intrusion in the Floridan Aquifer,
W74-06609 2F

LORIDA UNIV., GAINESVILLE. WATER ESOURCES RESEARCH CENTER.
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W74-06502 4A

Establishment of Mean High Water Lines in Florida Lakes,
W74-06610 2H

OOD AND DRUG DIRECTORATE, OTTAWA ONTARIO).
Mercury Content of Canadian Foods and Cereals Determined by Different Methods,
W74-06787 5A

OREST SERVICE (USDA), BERKELEY, ALIF. PACIFIC SOUTHWEST FOREST AND ANGE EXPERIMENT STATION.
DCP-Collected Absolute Target Reflectance Signatures Assist Accurate Interpretation of ERTS-1 Imagery,
W74-06688 7C

OREST SERVICE (USDA), WASHINGTON, .C.
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W74-06993 4A

RESHWATER FISHERIES RESEARCH LAB., OKYO (JAPAN).
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W74-07006 5C

ENERAL ELECTRIC CO., PHILADELPHIA, A.
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W74-06917 5A

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First Look Analyses of Five Cycles of ERTS-1 Imagery Over County of Los Angeles: Assessment of Data Utility for Urban Development and Regional Planning,
W74-06636 4A

ENEVA UNIV. (SWITZERLAND). DEPT. OF NORGANIC AND ANALYTICAL CHEMISTRY.
Phosphorimetric Determination of Traces of Boron,
W74-06755 5A

EOLOGICAL SURVEY, AUSTIN, TEX.
Effects of Ground-Water Development on the Proposed Palmetto Bend Dam and Reservoir in Southeast Texas,
W74-06920 4B

EOLOGICAL SURVEY, BOSTON, MASS.
Walden's Way Revealed,
W74-06925 2H

EOLOGICAL SURVEY, CORPUS CHRISTI, EX.
Distribution and Movement of Suspended Sediment in the Gulf of Mexico off the Texas Coast,
W74-06672 2L

GEOLOGICAL SURVEY, DENVER, COLO.
Hydrologic Data from the Piceance Basin, Colorado.
W74-06714 4B

Geologic and Hydrologic Background for Selecting Site of Pilot-Plant Repository for Radioactive Waste,
W74-06820 5B

GEOLOGICAL SURVEY, FLAGSTAFF, ARIZ.
The Use of Photographic Methods in Contrast Enhancement of ERTS-1 Images,
W74-06704 7C

GEOLOGICAL SURVEY, HARTFORD, CONN.
Plume Development in Long Island Sound Observed by Remote Sensing (ERTS-1),
W74-06668 2L

GEOLOGICAL SURVEY, MCLEAN, VA.
Progress in Cartography, Eros Program,
W74-06621 7C

GEOLOGICAL SURVEY, MENLO PARK, CALIF.
Ground-Water Hydrology of Northern Napa Valley, California,
W74-06880 2F

GEOLOGICAL SURVEY, MENLO PARK, CALIF. OFFICE OF MARINE GEOLOGY AND HYDROLOGY.
New Insights into the Influence of Ice on the Coastal Marine Environment of the Beaufort Sea, Alaska,
W74-06669 2C

GEOLOGICAL SURVEY, RALEIGH, N.C.
Karst Hydrology--A Review,
W74-06907 2F

GEOLOGICAL SURVEY, RESTON, VA.
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W74-06713 2C

GEOLOGICAL SURVEY, RESTON, VA. EROS PROGRAM OFFICE.
Coastal and Submarine Features on MSS Imagery of Southeastern Massachusetts: Comparison with Conventional Maps,
W74-06679 2L

GEOLOGICAL SURVEY, TAMPA, FLA.
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W74-06711 2L

GEOLOGICAL SURVEY, WASHINGTON, D.C.
Unique Characteristics of ERTS,
W74-06689 7B

Thermal Surveillance of Cascade Range Volcanoes Using ERTS-1 Multispectral Scanner, Aircraft Imaging Systems, and Ground-Based Data Communication Platforms,
W74-06692 7C

Flood of October 1972 at Petersburg and Colonial Heights, Virginia,
W74-06957 7C

Hydrology and Water Resources of the Hoosic River Basin, Massachusetts,
W74-06958 7C

Availability of Ground Water in the Grants Pass Area, Josephine County, Oregon,
W74-06959 7C

Quality of Ground Water in the Lower Colorado River Region, Arizona, Nevada, New Mexico, and Utah,
W74-06960 7C

Water Resources of Northwestern Missouri,
W74-06961 7C

Stream Temperatures in Washington State,
W74-06962 7C

GEOLOGICAL SURVEY, WASHINGTON, D.C. GEOGRAPHIC APPLICATIONS PROGRAM.
Change in Land Use in the Phoenix (1:250,000) Quadrangle, Arizona between 1970 and 1972: Successful Use of a Proposed Land Use Classification System,
W74-06622 4A

Land Use Classification and Change Analysis Using ERTS-1 Imagery in Carets,
W74-06625 4A

ERTS Regional-Scale Overview Linking Land Use and Environmental Processes in Carets,
W74-06626 4A

GEORGIA INST. OF TECH., ATLANTA. ENVIRONMENTAL RESOURCES CENTER.
Buffer Capacity in Aquatic Ecosystems,
W74-06829 5B

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W74-06611 5C

GEORGIA UNIV., ATHENS.
Cartographic Quality of ERTS-1 Images,
W74-06620 7C

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W74-06575 5C

GEORGIA UNIV., ATHENS. DEPT. OF ZOOLOGY; AND GEORGIA UNIV., ATHENS. INST. OF ECOLOGY.
Need for an Ecosystem Perspective in Eutrophication Modeling,
W74-06567 5C

GILBERT (J.B.) AND ASSOCIATES, SACRAMENTO, CALIF.
Ground Water Pollution--From the Waste Discharger's Viewpoint,
W74-06955 5G

GUELPH UNIV. (ONTARIO). SCHOOL OF ENGINEERING.
Hydraulic Roughness of Corrugated Plastic Tubing,
W74-06589 8B

HADASSAH MEDICAL SCHOOL, JERUSALEM (ISRAEL).
Cyanophages - Viruses Attacking Blue-Green Algae,
W74-06754 5C

HARCOURT BUTLER TECHNOLOGICAL INST., KANPUR (INDIA). DEPT. OF CHEMISTRY.
Electro-Osmotic Effects in a Bentonite-Water System,
W74-06910 2K

HARRIMAN UTILITY BOARD, TENN.
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W74-06513 5D

HAWAII STATE DEPT. OF PLANNING AND ECONOMIC DEVELOPMENT, HONOLULU.
Legal and Administrative Aspects of an Aquaculture Policy for Hawaii, An Assessment,
W74-06992 6E

HAWAII UNIV., HONOLULU.
A Simple Automatic Soil Percolator,
W74-06531 7B

HOKKAIDO UNIV., SAPPORO (JAPAN).
Yamadaphycus, a New Genus of the Delesseriaceae (Rhodophyta),
W74-06753 5A

HONEYWELL, INC., ST. PAUL, MINN. SYSTEMS AND RESEARCH CENTER.
Automatic Interpretation of ERTS Data for Forest Management,
W74-06643 4A

Determination of Land Use in Minnesota by Automatic Interpretation of ERTS MSS Data,
W74-06702 4A

HOPE COLL., HOLLAND, MICH. DEPT. OF CHEMISTRY.
Mercury in the Environment,
W74-06523 5B

Some Estimates of Natural Levels of Mercury in the Environment,
W74-06772 5B

HOWARD UNIV., WASHINGTON, D.C. DEPT. OF CIVIL ENGINEERING.
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W74-06853 4C

HYDRAULIC RESEARCH INST., PRAGUE (CZECHOSLOVAKIA).
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W74-06537 5C

Contribution to the Investigation of Odours in Water,
W74-06538 5C

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Automatic Processing and Verification of Meteorological Observations.
W74-06722 2B

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Results of Precision Processing (Scene Correction) of ERTS-1 Images Using Digital Image Processing Techniques,
W74-06651 7C

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W74-06587 2G

IFE UNIV. (NIGERIA). DEPT. OF BIOLOGICAL SCIENCES.
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W74-06768 2I

ILLINOIS UNIV., URBANA. DEPT. OF AGRICULTURAL ENGINEERING.
An Isokinetic Sampler for Wind Erosible Silt and Clay Particle Measurement,
W74-06902 2J

ILLINOIS UNIV., URBANA. DEPT. OF CIVIL ENGINEERING.
Application of DDDP in Water Resources Planning,
W74-06503 6A

Network Analysis of Conjunctively Operated Ground Water-Surface Water Systems,
W74-06504 4B

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W74-06791 5A

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Application of ERTS-1 Imagery in the Fields of Geology, Agriculture, Forestry, and Hydrology to Selected Test Sites in Iran,
W74-06710 4A

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First ERTS-1 Results in Southeastern France: Geology, Sedimentology, Pollution at Sea,
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W74-06908 2D

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Factors in the Transformation of Mercury to Methylmercury,
W74-06794 5B

Mercury and Food Chains,
W74-06796 5B

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W74-06738 2L

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Search for a Method for Sanitizing Sewage from Helminth Eggs Using Agrochemical Means. (Preliminary Communication), (In Russian),
W74-07018 5D

INTERNATIONAL HARVESTER CO., HINSDALE, ILL.
Development of Asphalt Moisture Barrier Equipment,
W74-06586 3F

INTERNATIONAL IMAGING SYSTEMS, MOUNTAIN VIEW, CALIF.
Experimental Masking of RBV Images to Reduce Stationary Residual Inaccuracies in Radiometric Correction,
W74-06649 7C

Water Depth Estimation with ERTS-1 Imagery,
W74-06680 2L

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W74-06767 5C

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W74-07045 2B

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Terrain Type Recognition Using ERTS-1 MSS Images,
W74-06661 7C

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Computer Techniques Used for Some Enhancements of ERTS Images,
W74-06653 7C

JOHNS HOPKINS UNIV., BALTIMORE, MD. CHESAPEAKE BAY INST.
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W74-06922 2J

The CBI Pogo Stick Corer,
W74-06923 7B

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Endogenous and Photoperiodic Diurnal Rhythms of in Vivo Light Absorption and Scattering in the Green Alga Ulva Lactuca L.,
W74-06547 5C

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The Selective Removal of Nitrate and Nitrite from Polluted Water,
W74-06833 5G

KANSAS STATE UNIV., MANHATTAN. DEPT. OF INDUSTRIAL ENGINEERING.
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W74-06832 5B

KANSAS UNIV., LAWRENCE. SPACE TECHNOLOGY CENTER.
Combined Spectral and Spatial Processing of ERTS Imagery Data,
W74-06660 7C

KANSAS WATER RESOURCES RESEARCH INST., MANHATTAN.
Quality Improvement of Feedlot Lagoon Water by Percolation Through Soil Under Native Pasture,
W74-06830 5D

Energetics of Daphnia Ambigua,
W74-06831 5C

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W74-06739 8B

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ent of Dry and Wet Weather Flows,
74-06508 5D

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74-06550 2I

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AYETTE, IND.
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74-06997 6D

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74-06811 5C

IAMOTO UNIV. (JAPAN). SCHOOL OF
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e Relationship Between Mercury Concentra-
n in Hair and the Onset of Minamata Dis-
e,
74-06806 5C

TO PREFECTURAL UNIV. OF MEDICINE
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Epidemiological Study on Clonorchiasis in
oto City, (In Japanese),
74-07050 5C

TO UNIV., (JAPAN). DEPT. OF SANITARY
INEERING.
the Selection of a Ground Disposal Site by
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74-06858 5B

ORATORY OF MOSQUITO CONTROL,
USHIMA (JAPAN).
servations on Gambusia affinis Introduced
Tokushima as a Natural Enemy of
squitoes, (In Japanese),
4-07048 5G

VIRGENES MUNICIPAL WATER
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tiary Treatment with a Controlled Ecologi-
System.
4-06524 5D

LENINGRAD STATE UNIV. (USSR).
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W74-07004 2G

LIBYA UNIV., TRIPOLI.
Competitive Saprophytic Colonization by Fusarium oxysporum F. Sp. vasinfectum,
W74-07011 3F

LOCKHEED ELECTRONICS CO., INC., HOUSTON, TEX. AEROSPACE SYSTEMS DIV.
Unsupervised Classification and Areal Measurement of Land and Water Coastal Features on the Texas Coast,
W74-06706 2L

LOCKHEED ELECTRONICS CO., INC., HOUSTON, TEX. HOUSTON AEROSPACE SYSTEMS DIV.
Significant Techniques in the Processing and Interpretation of ERTS-1 Data,
W74-06652 7C

LONG ISLAND UNIV., GREENVALE, N.Y. SCIENCE ENGINEERING RESEARCH GROUP.
In Situ Spectroradiometric Quantification of ERTS Data,
W74-06663 2G

LOUISIANA STATE UNIV., BATON ROUGE.
Digital Control Algorithms. Part III. Tuning PI and PID Controllers,
W74-06750 7C

LOUISIANA STATE UNIV., BATON ROUGE. DEPT. OF AGRONOMY.
Transformation of Iron in a Waterlogged Soil as Influenced by Redox Potential and pH,
W74-06934 5B

LOUISIANA STATE UNIV., BATON ROUGE. LAW SCHOOL.
Legal Impediments to the Use of Interstate Agreements in Coordinated Fisheries Management Programs: States in the N.M.F.S. Southeast Region,
W74-06991 6E

LUHDORFF (E.E.) CO., WOODLAND, CALIF.
Protecting Ground Water Quality--Some Problems and Solutions,
W74-06946 5B

LUND UNIV., (SWEDEN).
Selectrode - the Universal Ion-Selective Electrode. Part VII. A Valinomycin-Based Potassium Electrode with Nonporous Polymer Membrane and Solid-State Inner Reference System,
W74-06765 5A

MAGYAR TUDOMANYOS ADADEMIA, TIHANY. BIOLOGICAL RESEARCH INST.
Studies on the Photosynthetic Pigments and Their Decomposition in the Sediment of Lake Balaton and Lake Belso,
W74-06741 5C

MAGYAR TUDOMANYOS AKADEMIA, TIHANY. BIOLOGICAL RESEARCH INST.
Horizontal Phytoplankton Studies in Lake Balaton Based on Scooped Samples and Filtrates Taken in 1967,
W74-06756 5C

MAINE DEPT. OF INLAND FISHERIES AND GAME, BANGOR.
Spring Food of Chain Pickerel (Esox niger) in Maine Lakes,
W74-07032 2H

MAINE DEPT. OF INLAND FISHERIES AND GAME, MACHIAS.
Relative Recoveries of Hatchery-Reared Landlocked Salmon Planted at Different Ages at Schoodic Lake, Maine,
W74-06865 8I

MAINE UNIV., ORONO. DEPT. OF PHYSICS.
A Radioactive Isotopic Characterization of the Environment Near Wiscasset, Maine: A Preoperational Survey in the Vicinity of the Maine Yankee Atomic Power Plant,
W74-06855 5A

MALAYA UNIV., KUALA LUMPUR (MALAYSIA). DEPT. OF GEOGRAPHY.
Interception Loss in the Humid Forested Areas (With Special Reference to Sungai Lui Catchment, West Malaysia),
W74-07015 2D

MARTIN MARIETTA LABS., BALTIMORE, MD.
Absence of Oxygen-Evolving Capacity in Dark-Grown Chlorella: The Photoactivation of Oxygen-Evolving Centers,
W74-06544 5C

MARYLAND GEOLOGICAL SURVEY, BALTIMORE.
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W74-06664 2L

Recognition of Beach and Nearshore Depositional Features of Chesapeake Bay,
W74-06665 2L

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Dynamics of Changes in the Concentration of Fluorine Compounds Emitted by the Phosphorus Fertilizer Manufacturing Establishment in Pozan, and Their Influence on Surface and Underground Waters and on the Atmosphere Within th e Limits of the City of Poznan, (In Polish),
W74-07021 5B

METROPOLITAN WASHINGTON COUNCIL OF GOVERNMENTS, D.C. REMOTE SENSING PROJECT.
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W74-06700 4A

MICHIGAN DEPT. OF NATURAL RESOURCES, LANSING.
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W74-06784 5B

MICHIGAN DEPT. OF NATURAL RESOURCES, LANSING. FISH DIV.
Mercury in Fish in the Great Lakes,
W74-06774 5B

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The Mercury Pollution Problem in Michigan,
W74-06773 5B

MICHIGAN DEPT. OF PUBLIC HEALTH, LANSING.
Mercury Levels in a Sample of Michigan Residents,
W74-06782 5B

MICHIGAN STATE UNIV., EAST LANSING. DEPT. OF BOTANY.
The Influence of Environmental Factors on the Distribution of Freshwater Algae: An Experimental Study. III. Effects of Temperature, Vitamin Requirements and Inorganic Nitrogen Compounds on Growth,
W74-06549 5C

MICHIGAN STATE UNIV., EAST LANSING. DEPT. OF FISHERIES AND WILDLIFE.
Survival and Reproduction of Ring-Necked Pheasants Consuming Two Mercurial Fungicides,
W74-06808 5C

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Sources of Mercury in the Environment,
W74-06771 5B

MICHIGAN STATE UNIV., HICKORY CORNERS. W. K. KELLOGG BIOLOGICAL STATION.
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W74-06533 5C

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A Simple, Rapid Method for the Determination of Trace Mercury in Fish Via Neutron Activation Analysis,
W74-06788 5A

MICHIGAN UNIV., ANN ARBOR. DEPT. OF ENVIRONMENTAL AND INDUSTRIAL HEALTH.
The Determination of Mono- and Dimethylmercury Compounds by Gas Chromatography,
W74-06792 5A

The Role of Food Chains in Environmental Mercury Contamination,
W74-06795 5B

Research Needs: Study of the Environmental Dynamics of Mercury,
W74-06798 5B

MICHIGAN UNIV., ANN ARBOR. DEPT. OF INDUSTRIAL ENGINEERING.
Surface Electromyography in Chronic Inorganic Mercury Intoxication,
W74-06801 5C

MICHIGAN UNIV., ANN ARBOR. MUSEUM OF ANTHROPOLOGY.
The Mercury Content of Prehistoric Fish,
W74-07026 5A

MICHIGAN UNIV., ANN ARBOR. SCHOOL OF NATURAL RESOURCES.
Organic Phosphorus Compounds of a Northern Michigan Bog, Bog-Lake System,
W74-06742 5C

Preliminary Report of the Role of Sphagnum in the Cycling of Phosphorus in a Bog-Lake System,
W74-06743 5C

Ionic State and Coordination of Iron in Bog Lakes,
W74-06744 5C

Distribution and Circulation of Arsenic Through Water, Organisms and Sediments of Lake Michigan,
W74-07046 5B

MICHIGAN UNIV., ANN ARBOR. SCHOOL OF PUBLIC HEALTH.
Methods of Analysis for Mercury and its Compounds: A Review,
W74-06785 5A

The Dose-Response Relationship Resulting from Exposure to Alkyl Mercury Compounds,
W74-06805 5C

Epidemiological Approaches to the Study of Subclinical Effects of Mercury Intoxication,
W74-06813 5B

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W74-06800 5C

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W74-07041 5G

MINNESOTA UNIV., MINNEAPOLIS. DEPT. OF GEOGRAPHY.
ERTS-1 Applications to Minnesota Land Use Mapping,
W74-06632 4A

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Area Financing of Water Resource Development in West Minnesota,
W74-06846 6B

MINNESOTA UNIV., ST. PAUL. DEPT. OF SOIL SCIENCE.
Mineral Nitrogen Movement into Subsoils Following Continued Annual Fertilization for Corn,
W74-06898 5B

MISSOURI UNIV., COLUMBIA. DEPT. OF CHEMISTRY.
Atomic Absorption Detector for Liquid-Liquid Chromatography,
W74-06998 5A

An Atomic Absorption Analysis Method for Cyanide,
W74-06999 5A

MITRE CORP., MCLEAN, VA.
Air Quality Indices from ERTS-1 MSS Information, PR 568,
W74-06696 5A

NATHAN (ROBERT R.) ASSOCIATES, INC., WASHINGTON, D.C.
U.S. Deepwater Port Study, Vol. 2. Commodity Studies and Projections,
W74-06863 6D

U.S. Deepwater Port Study, Vol 3. Physical Coast and Port Characteristics, and Selected Deepwater Port Alternatives,
W74-06864 6D

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Symposium on Significant Results Obtained From the Earth Resources Technology Satellite-1, Volume I: Technical Presentations, Section B.
W74-06619 7C

Computed Atmospheric Effects on ERTS Observations,
W74-06694 2B

Advanced Scanners and Imaging Systems for Earth Observations.
W74-06712 7B

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A Comparison of Land-Use Determinations Using Data from ERTS-1 and High Altitude Aircraft,
W74-06638 4A

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Correlation of ERTS Multispectral Imagery with Suspended Matter and Chlorophyll in Lower Chesapeake Bay,
W74-06667 2L

NATIONAL CHEMICAL RESEARCH LAB., PRETORIA (SOUTH AFRICA).
Method of Preparing Washed Suspensions of Anaerobic Bacteria for Metabolic Studies,
W74-06875 5A

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ERTS-1 Observes Algal Bloom in Lake Erie and Utah Lake,
W74-06699 5A

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An Ecological Account of the Past and Future of South African Rivers,
W74-06606 5C

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Nitrogen Elimination by Bogus Alternation of Aerobic/'Anoxic' Conditions in 'Orbal' Activated Sludge Plants,
W74-06605 5D

Survival in Maturation Ponds of Coliform Bacteria With Transferable Drug Resistance,
W74-06748 5C

NATIONAL INST. OF SCIENTIFIC RESEARCH, QUEBEC.
Determination of the Confidence Intervals of the Pearson III Law Using Order Statistics (Determination des intervalles de confiance de la loi Pearson III par les statistiques d'ordre),
W74-06906 2E

NATIONAL MARINE FISHERIES SERVICE, HIGHLANDS, N.J. SANDY HOOK SPORTS FISHERIES MARINE LAB.
The Effects of Waste Disposal in the New York Bight. Section 3: Zooplankton Studies.
W74-06866 5C

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W74-06867 5C

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W74-06868 5C

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Relationships Between Remotely Sensed Fisheries Distribution Information and Selected Oceanographic Parameters in the Mississippi Sound,
W74-06708 7B

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Cooperative Gulf of Mexico Estuarine Inventory and Study, Florida: Phase 1 Area Description,
W74-06995 2L

NATIONAL MARINE WATER QUALITY LAB., WEST KINGSTON, R.I.
Using Artemia to Assay Oil Dispersant Toxicities,
W74-06877 5A

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Temperature Control of Reproduction and Productivity in a Subarctic Coralline Alga,
W74-06751 5C

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, MIAMI, FLA. ATLANTIC OCEANOGRAPHIC AND METEOROLOGICAL LABS.
Oceanographic Features in the Lee of the Windward and Leeward Islands: ERTS and Ship Data,
W74-06674 2E

Remote Sensing of Ocean Currents using ERTS Imagery,
W74-06675 2L

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Growth of Streptococcus cremoris and Streptococcus lactis in a Chemostat. Production of Cells and Survival of Bacteria during Frozen Storage,
W74-06762 5C

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Sample Sizes Required for Two-Sided Comparisons of Two Treatments With a Control,
W74-06746 7C

NAVAL MEDICAL RESEARCH INST., BETHESDA, MD.
Effects of Alewives (Alosa pseudoharengus) on the Zooplankton of Lake Wononskopomus, Connecticut,
W74-07033 2H

NEBRASKA UNIV., LINCOLN. COLL. OF ENGINEERING AND ARCHITECTURE.
Design Criteria for Irrigation Systems with Complex Pipe Loops,
W74-06585 3F

NEBRASKA UNIV., LINCOLN. DEPT. OF CIVIL ENGINEERING.
Biological Treatment of Feedlot Runoff,
W74-06847 5D

NEBRASKA UNIV., MITCHELL. SCOTTS BLUFF EXPERIMENT STATION.
Hydrodynamics of Border Irrigation Advance,
W74-06592 3F

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Pasture Irrigation with a Center-Pivot Sprinkler System,
W74-06601 3F

NEVADA UNIV., RENO.
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W74-07001 5C

NEVADA UNIV., RENO. DESERT RESEARCH INST.
Analysis of Iodine in Antarctic Snow,
W74-06929 5B

Silver Concentrations in Antarctic Snow and Firn,
W74-06930 5A

NEW HAMPSHIRE UNIV., DURHAM. DEPT. OF BOTANY.
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W74-06529 5C

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Initial Evaluation of the Geologic Applications of ERTS-1 Imagery for New Mexico,
W74-06693 4A

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A Multichannel Syringe Pump for Steady State Flow in Soil Columns,
W74-07028 2G

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W74-06807 5C

Mercury Concentrations in Human Tissues Among Heavy Fish Eaters,
W74-06812 5B

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W74-06545 5C

NORTH CAROLINA STATE UNIV., RALEIGH.
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W74-06682 4C

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W74-06599 2G

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W74-07000 5D

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W74-06850 2L

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W74-06749 5C

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W74-06615 9D

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W74-06616 9A

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W74-06617 9A

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Solute Movement Through Disturbed and Undisturbed Soil Cores,
W74-06935 5B

NOTRE DAME UNIV., IND. DEPT. OF CHEMICAL ENGINEERING; AND NOTRE DAME UNIV., IND. DEPT. OF CIVIL ENGINEERING.
Rates of Carbon, Oxygen, Nitrogen, and Phosphorus Cycling Through Microbial Populations in Stratified Lakes,
W74-06569 5C

NOTRE DAME UNIV., IND. DEPT. OF CIVIL ENGINEERING; NOTRE DAME UNIV., IND. DEPT. OF CHEMICAL ENGINEERING; ILLINOIS UNIV., CHICAGO. DEPT. OF BIOLOGICAL SCIENCES; AND TENECH ENVIRONMENTAL CONSULTANTS, SOUTH BEND, IND.
Multi-Nutrient Dynamic Models of Algal Growth and Species Competition in Eutrophic Lakes,
W74-06568 5C

OAK RIDGE NATIONAL LAB., TENN.
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W74-06825 5B

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W74-06818 5B

OBERLIN COLL., OHIO.
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W74-06876 5A

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W74-06918 6E

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W74-06602 8A

OHIO STATE UNIV. RESEARCH FOUNDATION, COLUMBUS. INST. OF POLAR STUDIES.
Folding of Cold Ice,
W74-06928 2C

Analysis of the Concentration of Microparticles in the Long Ice Core from Byrd Station,
W74-06931 2C

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W74-06695 5A

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W74-06517 2D

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W74-06505 5C

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W74-06618 2H

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Mercury in Humans in the Great Lakes Region,
W74-06783 5B

OREGON STATE UNIV., CORVALLIS.
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W74-06683 4A

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Studies of the Forest Energy Budget,
W74-06518 2D

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W74-06543 5C

Report of the Expert Group on Detergents.
W74-06554 5C

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W74-06563 5C

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W74-07008 2I

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W74-07013 2H

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK.
Groundwater Tracing with Post Sampling Activation Analysis,
W74-06889 2F

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. COLL. OF EARTH AND MINERAL SCIENCES.
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W74-06512 5D

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Investigations of an Urban Area and its Locale Using ERTS-1 Data Supported by U-Photography,
W74-06635 4A

Mapping of Agricultural Land Use from ERTS-1 Digital Data,
W74-06640 4A

The Use of the Temporal Dimension in Classifying and Mapping ERTS-1 Mss Data,
W74-06641 4A

Identification and Mapping of Coal Refuse Banks and Other Targets in the Anthracite Region,
W74-06642 4A

Classification of ERTS-1 MSS Data by Canonical Analysis,
W74-06662 7C

POLISH ACADEMY OF SCIENCE, KRAKOW. ZAKLAD BIOLOGII WOD.
Macrobenthos of Ponds with Sugar Factory Wastes,
W74-06553 5C

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W74-06551 5C

Protozoans in Ponds Filled with Sugar Factory Wastes,
W74-06552 5C

POLSKIE TOWARZYSTWO PRZYRODNKOW IM KOPERNIKA, WARSAW.
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W74-07020 5B

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W74-06603 5G

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W74-06612 5B

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W74-06637 4A

RAI RESEARCH CORP., LONG ISLAND CITY, N.Y.
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W74-06522 5D

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W74-06656 7C

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W74-06607 5B

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W74-06885 5A

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W74-06572 5C

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RUTGERS - THE STATE UNIV., NEW BRUNSWICK, N.J.
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W74-06761 5C

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W74-06834 5C

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W74-06809 5C

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Determination of Aerosol Content in the Atmosphere,
W74-06647 7C

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W74-06752 5C

HOCK HYDRODYNAMICS. SHERMAN OAKS, ALIF.
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W74-06860 8H

LIPPERY ROCK STATE COLL., PA. DEPT. OF IOLOGY.
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W74-06760 5A

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Assessing Systematic Errors in Rainfall-Runoff Models,
W74-06893 2A

OIL CONSERVATION SERVICE, BERKELEY, ALIF.
Patterson Watershed Project, Stanislaus County, California (Final Environmental Impact Statement).
W74-06987 4A

OIL CONSERVATION SERVICE, VASHINGTON, D.C.
Hurricane Creek Watershed Project, Humphreys and Dickson Counties, Tennessee (Final Environmental Impact Statement).
W74-06988 4D

Nutwood Watershed, Illinois (Final Environmental Statement).
W74-06990 4A

OIL TESTING SERVICES, INC., ORTHBROOK, ILL.
Effect of Roughness Elements on Hydraulic Resistance for Overland Flow,
W74-06594 8B

OUTH CAROLINA WATER RESOURCES OMMISSION, COLUMBIA.
Wando River Environmental Quality Studies, An Interim Report.
W74-06919 5B

OUTH DAKOTA STATE UNIV., BROOKINGS. EPT. OF AGRICULTURAL ENGINEERING.
Hydraulics of a Center Pivot System,
W74-06583 3F

OUTH DAKOTA STATE UNIV., BROOKINGS. EPT. OF PLANT SCIENCE; AND SOUTH AKOTA STATE UNIV., BROOKINGS. EMOTE SENSING INST.
Identification of Soil Associations in Western South Dakota on ERTS-1 Imagery,
W74-06629 2G

SOUTHERN CALIFORNIA METROPOLITAN WATER DISTRICT, LOS ANGELES.
Conjunctive Operation of Southern California Ground Water Basins with the State Water Project,
W74-06943 4B

STANFORD RESEARCH INST., MENLO PARK, CALIF.
Analysis of ERTS Imagery Using Special Electronic Viewing/Measuring Equipment,
W74-06659 7C

STATE UNIV. COLL., FREDONIA, N.Y.
Correlation Between CO2 and O2 Concentrations in Lake Erie, USA,
W74-07025 5C

STATE UNIV. OF NEW YORK, BUFFALO. FACULTY OF ENGINEERING AND APPLIED SCIENCES.
On the Solution of Transient Free-Surface Flow Problems in Porous Media by the Finite Element Method,
W74-06890 2F

STOCKTON DEPT. OF PUBLIC WORKS, CALIF.
Packinghouse Waste Treatment.
W74-06511 5D

SWIFT AND CO., OAK BROOK, ILL. RESEARCH AND DEVELOPMENT CENTER.
Recovery of Fatty Materials from Edible Oil Refinery Effluents,
W74-06514 5D

TARAPOREWALA MARINE BIOLOGICAL RESEARCH STATION, BOMBAY (INDIA).
Observations on Comparative Propensities for Carp Fry Destruction by Adults and Last Instar Preimaginal Stages of Predatory Aquatic Insects,
W74-07044 2I

TECHNICAL UNIV. OF DENMARK, LYNGBY. KEMISK LABORATORIUM A.
Selectrode - the Universal Ion-Selective Electrode. Part VI. The Calcium (II) Selectrode Employing a New Ion Exchanger in a Nonporous Membrane and a Solid-State Reference System,
W74-06764 5A

TECHNION - ISRAEL INST. OF TECH., HAIFA. DEPT. OF AGRICULTURAL ENGINEERING.
Thermodynamics of Ion Exchange,
W74-06936 2G

TECHNISCHE HOCHSCHULE, VIENNA (AUSTRIA). INSTITUT FUER GEOPHYSIK.
Hydrogeomorphology,
W74-06891 2A

TENNESSEE UNIV., KNOXVILLE. DEPT. OF GEOGRAPHY.
Geographic Applications of ERTS-1 Data to Landscape Change,
W74-06628 4A

TENNESSEE VALLEY AUTHORITY, CHATTANOOGA.
Investigation of Mercury Contamination in the Tennessee Valley Region,
W74-06780 5B

TETRA TECH, INC., HOUSTON, TEX.
Digital Interactive Image Analysis by Array Processing,
W74-06657 7C

TETRA TECH, INC., PASADENA, CALIFORNIA.
Mathematical Model for Barged Ocean Disposal of Wastes,
W74-06837 5B

TEXAS A AND M UNIV., COLLEGE STATION. DEPT. OF BIOLOGY.
Interaction of Temperature and Copper Ions as Orienting Stimuli in the Locomotor Behavior of the Goldfish (Carassius auratus),
W74-06769 5C

TEXAS A AND M UNIV., COLLEGE STATION. DEPT. OF CIVIL ENGINEERING.
Chemical Aspects of Bioassay Techniques for Establishing Water Quality Criteria,
W74-06747 5A

TEXAS UNIV., AUSTIN.
Hypolimnion Aeration with Commercial Oxygen - Vol. I - Dynamics of Bubble Plume,
W74-06525 5D

Hypolimnion Aeration with Commercial Oxygen - Vol. II - Bubble Plume Gas Transfer,
W74-06526 5D

TEXAS WATER DEVELOPMENT BOARD, AUSTIN. SYSTEMS ENGINEERING DIV.
Techniques for Identifying and Evaluating Market and Nonmarket Benefits and Costs of Water Resource Systems.
W74-06852 6B

TRW SYSTEMS GROUP, REDONDO BEACH, CALIF.
Digital Rectification of ERTS Multispectral Imagery,
W74-06650 7C

UTAH CENTER FOR WATER RESOURCES RESEARCH, LOGAN.
Intermittent Sand Filtration to Upgrade Existing Wastewater Treatment Facilities,
W74-06506 5D

UTAH STATE UNIV., LOGAN. DEPT. OF AGRICULTURAL AND IRRIGATION ENGINEERING.
Bibliography of Water Management.
W74-06854 3F

UTAH STATE UNIV., LOGAN. DEPT. OF SOIL SCIENCE AND BIOMETEOROLOGY.
Kinetics of the Phosphate Interaction with Calcite,
W74-06895 5B

UTAH WATER RESEARCH LAB., LOGAN.
Modeling the Eutrophication Process.
W74-06560 5C

Activity Analysis and the Management of Resources: A Model for Control of Eutrophication,
W74-06574 5C

Biological Response to Detergent and Nondetergent Phosphorus in Sewage - Part II,
W74-06873 5C

VERMONT UNIV., BURLINGTON. DEPT. OF ZOOLOGY.
Materials Input of Lake Champlain: A Synoptic Appraisal,
W74-06882 2H

VICTORIA UNIV. (BRITISH COLUMBIA). DEPT. OF GEOGRAPHY.
The Role of Dew in the Seasonal Moisture Balance of a Summer-Dry Climate,
W74-07037 2B

VIGINIA UNIV., CHARLOTTESVILLE. DEPT. OF ENVIRONMENTAL SCIENCES.
Evaluation of Land Use Mapping from ERTS in the Shore Zone of Carets,
W74-06627 4A

VIRGINIA UNIV., CHARLOTTESVILLE. DEPT. OF ENVIRONMENTAL SCIENCES.
Origin of Circular Beds of Thalassia (Spermatophyta:Hydrocharitaceae) in South Biscayne Bay, Florida, and Their Relationship to Mangrove Hammocks,
W74-07022 5A

VYSOKA SKOLA ZEMEDELSKA, LEDNICE (CZECHOSLOVAKIA). BIOLOGICAL STATION.
The Effect of Mineral Fertilization and of Carp Fry on the Composition and Dynamics of Plankton,
W74-06535 5C

WAITE AGRICULTURAL RESEARCH INST., GLEN OSMOND (AUSTRALIA).
Effect of Plant Growth and Form of Nitrogen Fertilizer on Dentrification from Four South Australian Soils,
W74-07039 2G

WAPORA, INC., WASHINGTON, D.C.
Technical and Economic Evaluation of Cooling System Blowdown Control Techniques,
W74-06510 5D

WASHINGTON STATE UNIV., PULLMAN. DEPT. OF AGRICULTURAL ENGINEERING.
Mathematical Model of Water Advance in Border Irrigation,
W74-06582 3F

WASHINGTON STATE UNIV., PULLMAN. DEPT. OF ZOOLOGY AND WASHINGTON STATE UNIV., PULLMAN. DEPT. OF COMPUTER SCIENCE.
Capabilities and Limitations of Nutrient-Plankton Model,
W74-06570 5C

WASHINGTON UNIV., SEATTLE. DEPT. OF CIVIL ENGINEERING.
Long-Term Lake Recovery Related to Available Phosphorus,
W74-06562 5C

WASHINGTON UNIV., SEATTLE. DEPT. OF OCEANOGRAPHY.
Oxidation of Organic Matter in Sediments,
W74-06528 5C

WATER POLLUTION RESEARCH LAB., STEVENAGE (ENGLAND).
Utilization of Oxygen in Estuaries,
W74-06540 5C

Oxygen in Estuaries: Requirements for Fisheries,
W74-06542 5C

WATER RESOURCES ENGINEERS, INC., WALNUT CREEK, CALIF.
Ground Water Quality Models: What They Can and Cannot Do,
W74-06944 5B

WAYNE COMMUNITY COLL., GOLDSBORO, N.C.
An Evaluation of Striped Bass Fingerling Culture,
W74-07002 8I

WEST VIRGINIA UNIV., MORGANTOWN. DEPT. OF BIOLOGY.
Micro-Ecosystems Simulation of Primary Production in Thermal and Acid Mine Water Loadings Related to Water Use of the Monongahela River,
W74-06507 5C

WESTERN NEW YORK NUCLEAR RESEARCH CENTER, INC., BUFFALO.
Preparation of Biological Samples for Neutron Activation Analysis of Mercury,
W74-06786 5A

WILEY AND WILSON, INC., LYNCHBURG, VA.
Emergency Planning for Municipal Wastewater Treatment Facilities,
W74-06577 5D

Start-Up of Municipal Wastewater Treatment Facilities,
W74-06578 5D

Maintenance Management Systems for Municipal Wastewater Facilities,
W74-06579 5D

WILLIAM PATERSON COLL. OF NEW JERSEY, WAYNE. DEPT. OF GEOGRAPHY.
ERTS-1 Applied for Structural and Morphological Investigations Case Studies: (1) Los Angeles, California and (2) Coastal Plain, New Jersey,
W74-06690 7C

WISCONSIN DEPT. OF NATURAL RESOURCES, MADISON.
Mercury Contents of Bottom Sediments from Wisconsin Rivers and Lakes,
W74-06777 5B

Mercury Levels in Wisconsin Fish,
W74-06778 5B

WISCONSIN UNIV., MADISON.
The Use of ERTS-1 Data for the Inventory of Critical Land Resources for Regional Land Use Planning,
W74-06634 4A

WISCONSIN UNIV., MADISON. DEPT. OF CIVIL AND ENVIRONMENTAL ENGINEERING.
New Methods of Nitrite and Nitrate Analysis for Natural Waters,
W74-06836 5A

WISCONSIN UNIV., MADISON. DEPT. OF SOIL SCIENCE.
A Comparison of Hydraulic Conductivities Calculated with Morphometric and Physical Methods,
W74-06899 2G

WISCONSIN UNIV., MADISON. INST. FOR ENVIRONMENTAL STUDIES
Simulation of Urban Runoff, Nutrient Loading, and Biotic Response of a Shallow Eutrophic Lake,
W74-06564 5C

WISCONSIN UNIV., MADISON. LAB. OF LIMNOLOGY.
Social Interaction Between Juvenile Coho (Oncorhynchus kisutch) and Fall Chinook Salmon (O. tshawytscha) in Sixes River, Oregon,
W74-07040 2I

WISCONSIN UNIV., MADISON. WATER CHEMISTRY PROGRAM; AND TEXAS A AND M UNIV., COLLEGE STATION. DEPT. OF CIVIL ENGINEERING.
The Role of Thermocline Migration in Regulating Algal Blooms,
W74-06566 5C

WOJEWODZKIE PRZEDSIEBIORSTWO WODOCIAGOW KANALIZ, KATOWICE (POLAND).
Influence of Some Hydrological Parameters on Changes in the Radioactivity of the Waters of the Rivers Czarna Przemsza and Przemsza,
W74-07019 5B

WOODS HOLE OCEANOGRAPHIC INSTITUTION, MASS. DEPT. OF BIOLOGY.
Growth Comparisons of Oysters, Mussels and Scallops Cultivated on Algae Growth With Artificial Medium and Treated Sewage Effluent,
W74-07035 5C

WYOMING UNIV., LARAMIE. DEPT. OF AGRICULTURAL ENGINEERING.
A Large Undisturbed, Weighing Lysimeter for Grassland Studies,
W74-06581 2G

WYOMING UNIV., LARAMIE. DEPT. OF GEOLOGY.
Remote Sensing Applied to Land-Use Studies in Wyoming,
W74-06631 4A

WYZSZA SZKOLA ROLNICZA, WROCLAW (POLAND). INSTYTUT HODOWLI ROSLIN I NASIENNICTWO.
Baking Quality of Spring Wheat as Affected by Rain During Drying After Reaping (In Polish),
W74-06548 3F

ZENTRALANSTALT FUER METEOROLOGIE UND GEODYNAMIK, VIENNA (AUSTRIA).
On Flood Probabilities of East Alpine Rivers,
W74-06909 2E

ZOOLOGISCHES FORSCHUNGSINSTITUT UND MUSEUM ALEXANDER KOENIG, BONN (WEST GERMANY).
The Laguna de Vegueta on the Mid-Peruvian Coast and Its Fishes, Particularly Aequidens rivulatus (Guenther 1859), (In German),
W74-07007 2H

ACCESSION NUMBER INDEX

W74-06501 3D
W74-06502 4A
W74-06503 6A
W74-06504 4B
W74-06505 5C
W74-06506 5D
W74-06507 5C
W74-06508 5D
W74-06509 5D
W74-06510 5D
W74-06511 5D
W74-06512 5D
W74-06513 5D
W74-06514 5D
W74-06515 9A
W74-06516 5D
W74-06517 2D
W74-06518 2D
W74-06519 5D
W74-06520 5D
W74-06521 5D
W74-06522 5D
W74-06523 5B
W74-06524 5D
W74-06525 5D
W74-06526 5D
W74-06527 5F
W74-06528 5C
W74-06529 5C
W74-06530 5C
W74-06531 7B
W74-06532 7C
W74-06533 5C
W74-06534 5C
W74-06535 5C
W74-06536 5C
W74-06537 5C
W74-06538 5C
W74-06539 5C
W74-06540 5C
W74-06541 5C
W74-06542 5C
W74-06543 5C
W74-06544 5C
W74-06545 5C
W74-06546 5C
W74-06547 5C
W74-06548 3F
W74-06549 5C
W74-06550 2I
W74-06551 5C
W74-06552 5C
W74-06553 5C
W74-06554 5C
W74-06555 5C
W74-06556 5C
W74-06557 5C
W74-06558 5A
W74-06559 6B
W74-06560 5C
W74-06561 5C
W74-06562 5C
W74-06563 5C
W74-06564 5C
W74-06565 5C
W74-06566 5C
W74-06567 5C
W74-06568 5C
W74-06569 5C
W74-06570 5C
W74-06571 5C
W74-06572 5C
W74-06573 5C
W74-06574 5C
W74-06575 5C
W74-06576 5C
W74-06577 5D
W74-06578 5D
W74-06579 5D
W74-06580 3F
W74-06581 2G
W74-06582 3F
W74-06583 3F
W74-06584 2F
W74-06585 3F
W74-06586 3F
W74-06587 2G
W74-06588 3F
W74-06589 8B
W74-06590 3F
W74-06591 3F
W74-06592 3F
W74-06593 3F
W74-06594 8B
W74-06595 3F
W74-06596 3F
W74-06597 2E
W74-06598 3F
W74-06599 2G
W74-06600 4A
W74-06601 3F
W74-06602 8A
W74-06603 5G
W74-06604 5B
W74-06605 5D
W74-06606 5C
W74-06607 5B
W74-06608 5D
W74-06609 2F
W74-06610 2H
W74-06611 5C
W74-06612 5B
W74-06613 5B
W74-06614 6E
W74-06615 9D
W74-06616 9A
W74-06617 9A
W74-06618 2H
W74-06619 7C
W74-06620 7C
W74-06621 7C
W74-06622 4A
W74-06623 4A
W74-06624 4A
W74-06625 4A
W74-06626 4A
W74-06627 4A
W74-06628 4A
W74-06629 2G
W74-06630 4A
W74-06631 4A
W74-06632 4A
W74-06633 4A
W74-06634 4A
W74-06635 4A
W74-06636 4A
W74-06637 4A
W74-06638 4A
W74-06639 4A
W74-06640 4A
W74-06641 4A
W74-06642 4A
W74-06643 4A
W74-06644 4A
W74-06645 4A
W74-06646 7C
W74-06647 7C
W74-06648 7C
W74-06649 7C
W74-06650 7C
W74-06651 7C
W74-06652 7C
W74-06653 7C
W74-06654 7C
W74-06655 7C
W74-06656 7C
W74-06657 7C
W74-06658 7C
W74-06659 7C
W74-06660 7C
W74-06661 7C
W74-06662 7C
W74-06663 2G
W74-06664 2L
W74-06665 2L
W74-06666 2L
W74-06667 2L
W74-06668 2L
W74-06669 2C
W74-06670 2L
W74-06671 2L
W74-06672 2L
W74-06673 2L
W74-06674 2E
W74-06675 2L
W74-06676 2C
W74-06677 5A
W74-06678 2L
W74-06679 2L
W74-06680 2L
W74-06681 2E
W74-06682 4C
W74-06683 4A
W74-06684 4A
W74-06685 4A
W74-06686 4A
W74-06687 4A
W74-06688 7C
W74-06689 7B
W74-06690 7C
W74-06691 7C
W74-06692 7C
W74-06693 4A
W74-06694 2B
W74-06695 5A
W74-06696 5A
W74-06697 2C
W74-06698 5A
W74-06699 5A
W74-06700 4A
W74-06701 4A
W74-06702 4A
W74-06703 2L
W74-06704 7C
W74-06705 4A
W74-06706 2L
W74-06707 2L
W74-06708 7B
W74-06709 2L
W74-06710 4A
W74-06711 2L
W74-06712 7B
W74-06713 2C
W74-06714 4B
W74-06715 2G
W74-06716 2C
W74-06717 2C
W74-06718 2C
W74-06719 2C
W74-06720 2C
W74-06721 2C
W74-06722 2B
W74-06723 2B
W74-06724 2B
W74-06725 2B
W74-06726 2B
W74-06727 2B
W74-06728 2B
W74-06729 2B
W74-06730 2B
W74-06731 2B
W74-06732 2B
W74-06733 2B
W74-06734 2G
W74-06735 2G
W74-06736 2G
W74-06737 2E
W74-06738 2L
W74-06739 8B
W74-06740 4B
W74-06741 5C
W74-06742 5C
W74-06743 5C
W74-06744 5C
W74-06745 5C
W74-06746 7C
W74-06747 5A
W74-06748 5C
W74-06749 5C
W74-06750 7C
W74-06751 5C
W74-06752 5C
W74-06753 5A
W74-06754 5C
W74-06755 5A
W74-06756 5C
W74-06757 5A
W74-06758 2K
W74-06759 5C
W74-06760 5A
W74-06761 5C
W74-06762 5C
W74-06763 5C
W74-06764 5A
W74-06765 5A
W74-06766 5B
W74-06767 5C
W74-06768 2I
W74-06769 5C
W74-06770 5B
W74-06771 5B
W74-06772 5B
W74-06773 5B
W74-06774 5B
W74-06775 5B
W74-06776 5B
W74-06777 5B
W74-06778 5B
W74-06779 5B
W74-06780 5B
W74-06781 5B
W74-06782 5B
W74-06783 5B
W74-06784 5B
W74-06785 5A
W74-06786 5A
W74-06787 5A
W74-06788 5A
W74-06789 5A
W74-06790 5A
W74-06791 5A
W74-06792 5A
W74-06793 5A
W74-06794 5B
W74-06795 5B
W74-06796 5B
W74-06797 5B
W74-06798 5B
W74-06799 5B
W74-06800 5C
W74-06801 5C
W74-06802 5C
W74-06803 5C
W74-06804 5C
W74-06805 5C
W74-06806 5C
W74-06807 5C
W74-06808 5C
W74-06809 5C
W74-06810 5C
W74-06811 5C
W74-06812 5B

W74-06813 5B
W74-06814 5C
W74-06815 5A
W74-06816 5A
W74-06817 5A
W74-06818 5B
W74-06819 5C
W74-06820 5B
W74-06821 5B
W74-06822 5D
W74-06823 6B
W74-06824 5A
W74-06825 5B
W74-06826 5B
W74-06827 6D
W74-06828 5D
W74-06829 5B
W74-06830 5D
W74-06831 5C
W74-06832 5B
W74-06833 5G
W74-06834 5C
W74-06835 5C
W74-06836 5A
W74-06837 5B
W74-06838 5D
W74-06839 5D
W74-06840 5D
W74-06841 5A
W74-06842 5D
W74-06843 6E
W74-06844 2F
W74-06845 6B
W74-06846 6B
W74-06847 5D
W74-06848 5B
W74-06849 5B
W74-06850 2L
W74-06851 5B
W74-06852 6B
W74-06853 4C
W74-06854 3F
W74-06855 5A
W74-06856 5A
W74-06857 5C
W74-06858 5B
W74-06859 8H
W74-06860 8H
W74-06861 5B
W74-06862 5B
W74-06863 6D
W74-06864 6D
W74-06865 8I
W74-06866 5C
W74-06867 5C
W74-06868 5C
W74-06869 5A
W74-06870 5A
W74-06871 5A
W74-06872 5A
W74-06873 5C
W74-06874 2K
W74-06875 5A
W74-06876 5A
W74-06877 5A
W74-06878 5A
W74-06879 6D
W74-06880 2F
W74-06881 2F
W74-06882 2H
W74-06883 2J
W74-06884 4D
W74-06885 5A
W74-06886 2G
W74-06887 2F
W74-06888 2F
W74-06889 2F
W74-06890 2F
W74-06891 2A
W74-06892 2F
W74-06893 2A
W74-06894 5B
W74-06895 5B
W74-06896 5B
W74-06897 5B
W74-06898 5B
W74-06899 2G
W74-06900 2D
W74-06901 2J
W74-06902 2J
W74-06903 2J
W74-06904 2G
W74-06905 2G
W74-06906 2E
W74-06907 2F
W74-06908 2D
W74-06909 2E
W74-06910 2K
W74-06911 8B
W74-06912 8B
W74-06913 8B
W74-06914 8B
W74-06915 8B
W74-06916 8B
W74-06917 5A
W74-06918 6E
W74-06919 5B
W74-06920 4B
W74-06921 2C
W74-06922 2J
W74-06923 7B
W74-06924 5B
W74-06925 2H
W74-06926 2E
W74-06927 3F
W74-06928 2C
W74-06929 5B
W74-06930 5A
W74-06931 2C
W74-06932 5A
W74-06933 5B
W74-06934 5B
W74-06935 5B
W74-06936 2G
W74-06937 2B
W74-06938 2B
W74-06939 2B
W74-06940 2B
W74-06941 2B
W74-06942 5B
W74-06943 4B
W74-06944 5B
W74-06945 4B
W74-06946 5B
W74-06947 5A
W74-06948 5D
W74-06949 5B
W74-06950 5B
W74-06951 5B
W74-06952 5G
W74-06953 5G
W74-06954 5G
W74-06955 5G
W74-06956 5B
W74-06957 7C
W74-06958 7C
W74-06959 7C
W74-06960 7C
W74-06961 7C
W74-06962 7C
W74-06963 5G
W74-06964 6E
W74-06965 6E
W74-06966 6E
W74-06967 5G
W74-06968 6E
W74-06969 5G
W74-06970 6G
W74-06971 4D
W74-06972 6E
W74-06973 6E
W74-06974 6E
W74-06975 6E
W74-06976 6E
W74-06977 6E
W74-06978 6E
W74-06979 6E
W74-06980 6E
W74-06981 6E
W74-06982 6E
W74-06983 6E
W74-06984 6E
W74-06985 4A
W74-06986 8A
W74-06987 4A
W74-06988 4D
W74-06989 4A
W74-06990 4A
W74-06991 6E
W74-06992 6E
W74-06993 4A
W74-06994 6E
W74-06995 2L
W74-06996 6B
W74-06997 6D
W74-06998 5A
W74-06999 5A
W74-07000 5D
W74-07001 5C
W74-07002 8I
W74-07003 2H
W74-07004 2G
W74-07005 5C
W74-07006 5C
W74-07007 2H
W74-07008 2I
W74-07009 5B
W74-07010 5C
W74-07011 3F
W74-07012 5C
W74-07013 2H
W74-07014 2I
W74-07015 2D
W74-07016 2H
W74-07017 5G
W74-07018 5D
W74-07019 5B
W74-07020 5B
W74-07021 5B
W74-07022 5A
W74-07023 5A
W74-07024 5B
W74-07025 5C
W74-07026 5A
W74-07027 3F
W74-07028 2G
W74-07029 2G
W74-07030 2G
W74-07031 5C
W74-07032 2H
W74-07033 2H
W74-07034 2G
W74-07035 5C
W74-07036 2I
W74-07037 2B
W74-07038 2H
W74-07039 2G
W74-07040 2I
W74-07041 5G
W74-07042 2G
W74-07043 2B
W74-07044 2I
W74-07045 2B
W74-07046 5B
W74-07047 4A
W74-07048 5G
W74-07049 2L
W74-07050 5C

ABSTRACT SOURCES

Source	Accession Number	Total
A. Centers of Competence		
AEC Oak Ridge National Laboratory, Nuclear Radiation and Safety	W74-06815 -- 06826 06855 -- 06862	20
Battelle Memorial Institute, Methods for Chemical and Biological Identification of Pollutants	W74-06745 -- 06755 06757 -- 06765 06866 -- 06878	33
Colorado State University, Irrigation Return Flow Quality	W74-06580 -- 06602	23
University of Florida, Eastern U. S. Water Law	W74-06963 -- 06995	33
University of Wisconsin, Eutrophication	W74-06529 -- 06530 06533 -- 06547 06549 06551 -- 06576 06742 -- 06744	47
University of Wisconsin, Water Resources Economics	W74-06863 -- 06864	2
U. S. Geological Survey, Hydrology	W74-06515 -- 06516 06619 -- 06740 06879 -- 06926 06928 -- 06962	207
Vanderbilt University, Metals Pollution	W74-06766 -- 06767 06769 -- 06814	48
B. State Water Resources Research Institutes		
California Water Resources Center	W74-06608, 06843 06996	3
Colorado Environmental Resources Center	W74-06844	1
Connecticut Institute of Water Resources	W74-06828	1
Florida Water Resources Research Center	W74-06502 06609 -- 06610 06845	4
Georgia Environmental Resources Center	W74-06611, 06829	2
Illinois Water Resources Center	W74-06503 -- 06504	2
Indiana Water Resources Research Center	W74-06612, 06997	2
Kansas Water Resources Research Institute	W74-06830 -- 06833	4
Minnesota Water Resources Research Center	W74-06846	1
Missouri Water Resources Research Center	W74-06998 -- 06999	2
Nebraska Water Resources Research Institute	W74-06847	1
New Jersey Water Resources Research Institute	W74-06613, 06834	2
New York Water Resources and Marine Sciences Center	W74-06614, 06835 06848 -- 06849	4
North Carolina Water Resources Research Institute	W74-06615 -- 06617 06850, 07000	5

Source	Accession Number	Total
B. State Water Resources Research Institutes (Cont'd)		
Oklahoma Water Resources Research Institute	W74-06505, 06618	2
Utah Center for Water Resources Research	W74-06506	1
West Virginia Water Research Institute	W74-06507	1
Wisconsin Water Resources Center	W74-06836	1
C. Other		
BioSciences Information Service	W74-06531 -- 06532 06548, 06550 06741, 06756 06768, 06865 06927 07001 -- 07050	59
Department of Water Affairs	W74-06603 -- 06607	5
Environmental Protection Agency	W74-06508 -- 06514 06519 -- 06528 06577 -- 06579 06837 -- 06842	26
Office of Water Resources Research	W74-06501 06517 -- 06518 06827 06851 -- 06854	8

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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.

Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

6 WATER RESOURCES PLANNING

7 RESOURCES DATA

8 ENGINEERING WORKS

9 MANPOWER, GRANTS, AND FACILITIES

10 SCIENTIFIC AND TECHNICAL INFORMATION

INDEXES

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 7, NUMBER 14
JULY 15, 1974

W74-07051 -- W74-076000

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SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

VOLUME 7, NUMBER 14
JULY 15, 1974

W74-07051 -- W74-07600

The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

CONTENTS

FOREWORD iii

SUBJECT FIELDS AND GROUPS

(Use Edge Index on back cover to Locate Subject Fields and Indexes in the journal.)

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Non-Water Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

WATER CYCLE

. General

AINAGE DENSITY AND EFFECTIVE ECIPITATION,
M. Madduma Bandara.
rnal of Hydrology, Vol 21, No 2, p 187-190, ruary 1974. 1 fig, 11 ref.

scriptors: *Erosion, *Geomorphology, ainage density, *Tropical regions, asslands, Humid areas, Wet climates, inage patterns(Geologic), Hortons law.
ntifiers: *Ceylon(Sri Lanka region).

he central hills of Sri Lanka, the relationship ween drainage density and effective precipita- is significantly positive. This shows that ve a certain critical level of effective precipita- (80-90) the relationship between drainage den- and P/E index turns positive. Such a conclu- is in agreement with the results of recent work ch shows that, in humid tropical areas, sedi- nt yield reaches a maximum under grassland ditions and possibly reaches another peak ere the impeding effect of vegetation cannot be reased by further increase of precipitation. app-USGS)
4-07155

TER YIELD, ANNUAL PEAKS AND EXPO-RE IN MOUNTAINOUS TERRAIN,
rest Service (USDA), Moscow, Idaho. Forestry ences Lab.
Bethlahmy.
rnal of Hydrology, Vol 20, No 2, p 155-169, tober 1973. 2 fig, 5 tab, 20 ref.

scriptors: *Snowmelt, *Alpine, *Water yield, unoff forecasting, *Rocky Mountain Region, lation, Solar radiation, Topography, Flood ecasting, Streamflow forecasting, Peak charge, Slopes, Mountains.

steep, mountainous terrain of the western ited States, where summer rains are negligible annual runoff is primarily dependent on melt- snow, the runoff distribution is such that a high rgy recipient (HE) watershed generally yields re water per unit area than a low energy ipient (LE) watershed except during the latter's od peak period, at which time the ratio of yields eversed. HE watersheds peak sooner than their responding LE watersheds, but also vary more their peaking date. The ratio of maximum peak ws may be greater or less than 1.0 depending on vironmental circumstances. (Knapp-USGS)
4-07165

MERICAL STUDIES OF TWO-DIMEN-ONAL SATURATED-UNSATURATED AINAGE MODELS,
lo Univ. (Norway). Inst. of Geophysics.
r primary bibliographic entry see Field 2G.
4-07168

OSS-SPECTRAL ANALYSIS OF RAINFALL ID RUNOFF FOR RARITAN AND MULLICA VER BASINS IN NEW JERSEY,
tgers - The State Univ., New Brunswick, N.J. pt. of Civil and Environmental Engineering.
L. Bourodimos, and A. M. Oguntuase.
urnal of Hydrology, Vol 21, No 1, p 61-79, nuary 1974. 9 fig, 1 tab, 11 ref.

escriptors: *Rainfall-runoff relationships, atistical methods, *Correlation analysis, Fourier alysis, Time series analysis, *New Jersey, ochastic processes.
entifiers: *Cross-spectral analysis, *Raritan ver basin(N.J.), *Mullica River basin(N.J.).

Cross-correlation and cross-spectral analysis were employed in the analysis of rainfall and runoff in two river basins: the Raritan and Mullica River basins in New Jersey. Cross-covariance and coherence were studied in the correlograms for the following cases: (a) rainfall-runoff for each basin separately; (b) rainfall-rainfall analysis for two main meteorological stations in each of the basins; (c) runoff-runoff for two main gaging stations in each of the basins. From the estimates of the coherence at various frequencies, the cross-spectral analysis shows a highly nonlinear relationship between rainfall and runoff. A poor coherence of the annual cycles for each basin makes it difficult to predict the annual oscillations of runoff from those of rainfall by a linear regression model. The high coherence between rainfall (or runoff) at the first station and rainfall (or runoff) at the second station within the same basin at almost all frequencies establishes an accurate prediction on a linear basis. (Knapp-USGS)
W74-07183

THE EPA STORMWATER MANAGEMENT MODEL: A CURRENT OVERVIEW,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5D.
W74-07265

SOME GENERALIZED BETA DISTRIBUTIONS OF THE SECOND KIND HAVING DESIRABLE APPLICATION FEATURES IN HYDROLOGY AND METEOROLOGY,
Colorado State Univ., Fort Collins. Dept. of Statistics.
P. W. Mielke, Jr., and E. S. Johnson.
Water Resources Research, Vol 10, No 2, p 223-226, April 1974. 3 tab, 9 ref.

Descriptors: *Statistics, *Statistical methods, *Simulation analysis, Sampling, Variability, Statistical models, Mathematical studies.
Identifiers: Distribution functions.

Two distinct versions of the generalized beta distribution of the second kind are considered. These beta-type distributions compare favorably with the commonly used gamma and log normal distributions in their ability to fit selected sets of accumulated streamflow and precipitation amount data. The comparisons are based on empirical results associated with three different goodness of fit criteria. Since the cumulative distribution functions of these beta-type distributions are in closed form, they possess unique computational advantages over the gamma and log normal distributions. (Knapp-USGS)
W74-07412

ALGEBRAIC BOUNDEDNESS OF SAMPLE STATISTICS,
Geological Survey, Reston, Va. Water Resources Div.
W. Kirby.
Water Resources Research, Vol 10, No 2, p 220-222, April 1974. 1 tab, 2 ref.

Descriptors: *Statistics, *Statistical methods, *Simulation analysis, Sampling, Variability, Statistical models, Mathematical studies.
Identifiers: Distribution functions.

Some puzzling results from a computer simulation study are explained by showing that the sample skew coefficient has population-independent bounds depending only on the sample size. Similar results are obtained for the coefficient of variation of positive data, the maximum standardized deviate, and the standardized range. These bounds are called algerbraic bounds to emphasize that they are properties of the algebraic formulas defining the statistics; they are totally independent of any assumptions about the processes generating the samples for which the statistics are computer. (Knapp-USGS)
W74-07413

JUST A MOMENT,
IBM Thomas J. Watson Research Center, Yorktown Heights, N.Y.
J. R. Wallis, N. C. Matalas, and J. R. Slack.
Water Resources Research, Vol 10, No 2, p 211-219, April 1974. 6 fig, 4 tab, 8 ref.

Descriptors: *Statistics, *Statistical methods, *Monte Carlo method, Mathematical studies, Variability, Probability, Distribution patterns.
Identifiers: *Distribution functions.

The distribution functions for three statistics, the mean, standard deviation and coefficient of skewness, for small samples from various distributions were obtained by Monte Carlo experiments. Sample sizes of 10 (10) 90 were considered, and the distributions used were the normal, Gumbel (extreme value type 1), log normal, Pearson type 3 (gamma), Weibull, and Pareto type 1 (Pearson type 4). Values of the coefficient of skewness used in generating the samples were in the range 0.0 to 15.0. Pronounced skews, biases, and constraints in the sampling properties of the statistics were observed. Examples of the available graphs of the distribution functions are presented. (Knapp-USGS)
W74-07414

PREDICTING PESTICIDE RUNOFF FROM AGRICULTURAL LAND: A CONCEPTUAL MODEL,
Environmental Protection Agency, Athens, Ga. Agro-Environmental Systems Branch.
For primary bibliographic entry see Field 5B.
W74-07427

GENERATION MODELS FOR SYNTHETIC ANNUAL AND MONTHLY FLOWS FOR SOME INDIANA WATERSHEDS,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
J. W. Delleur, and I. T. Kisisel.
Indiana Academy of Science Proceedings, Vol 2, p 208-213, 1972. 2 fig, 1 tab, 7 ref. OWRR-A-020-IND (4).

Descriptors: *Model studies, *Hydrograph analysis, *Time series analysis, *Watersheds(Basins), *Indiana, Flow, Markov processes, Discharge, Runoff, Precipitation, Geomorphology, *Synthetic hydrology.
Identifiers: *Autoregressive process, Fiering type logarithms.

A first order autoregressive process can be used to generate annual flows. The mean annual flow and the rank one serial correlation coefficient were related to watershed and climatological properties. A first order Markov process of the Fiering type adequately simulates the sequence of normalized logarithms of monthly flows. The means and standard deviations of the logarithms of the monthly flows and the autoregressive constant were related to climatological and basin characteristics.
W74-07431

A COMPUTER ATLAS OF HYDROLOGIC AND GEOMORPHOLOGIC DATA FOR SMALL WATERSHEDS IN INDIANA,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
J. W. Delleur, M. T. Lee, and D. Blank.
Indiana Academy of Science Proceedings, Vol 82, p 222-226, 1972. 1 fig, 11 ref. OWRR B-008-IND (14).

Descriptors: *Geomorphology, *Drainage density, *Small watersheds, *Indiana, *Maps, Topog-

raphy, Streams, Hydrologic data, Networks, Data processing, Computers, Rainfall, Runoff, Drainage patterns, Contours, Hydrologic analysis, Unit hydrograph, Hydrologic models.
Identifiers: *Geomorphologic data, *Stream network, Instantaneous hydrographs.

Banks of hydrologic and geomorphologic data for Indiana small watersheds were prepared for computer use. Four major types of data were collected: rainfall and runoff data for 55 watersheds; and drainage networks and topographic data for 34 of these watersheds. The data were loaded on four magnetic tapes. The first tape contains the single storm rainfalls and runoffs; the second, the single storm rainfall excesses and direct runoff hydrographs; the third, the planforms of stream networks; and the fourth, the elevation contours of the watersheds. Such data are useful in hydrograph analysis, estimation of instantaneous hydrographs, identification and calibration of hydrologic models for runoff estimation. They have applications in drainage design, development and management of water resources.
W74-07432

COMPARISON OF RAINFALL-RUNOFF MODELS FOR URBAN AREAS,
India Inst. of Tech., Kanpur.
P. B. S. Sarma, J. W. Delleur, and A. R. Rao.
Journal of Hydrology, Vol 18, p 329-347, 1973. 6 fig, 3 tab, 20 ref. OWRR B-002-IND(6).

Descriptors: *Urban runoff, *Instantaneous unit hydrograph, *Rainfall-runoff relationships, *Precipitation excess, Urban drainage, Base flow, Mathematical models, Hydrographs.
Identifiers: Fourier transform method, Nash model, Double routing method, Linear channel-linear reservoir method.

The relative regeneration performances of five linear rainfall excess-direct runoff models are compared for several urban watersheds with varying degrees of development. The five models considered are the single linear reservoir, the Nash model, the double routing method, the linear channel-linear reservoir model and the instantaneous unit hydrograph (IUH) obtained by the Fourier transform method. The IUH always gives the best regeneration performance among the four conceptual models tested. The optimized single linear reservoir constant differs from the theoretical time lag value, but is related to the latter, and for each watershed varies from storm to storm. For larger watersheds the Nash model gives the best regeneration performance among the four conceptual models tested. The model parameters for each watershed are found to vary from storm to storm. The quality of regeneration for larger basins is less than that found for the smaller basins.
W74-07463

A RAINFALL-RUNOFF MODEL BASED ON THE WATERSHED STREAM NETWORK,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
J. W. Delleur, and M. T. Lee.
In: Proceedings, Symposium on the Design of Water Resources Projects With Inadequate Data, Madrid, Spain, p 75-87, June 1973. 4 fig, 19 ref. OWRR B-008-IND(13).

Descriptors: *Rainfall-runoff relationships, *Hydrographs, *Overland flow, *Slopes, *Drainage density, *Remote sensing, *Aerial photography, Geomorphology, Precipitation, Runoff, Base flow, Percolation, Drainage systems, Stream flow, Aerial sensing, Photography, Physical models, Watersheds(Basins), Networks.
Identifiers: *Stream network, Stream order, Infrared color, Dynamic contributing area model, Linear routing.

Physical models of the rainfall-runoff process are better suited than either stochastic or black box models for areas with limited data. The model parameters must have a physical significance, be convenient to obtain and their number should be small. The framework of a model meeting these objectives is proposed and is based primarily on the geomorphologic characteristics of the stream network obtainable from maps or from aerial photographs. There is analytical and experimental evidence that hydrographs are dominated by direct runoff from very short overland flow paths from precipitation on transient, near channel wetlands. This wetland area is dynamic in the sense that it varies in terms of the history of the excess of the precipitation over the 'B' horizon permeability. The distribution of the dynamic contributing area along the main stream is obtained under the assumptions that the velocity of flow along the stream network is uniform, that the drainage density is a constant within a given watershed and that the first order streams are uniformly distributed in the basin. The runoff from the dynamic contributing area is then routed through the synthesized stream network to obtain the direct runoff at the basin outlet.
W74-07464

PROBLEM OF CALCULATING DEPTH OF THE QUASIUNIFORM LAYER OF THE OCEAN (K VOPROSU O RASCHETE TOLSHCHINY KVAZIODNORODNOGO SLOYA OKEANA),
Gidrometeorologicheskii Institut, Leningrad (USSR).
I. N. Rusin.
Meteorologiya i Gidrologiya, No 6, p 62-69, June 1973. 2 fig, 11 ref.

Descriptors: *Oceanography, *Depth, *Boundaries(Surfaces), *Boundary layers, *Temperature, Thermocline, Heat balance, Seasonal, Heat transfer, Turbulence, Mixing, Model studies, Equations.
Identifiers: USSR, Heat flux.

A method of derivation of equations and some solutions to the equations simulating annual movement of the depth of the quasiuniform layer of the ocean are considered. The model was based on laboratory experiments on a study of the propagation of turbulence from a surface into a liquid and on a procedure for constructing boundary conditions at the lower boundary of a quasihomogeneous layer. Despite a large number of simplifications, the model obtained gives a qualitatively true picture of the evolution of the investigated value. (Josefson-USGS)
W74-07506

MATHEMATICAL SIMULATION OF SUBSURFACE FLOW CONTRIBUTIONS TO SNOWMELT RUNOFF, REYNOLDS CREEK WATERSHED, IDAHO,
Agricultural Research Service, Boise, Idaho. Northwest Watershed Research Center.
For primary bibliographic entry see Field 2F.
W74-07516

CALIBRATING A WATER YIELD MODEL FOR SMALL UNGAGED WATERSHEDS,
Kentucky Dept. of Natural Resources, Frankfort. Division of Water.
J. E. Jarboe, and C. T. Haan.
Water Resources Research, Vol 10, No 2, p 256-262, April 1974. 1 fig, 10 tab, 8 ref.

Descriptors: *Water yield, *Mathematical models, *Kentucky, Systems analysis, Rainfall-runoff relationships, Optimization, *Small watersheds.

A four-parameter water yield model was calibrated on 17 Kentucky watersheds by relating the model parameters to watershed topographic, geologic, and soil characteristics. The relationships were tested by comparing observed and simulated runoff records from six watersheds that were not contained in the original 17 watersheds. The results show that the water yield model can be satisfactorily applied to ungaged basins. (Knapp-USGS)
W74-07519

STREAMFLOW SIMULATION: 3. THE BROKEN LINE PROCESS AND OPERATIONAL HYDROLOGY,
Ecole Polytechnique, Montreal (Quebec). Hydraulic Div.
J. M. Mejia, D. R. Dawdy, and C. F. Nordin.
Water Resources Research, Vol 10, No 2, p 242-245, April 1974. 11 ref.

Descriptors: *Synthetic hydrology, *Simulation analysis, *Statistical models, Markov processes, Stochastic processes, Regression analysis, Probability, Variability.
Identifiers: *Hurst phenomenon, Operational hydrology, Broken-line processes.

Broken line processes can be used to produce a standardized Gaussian process. An extension of the theory of the broken line process leading to the generation of processes preserving the mean, the variance, and a skewness coefficient different from zero is presented. The broken line process allows the modeling of cross-correlated sequences, for which it is possible to reproduce the value of H, the second spectral moment for a continuous process or the first serial correlation coefficient for a discrete one, and the first three moments for each of the sequences as well as the lag zero cross correlation among them. In addition, by proper structuring of the broken line process, parameter estimates may be preserved by simple algorithms. The addition of simple broken line processes is a useful operational tool for the synthesis of skewed multivariate sequences exhibiting the Hurst phenomenon. It can be used for continuous as well as discrete processes. (See also W72-13478 and W72-13479) (Knapp-USGS)
W74-07520

EFFECT OF GRAZING ON RUNOFF FROM TWO SMALL WATERSHEDS IN SOUTHWESTERN WISCONSIN,
Forest Service (USDA), La Crosse, Wis. Watershed Lab.
For primary bibliographic entry see Field 4C.
W74-07525

2B. Precipitation

AGROCLIMATIC REGIONS OF RAJASTHAN,
Central Arid Zone Research Inst., Jodhpur (India).
For primary bibliographic entry see Field 3F.
W74-07102

SOURCE AND BUDGET OF SULFATE IN PRECIPITATION FROM CENTRAL ALBERTA, CANADA,
Research Council of Alberta, Edmonton.
For primary bibliographic entry see Field 5B.
W74-07164

AERIAL SPILL PREVENTION SURVEILLANCE DURING SUB-OPTIMIM WEATHER,
Earth Satellite Corp., Washington, D.C.
For primary bibliographic entry see Field 5A.
W74-07342

AN IRRIGATION SCHEDULING MODEL WHICH INCORPORATES RAINFALL PREDICTIONS,
Auburn Univ., Ala. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W74-07440

FECT OF AGNES FLOODS ON ANNUAL SE-
ES IN PENNSYLVANIA,
nnsylvania State Univ., University Park. Dept.
Civil Engineering.
r primary bibliographic entry see Field 2E.
74-07455

C. Snow, Ice, and Frost

OBABILITY DISTRIBUTION OF SNOW
OURSE DATA FOR CENTRAL ARIZONA,
izona Univ., Tucson. Dept. of Watershed
anagement.
E. Cary, and R. L. Beschta.
: Hydrology and Water Resources in Arizona
d the Southwest, Proceedings of the 1973 meet-
of the Arizona Section -- AWRA and the
ydrology Section -- Arizona Academy of
ience, May 4-5, 1973, Tucson, Arizona, vol 3, p
6 (1973). 8 fig, 3 tab, 8 ref.

escriptors: *Snowfall, *Water yield,
robability, *Distribution patterns, *Water
uivalent, Snowpacks, Snow, Ponderosa Pine
es, Coniferous trees, Water supply,
atershed(Basins), Snowmelt, Ablation, Regres-
n analysis, Statistics, *Arizona.
entifiers: Snow course.

preliminary study of probability distributions
r use on snowpack accumulation in the central
izona highlands was made from 22 snow cour-
s selected as having 10 or more years of availa-
e records. Due to the frequent occurrence of
ro water equivalent value, application of a single
ntinuous probability distribution is precluded.
y means of two distributions, however, the
owpack water equivalent can be assessed by a
nomial distribution describing the probability of
ow, and a lognormal distribution describing the
obability of water equivalent. The area chosen
r detailed analysis is where the headwaters of
any of Arizona's major river systems occur.
Mastic-Arizona)
74-07094

ATER YIELD, ANNUAL PEAKS AND EXPO-
URE IN MOUNTAINOUS TERRAIN,
orest Service (USDA), Moscow, Idaho. Forestry
ciences Lab.
or primary bibliographic entry see Field 2A.
74-07165

AVALANCHE STUDIES (1971-1972),
Vashington Univ., Seattle. Geophysics Program;
nd Washington Univ., Seattle. Dept. of Civil En-
ineering.
. R. LaChapelle, C. B. Brown, and R. J. Evans.
vailable from NTIS, Springfield, Va. 22151 as
B-221 080; Price $4.85 printed copy; $1.45
icrofiche. Washington State Highway Depart-
ent Research Program Report 8.3, September
972. 81 p, 17 fig, 8 plate, 2 tab, 10 ref, append.
OT Y-1301.

Descriptors: *Avalanches, *Snow management,
Washington, Highways, Stress, Strain, Creep,
Mass wasting, Snowpacks, Temperature,
Precipitation(Atmospheric), Snowfall.
dentifiers: *Japan.

The University of Washington program in
valanche studies in the North Cascades is
perated in conjunction with the Washington State
Highway Department. A complete bibliography of
snow clearing methods used in Japan was com-
piled, and Japanese avalanche problems were stu-
died. The observed state of stress in fallen snow
and subsequent mechanics of slab avalanching
were studied. Theory was correlated with ob-
served avalanching. Important mechanical
parameters of the snow are required for the en-
gineering application of the theory. These
strength, glide and creep properties are being col-
lected at test sites in the North Cascades. (Knapp-
USGS)
W74-07319

A SCANNING ELECTRON MICROSCOPE STUDY OF SURFACE TEXTURES OF QUARTZ GRAINS FROM GLACIAL ENVIRONMENTS,
Cambridge Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 2J.
W74-07331

STUDIES OF THE INGREDIENTS VARIATION OF THE SAKE-GAWA RIVER, A TRIBUTARY OF THE MOGAMI RIVER (IN JAPANESE),
Yamagata Prefectural School for the Blind, Kaminoyama (Japan).
For primary bibliographic entry see Field 2K.
W74-07360

STUDIES ON ORGANISMS FOUND IN ARCTIC SEA ICE,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5C.
W74-07487

WINTER-REGIME THERMAL RESPONSE OF HEATED STREAMS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 5B.
W74-07511

SNOW ACCUMULATION AND SNOWMELT AS INFLUENCED BY A SMALL CLEARING IN A LODGEPOLE PINE FOREST,
Forest Service (USOA) Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
H. L. Gary.
Water Resources Research, Vol 10, No 2, p 348-353, April 1974. 8 fig, 1 tab, 9 ref.

Descriptors: *Snowpacks, *Forests, *Snowmelt, *Land clearing, *Wyoming, Forest management, Watershed management, Water equivalent, Water yield.

Snow accumulation increased under a thinned lodgepole pine stand about 35 feet tall and 80 years old for two winter seasons before and two seasons after cutting a clearing 1 tree height wide and 5 tree heights long. The clearing was on a gently sloping plateau 9000 feet above msl and was oriented perpendicularly to the prevailing southwest wind. The maximum snowpack water equivalent the first year after clearing averaged 13.1 inches in the upwind forest, 16.2 inches in the clearing, and 12.2 inches in the downwind forest zone. The snow accumulation pattern was similar the second year. The increased snow catch in the clearing was offset by the snow deficit in the downwind forest. The clearing affected the distribution of snow over the area but not the total amount of snow water equivalent. Melt rates in the clearing were about twice those in the interior forest zones. Near the middle of the melt season the clearing as a whole contained 12% less snow water equivalent than the interior forest. (Knapp-USGS)
W74-07526

2D. Evaporation and Transpiration

EVAPOTRANSPIRATION ON A PALOUSE WATERSHED,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
M. Molnau, and D. J. Davis.
Paper No 73-218 presented at 1973 Annual Meeting, American Society of Agricultural Engineers, University of Kentucky, Lexington, June 17-20, 1973. 9 p, 6 fig, 2 tab, 7 ref. OWRR A-029-IDA (6).

Descriptors: *Evapotranspiration, *Idaho, *Barley, *Soil moisture, *Watershed management, Measurement, Evaporation pans.
Identifiers: *Palouse watershed(Ida-Wash), Penman method.

Evapotranspiration of a spring barley crop was estimated by measuring soil moisture changes. An evaporation pan, the Penman method, and the Jensen-Haise method were used to estimate evapotranspiration. On an overall evaluation, the evaporation pan is unacceptable while the other two methods were acceptable with the Penman method to be preferred.
W74-07087

EVAPORATION FROM AN IRRIGATED RICE CROP IN A SEMI-ARID REGION,
Commonwealth Scientific and Industrial Research Organization, Griffith (Australia). Div. of Irrigation Research.
A. R. G. Lang, G. N. Evans, and P. Y. Ho.
Paper presented at First Australasian Conference on Heat and Mass Transfer at Monash University, Melbourne, Australia, May 23-25, 1973. 6 p, 1 fig, 1 tab, 16 ref.

Descriptors: *Evapotranspiration, *Advection, *Rice, *Flood irrigation, Semi-arid climates, Air-earth interface, Consumptive use, Energy budget, Irrigation effects, Transpiration, Water loss, Water balance, Heat balance, *Australia.

An assessment is made of the fluctuations in evapotranspiration rate associated with the extreme advective conditions of flood-irrigated rice crops bounded by a semi-arid area. The influence of the humid-arid boundary is theoretically examined and compared to experimental measurements of heat and water flux determined along a transect through a rice field. The theoretical equation is found to be an adequate simulation of the field situation. (Muller-Arizona)
W74-07096

MODEL TESTS WITH THIN SHEETS TO REDUCE EVAPORATION,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 3B.
W74-07103

EVAPORATION OF WATER FROM SAND: 5. THE EFFECT OF EVAPORATION ON THE CONCENTRATION OF SALTS DISSOLVED IN WATER STORED IN SAND,
National Inst. for Water Research, Windhoek (South-West Africa).
D. H. R. Hellwig.
Journal of Hydrology, Vol 21, No 2, p 101-110, February 1974. 2 fig, 4 tab, 2 ref.

Descriptors: *Evaporation, *Dissolved solids, *Mass transfer, Sands, Capillary action, Salinity, Evaporimeters, Soil water movement, *Salts.

To determine the effect of evaporation on the concentration of salts dissolved in water stored in sand, three different sand mixtures were studied and the water table was maintained at three different levels. After 71 weeks the average salt concentration of the water in each tank was practically the same as it was 12 weeks after the start of the test, which indicated that salts were removed from solution during the test period. When water was transported to the sand surface by capillary action, the salts removed from solution accumulated in a thin sand layer near the sand surface. If capilllary action did not transport water to the sand surface, salts removed from solution were accumulated 10 to 15 cm above the water table. With increasing evaporation, proportionately greater amounts of dissolved salts are removed from water stored in sand. This relationship was expressed as a hyperbolic function. (See also W73-07055 and W73-07056) (Knapp-USGS)

W74-07169

SOLAR EVAPORATION CONTROLLED IRRIGATION SYSTEM,
D. F. Marean.
U.S. Patent No 3,786,832, 4 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 918, No 4, p 1414, January 22, 1974.

Descriptors: *Patents, *Irrigation systems, *Evaporation pans, Rainfall, Equipment, Control systems, Surface irrigation, Water distribution(Applied), Solar radiation, Water delivery, Soil water.
Identifiers: *Solar evaporation, Soil moisture.

Control for a land irrigation system is actuated in response to the rate of solar evaporation of water from an evaporator pan and the rate of evaporation from land. These are so related that the pan moves to initiate irrigation only when the land actually requires water. When the pan is filled with water from rainfall or from the supply line, a valve closes to terminate the irrigation operation. However, when solar evaporation of water form the pan has depleted the weight of the water to the extent that the resilient means can pivot the pan to the first pollution, the valve is opened to initiate an irrigation operation. (Sinha-OEIS)
W74-07211

IRRIGATION AND SPRINKLER SYSTEM,
Clemar Mfg. Corp., Azusa, Calif. Assignee.
For primary bibliographic entry see Field 3F.
W74-07212

INVESTIGATION OF THE RELATION OF GROUNDWATER EVAPORATION TO LITHOLOGICAL STRUCTURE OF THE ZONE OF AERATION (K IZUCHENIYU ZAVISIMOSTI ISPARENIYA GRUNTOVYKH VOD OT LITOLOGICHESKOGO STROYENIYA ZONY AERATSII),
Institute of Hydrogeology and Engineering Geology, Tashkent (USSR).
K. G. Ganiyev.
Uzbekskiy Geologicheskiy Zhurnal, No 6, p 20-21, 1973. 1 tab, 2 ref.

Descriptors: *Groundwater, *Evaporation, *Petrology, *Zone of aeration, Water table, Evapotranspiration, Lysimeters, Loam, Clay loam, Sands, Cotton, Alfalfa.
Identifiers: *USSR(Uzbek SSR).

Groundwater evaporation depends on climatic and water-management conditions, soil particle size and solid-residue content in groundwater, and on character of the active cover. Evaporation from coarse loam planted to cotton was 60% less than that from clay loam. At lysimeters where alfalfa was grown, evaporation from coarse loamy sand was 58% less than that from clay loam. The relation of groundwater evaporation to lithological composition of soils was established on the basis of data of lysimeter investigations conducted by the Fergana Hydrogeological Station in 1956-62. (Josefson-USGS)
W74-07529

2E. Streamflow and Runoff

FLOOD PLAIN INFORMATION-NEUSE AND TRENT RIVERS AND JACK SMITH CREEK, NEW BERN, NORTH CAROLINA.
Army Engineer District, Wilmington, N.C.
For primary bibliographic entry see Field 4A.
W74-07073

FLOOD PLAIN INFORMATION-NEUSE RIVER AND BUFFALO CREEK, SMITHFIELD, NORTH CAROLINA.
Army Engineer District, Wilmington, N.C.
For primary bibliographic entry see Field 4A.
W74-07074

FLOOD PLAIN INFORMATION: BURDENS AND TWO BOTTLE CREEKS AT RESEARCH TRIANGLE AREA, DURHAM COUNTY, NORTH CAROLINA.
Army Engineer District, Wilmington, N.C.
For primary bibliographic entry see Field 4A.
W74-07075

FLOOD PLAIN INFORMATION - GLADE CREEK, VINTON, VIRGINIA.
Army Engineer District, Wilmington, N.C.
For primary bibliographic entry see Field 4A.
W74-07076

STATE FLOOD CONTROL PROGRAM.
Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 4A.
W74-07111

THE FORECASTING OF STREAMFLOW USING THE METHOD OF CHARACTERISTIC MODES,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W74-07178

A SYNTHETIC MODEL FOR DAILY STREAMFLOW,
Birmingham Univ. (England). Dept. of Civil Engineering.
N. M. D. Green.
Journal of Hydrology, Vol 20, No 4, p 351-364, December 1973. 7 fig, 3 tab, 4 ref.

Descriptors: *Streamflow forecasting, *Synthetic hydrology, *Statistical models, Time series analysis, Rainfall-runoff relationships.
Identifiers: *Great Britain(England).

A model for synthesizing daily average streamflow data is presented; it is suitable for most rivers in Great Britain. The method is based on a linear interpolation of the logarithms of 5-day average flows produced using a statistical model. The 5-day model preserves the long-term statistical characteristics of the daily data, while the short-term characteristics such as hydrograph shape are imposed by the interpolation method. A stochastic error term is superimposed on the interpolated daily flows. This term represents the nondeterministic component of the daily time series. The riverflow in the Severn at Bewdley was used to demonstrate both the analysis of actual data and the generation of synthetic data. The technique was applied to data from two other rivers with widely differing characteristics to demonstrate the range of the method. (Knapp-USGS)
W74-07179

AN INNOVATIVE AUTOMATIC STREAM GAGING METHOD,
Oklahoma Univ., Norman. School of Engineering and Environmental Science.
For primary bibliographic entry see Field 7B.
W74-07181

CROSS-SPECTRAL ANALYSIS OF RAINFALL AND RUNOFF FOR RARITAN AND MULLICA RIVER BASINS IN NEW JERSEY,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2A.
W74-07183

AN INVESTIGATION OF FLOODS IN HAWAII THROUGH SEPTEMBER 30, 1973,
Geological Survey, Honolulu, Hawaii.
R. H. Nakahara.
Progress Report No 16 (Basic data release), Jan ry 1974. 175 p, 5 fig, 1 tab.

Descriptors: *Floods, *Hawaii, *Hydrologic da *Flood data, Peak discharge, Data collections

Floods--mainly because of the high frequency intense rainfall--are common in Hawaii Flo damages to crops, homes, highways, and oth facilities, and pollution of bays and estuaries fro storm runoff and sediment discharge occur near every year. Flood data are obtained through a ne work of stream-gaging and peak-discharge statio throughout the State. At the close of the 19 water year, flood data were being collected at regular gaging stations and 103 crest-stage gagi stations on Kauai, Oahu, Molokai, Maui, a Hawaii. Although peaks occurred during months of the year, only the months of Octobe February, and March denoted excessive runo throughout the State. (Knapp-USGS)
W74-07185

WATER RESOURCES OF THE TAUNTO RIVER BASIN SOUTHEASTERN MA SACHUSETTS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-07190

WATER-RESOURCES INVESTIGATIONS I TEXAS, FISCAL YEAR 1974.
Geological Survey, Austin, Tex.
Water-Resources Investigations Report, Februar 1974. 34 p.

Descriptors: *Water resources, *Texa *Investigations, Groundwater, Surface water Data collections, Gaging stations, Hydrologi data, Streamgages, Water wells.

Water-resources investigations by the U.S Geological Survey in Texas consist of the collec tion of basic records through the hydrologic-dat network, interpretive studies, and research pro jects. The water-resources projects and activitie of the Geological Survey in Texas for the 197 fiscal year (July 1, 1973, to June 30, 1974) ar described. In Texas, continuing measurements an analyses are made of streamflow, reservoir con tents, chemical quality of water, sediment i streams and reservoirs, water levels in wells, an land-surface subsidence. Modern compute techniques are being used successfully in the col lection and publication of water data. As of June 30, 1973, 567 stream-gaging, stage-only, and reser voir-contents stations were in operation. The fisca 1974 program provides for three water-quality sur veys each of Lake Meredith, Greenbelt Reservoir, Lake Arlington, Livingston Reservoir, Lake Con roe, Hubbard Creek Reservoir, Possum Kingdom Reservoir, Lake Granbury, Whitney Lake, Belton Lake, Canyon Lake, and Lake Corpus Christi, and two surveys of Sam Rayburn Reservoir. Onsite determinations will be made of specific con ductance, dissolved oxygen, temperature, and pH. Samples will be collected for laboratory analyses during each survey. (Knapp-USGS)
W74-07321

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR URBAN STUDIES IN THE SAN ANTONIO, TEXAS METROPOLITAN AREA, 1971,
Geological Survey, Austin, Tex.
R. D. Steger.
Data Report, 1973. 109 p, 1 fig, 4 tab, 3 ref.

Descriptors: *Urban hydrology, *Texas, *Hydrologic data, *Data collections, Urban runoff, Water quality, Recharge, Limestones, Storm runoff, Water pollution sources.
Identifiers: *San Antonio(Tex).

A compilation and analysis of hydrologic data collected in the San Antonio, Texas, urban area for the 1971 water year are presented. The objectives of the San Antonio urban hydrology study are: to provide data showing the effects of various stages of urbanization on flood discharge and runoff, and to provide water-quality data showing chemical constituents, nutrients, biochemical oxygen demand, pesticides, and sediment in surface-water runoff from floods of various magnitudes during all seasons of the year from areas with different types of utilization. Water-quality data have been collected from watersheds in various stages of urban development at most of the gaging stations in the San Antonio urban area. This water-quality program provides data on the concentration of pollutants as a result of runoff from these watersheds. In addition, these data provide a relationship of water-quality parameters to discharge and seasonal conditions. The importance of water quality in this area is unique because of the large amounts of surface-water runoff recharged to the Edwards and associated limestones, which is the major aquifer supplying groundwater for domestic supply, municipal supply, irrigation, and industrial use in the San Antonio area. (Knapp-USGS)
W74-07323

PREDICTING PESTICIDE RUNOFF FROM AGRICULTURAL LAND: A CONCEPTUAL MODEL,
Environmental Protection Agency, Athens, Ga. Agro-Environmental Systems Branch.
For primary bibliographic entry see Field 5B.
W74-07427

PARAMETER IDENTIFICATION IN FIELD PROBLEMS,
California Univ., Santa Barbara. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 7C.
W74-07428

GENERATION MODELS FOR SYNTHETIC ANNUAL AND MONTHLY FLOWS FOR SOME INDIANA WATERSHEDS,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 2A.
W74-07431

A COMPUTER ATLAS OF HYDROLOGIC AND GEOMORPHOLOGIC DATA FOR SMALL WATERSHEDS IN INDIANA,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 2A.
W74-07432

EFFECT OF AGNES FLOODS ON ANNUAL SERIES IN PENNSYLVANIA,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
B. M. Reich.
Available from the National Technical Information Service as PB-231 871; $7.00 in paper copy, $1.45 in microfiche. Pennsylvania State University Institute for Research on Land and Water Resources Research Publication, No 74, July 1973. 72 p, 9 fig, 30 ref. OWRR A-016-PA(4).

Descriptors: *Floods, *Hurricanes, *Pennsylvania, *Historic floods, Peak discharge, Flood frequency, Flood recurrence interval, Statistics, Hydrologic data, Flood forecasting.
Identifiers: *Hurricane Agnes(1972).

Maximum flood discharges for Hurricane Agnes, 1972, on 44 Pennsylvania watersheds were compared with historic flood records. Mathematical frequency curves were fitted to each series according to the Gumbel, log-Gumbel, and log-Pearson Type III methods. The 1972 floods were less than 4.8 times the average annual flood peak in all but 8 of the 44 cases. The threshold was established in previous studies as the ratio between a 1,000-year flood and an average annual flood, equivalent to about a 5% chance of being exceeded by a worse flood once or more in the next 50 years. Most locations have high probabilities of being struck by far worse floods than they experienced in 1972. The worst area of recorded flood during Agnes, measured at the East Mahantango Creek, was 11.5 times its mean annual flood. (Knapp-USGS)
W74-07455

PROBLEM OF CALCULATING DEPTH OF THE QUASIUNIFORM LAYER OF THE OCEAN (K VOPROSU O RASCHETE TOLSHCHINY KVAZIODNORODNOGO SLOYA OKEANA),
Gidrometeorologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 2A.
W74-07506

STREAMFLOW SIMULATION: 3. THE BROKEN LINE PROCESS AND OPERATIONAL HYDROLOGY,
Ecole Polytechnique, Montreal (Quebec). Hydraulic Div.
For primary bibliographic entry see Field 2A.
W74-07520

A MIXING CELL MODEL FOR LONGITUDINAL DISPERSION IN OPEN CHANNELS,
Universidad Nacional Autonoma de Mexico, Mexico City. Facultad de Ingenieria.
For primary bibliographic entry see Field 8B.
W74-07527

FIRST CHARACTERIZATION OF THE RUNOFF FROM THE WATERSHED OF THE MANSO SUPERIOR RIVER AND ITS BASINS (ARGENTINA), (IN SPANISH),
Universidad Nacional del Sur, Bahia Blanca (Argentina).
J. A. Luque.
Rev Invest Agropecu Ser 3 Clima Suelo. Vol 8, No 2, p 75-99. 1971, Illus, (English summary).
Identifiers: *Argentina(Manso Superior River), *Hydrographs, River basins, *Runoff, Watershed.

The river beds are characterized and the main parameters are calculated to obtain the synthetic unit hydrograph. An example of application for a precipitation of the compound synthetic unit hydrograph type is developed, attaining in each case the final ordinates of QQ total for an imaginary hydrograph.--Copyright 1973, Biological Abstracts, Inc.
W74-07536

2F. Groundwater

GROUNDWATER GEOLOGY OF FORT VALLEY, COCONINO COUNTY, ARIZONA,
For primary bibliographic entry see Field 4B.
W74-07092

WATER RESOURCES SEMINAR SERIES NO. 2.
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W74-07133

HYDROGEOLOGY OF CARBONATE AND VOLCANIC ROCKS--SIMILARITIES AND CONTRASTS,
Missouri Univ., Columbia. Dept. of Geology.
S. N. Davis.
In: Hawaii Univ., Honolulu, Water Resources Research Center, Water Resources Seminar Series No. 2, December 1972, p 3-9. 2 fig, 1 tab, 15 ref,

Descriptors: *Hawaii, *Aquifer characteristics, *Hydrogeology, *Wells, Chemical properties, Rocks, Permeability.
Identifiers: *Carbonate rocks, Volcanic rocks, Oahu(Hawaii).

The hydrogeologic properties of tuff, chalk, lava flows, and Late Cenozoic rock are examined. Porosity of each is found to be 35-45%, 20-45%, 10-30%, and 15-30% respectively. Permeability of tuff and chalk, however, is so low as to make them poor aquifers, although welded tuff and cherty chalk, both of which are relatively brittle and tend to develop fractures creating rocks with significant permeability, form locally important aquifers in western United States and southeastern Great Britain. In contrast, lava flows of recent volcanic rock exceed 200 darcys in many areas, while Lake Cenozoic rock was found to exceed 400 darcys. A brief examination suggests that the statistical distribution of hydrological properties might provide useful information in regional planning decisions. In particular, it is contended that the knowledge of the statistical distribution of well and gallery yields is of great value in predicting the chances of obtaining a specified well yield for a given investment. (See also W74-07133) (Schroeder-Wisconsin)
W74-07134

DEVELOPMENT OF DIKE STORED WATER BY DRILLING, WAIHEE, OAHU,
Honolulu City and County Board of Water Supply, Hawaii.
C. Lao.
In: Hawaii Univ., Honolulu, Water Resources Research Center, Water Resources Seminar Series No. 2, December 1972, p 63-73, 5 fig, 1 tab, 2 ref,

Descriptors: *Hawaii, *Aquifers, *Aquicludes, Groundwater barriers, Water resources, Drilling, Water supply, Wells, Pressure head.
Identifiers: *Oahu(Hawaii), Waihee Valley(Oahu), Inclined wells.

Development of underground dike storage water by angle drilling is examined through a recent project conducted on Oahu, Hawaii. Dike water represents a valuable asset to the island, both because its higher location allows delivery through gravity flow and because its low content of dissolved minerals and general absence of coliform bacteria. While it is assumed that dike storage represents a large future source of water, the described study's small size prevented an actual determination of the maximum potential. The inclined drilling method was shown to have an approximate 10:1 advantage over the existing method of tunneling. Additionally, drilling results in substatial conservation of water otherwise lost during tunnel construction. A comparison of a horizontal versus the angle drilling method found that while the latter required greater drilling than the former, it also increased the well efficiency such that it represented the best technique. (See also W74-07133) (Schroeder-Wisconsin)
W74-07137

HYDROGEOLOGY OF THE SASSO LUNGO GROUP, A DOLOMITIC REEF STOCK IN THE ALPINE DOLOMITES OF NORTH ITALY,
Vrije Universiteit, Amsterdam (Netherlands). Inst. of Earth Sciences.
G. B. Engelen.
Journal of Hydrology, Vol 21, No 2, p 111-130, February 1974. 10 fig, 2 tab, 5 ref.

Descriptors: *Hydrogeology, *Carbonate rocks, *Dolomite, Limestones, Fractures(Geologic), Water chemistry, Springs, Groundwater movement, *Aquifer characteristics, Aquicludes.
Identifiers: *Italy(Sasso Lungo).

The hydrogeological characteristics of the formations of the Sasso Lungo Group, Italy, are discussed. The central reef mass forms the main

aquifer. It is embedded in impervious formations. The Sasso Lungo group forms an isolated mountain mass in the Italian Dolomites in the SE Alps. The group has an area of 9 sq km and its elevation ranges from plus or minus 2000-3000 m. The central part consists of an exhumed, dolomitized reef of Triassic age, which has subsided by gravity tectonics partly into the surrounding and underlying plastic Permian and Triassic formations. The discharge of snowmelt water and rain takes place through a few large springs around the group at some distance from the reef. The springs are hydraulically connected with low subterranean overflow points in the impervious rim of the reef through natural conduits of permeable moraines and Quaternary valley fills. The central dolomite aquifer shows no signs of karst drainage. The water moves through a dense network of fractures and joints, and it probably has a free, fluctuating water table. Groundwater divides coincide in most cases with surface drainage divides. All springs and surface waters were mapped and sampled during the summer and fall periods from 1966 through 1968. The chemical composition of the spring waters was very useful in tracing their origin. (Knapp-USGS)
W74-07153

CRITICAL ANALYSIS OF THE ALTERNATING DIRECTION IMPLICIT METHOD OF AQUIFER ANALYSIS,
Birmingham Univ. (England). Dept. of Civil Engineering.
K. R. Rushton.
Journal of Hydrology, Vol 21, No 2, p 153-172, February 1974. 8 fig, 1 tab, 6 ref.

Descriptors: *Finite element analysis, *Groundwater movement, *Mathematical models, Aquifers, Equations, Discharge(Water), Water yield, Numerical analysis.

The alternating direction implicit method, when used for aquifer analysis, may produce to erroneous results. By a careful examination of the effect of various factors, such as external boundaries, variable mesh intervals, internal boundaries with fixed heads, re-entrant boundaries and leakage, the occasions when these errors are serious were identified. Techniques which can avoid these errors and lead to reliable numerical solutions are given. (Knapp-USGS)
W74-07154

HEAT DISPERSION EFFECT ON THERMAL CONVECTION IN A POROUS MEDIUM LAYER,
Technion-Israel Inst. of Tech., Haifa. Dept. of Civil Engineering.
H. Rubin.
Journal of Hydrology, Vol 21, No 2, p 173-185, February 1974. 3 fig, 13 ref.

Descriptors: *Convection, *Dispersion, *Diffusion, *Heat transfer, *Porous media, Geothermal studies, Groundwater movement, Mass transfer, Water circulation.

Thermal convection resulting from vertical temperature gradients in porous media was analyzed, taking into account the effect of heat dispersion. Heat dispersion increases the thermal stability of the flow field and may inhabit the appearance of convection currents. Longitudinal as well as lateral dispersivities affect the thermal stability and the dimensions of the convection cells. As a result of convection currents, horizontal streamlines in the steady state are distorted. The convection currents appear as oscillations in the flow field. The frequency of these oscillations depends on the barycentric steady state horizontal flow velocity, the ratio between the longitudinal and lateral dispersivities, and the aquifer thickness. (Knapp-USGS)
W74-07156

KARST PROCESSES OF THE EASTERN UPPER GALILEE, NORTHERN ISRAEL,
Hebrew Univ., Jerusalem (Israel), Dept. of Geography.
R. Gerson.
Journal of Hydrology, Vol 21, No 2, p 131-152, February 1974. 10 fig, 1 tab, 14 ref.

Descriptors: *Karst, *Karst hydrology, *Geomorphology, Limestones, Erosion, Topography, Springs, Water chemistry, Calcium, Magnesium, Water balance, Arid lands.
Identifiers: *Israel(Galilee).

Karst processes dominate most of the geomorphic activity in the Upper Galilee, Israel. The rocks of the area are dolomites and limestones. The major portion of carbonate solute is gained subaerially and in the upper part of the vadose zone. Most cave and spring water is already saturated with respect to aragonite and calcite. The karst depressions are mostly associated with fault-line traces. Their evolution is possible mainly in areas sloping initially less than 15 deg. The absence of evolved caves, representing well-developed karst of an earlier period, is attributed mainly to the marginal climate throughout the past, combined with tectonic and hydrologic instability of the region. The discharge of the karst springs shows clearly dependence on annual precipitation, with a lag of about 2 years of the response to drought or more humid periods. Long-term fluctuations are larger in the smaller T'EO Spring than in the larger 'Enan Springs. Most of the denuded material is extracted from the region as dissolved load via underground conduits and only small amounts as clastics. Mean long-term denudation is approximately 20 mm per 1,000 years, averaged for the surface area contributing to the springs. Most topographic forms are shaped by runoff erosion, active during medium to high intensity rainstorms. Solution processes prevail during low to medium rainfall intensities. Even in karst depressions, erosion becomes dominant after their bottoms are covered by almost impervious terra-rossa mantle. (Knapp-USGS)
W74-07157

MINERAL SPRINGS IN THE SUEZ RIFT VALLEY--COMPARISON WITH WATERS IN THE JORDAN RIFT VALLEY AND POSTULATION OF A MARINE ORIGIN,
Israel Atomic Energy Commission, Yavne. Soreq Nuclear Research Centre.
For primary bibliographic entry see Field 2K.
W74-07167

WATER RETENTION OF GRANITIC SOILS IN THE IDAHO BATHOLITH,
Forest Service, (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2G.
W74-07170

PUBLIC GROUNDWATER SUPPLIES IN ADAMS COUNTY,
Illinois State Water Survey, Urbana. Hydrology Section.
For primary bibliographic entry see Field 4B.
W74-07172

VARIABLES AFFECTING WELL SUCCESS IN A KENTUCKY LIMESTONE AQUIFER,
Kentucky Univ., Lexington. Dept. of Geology.
For primary bibliographic entry see Field 4B.
W74-07176

VERTICAL MOVEMENTS IN THE NONSATURATED ZONE AND THE SPECIFIC YIELD OF A WATER-TABLE AQUIFER (ETUDE DES TRANSFERTS VERTICAUX DANS LA ZONE NON SATUREE ET DE L'EMMAGASINEMENT D'UNE NAPPE LIBRE, DANS LE CAS D'UN POMPAGE, DANS LES CONDITIONS N TURELLES),
Bordeaux Univ (France)
A. Cazal, and G. Lacazedieu
Journal of Hydrology, Vol 21, No 1, p 33-5 January 1974. 15 fig, 2 tab, 12 ref.

Descriptors: *Water level fluctuations, *Aquif testing, *Water balance, *Drawdow *Unsaturated flow, Wetting, Surface-groundwat relationships, Withdrawal, Saturated flo Groundwater movement, Specific yield.
Identifiers: *France

A 1-month pumping test was carried out during th summer of 1970 to study the desaturation of th cone of depression, the restoration of the wat level, and rewetting during the recovery phas The observations were continued to evaluate th water movements during an annual cycle. Slo and long-continued drainage was due to the lo permeability of the water-bearing formation Less than half the gravitational water wa removed. The specific yields obtained fro nuclear methods and from other methods based o the transient flow formulae are quite different; a much as 10-15 times smaller for the transient flo methods. In the unsaturated zone the capillar fringe contributed only a small part to the wat flux. In the cone of depression the resaturatio was not complete. During the recharge period water-level rose in the absence of vertical fluxes due to an increase of the level of a nearby rive The water balance obtained from the water co tent measurements is close to that found by th generalized Darcy Law and it yields an acceptabl approximation of infiltration and evapotranspira tion components. The evapotranspiration esti mated by this method is, however, very differen from that derived from the climatic method. Mos of the groundwater recharge is obtained by a fe periods of intense precipitation during which th daily fluxes reach values 100 times higher tha normal inflow. Summer rains can reach th groundwater table when their intensity and timing create conditions favorable for downward flow i the upper soil horizons. (Knapp-USGS)
W74-07182

AQUIFERS IN THE SOKOTO BASIN, NORTHWESTERN NIGERIA, WITH A DESCRIPTION OF THE GENERAL HYDROGEOLOGY OF THE REGION,
Geological Survey, Washington, D.C.
H. R. Anderson, and W. Ogilbee.
Available from GPO, Washington, D.C. 20402. Price $6.75. Water-Supply Paper 1757-L, 1973. 79 p, 10 fig, 11 plate, 12 tab, 25 ref.

Descriptors: *Water resources, *Hydrologic data, *Hydrogeology, *Groundwater, Aquifers, Aquifer characteristics, Africa, Water yield, Water quality, Water wells.
Identifiers: *Nigeria(Sokoto River basin).

Flow in streams of the Sokoto Basin of Nigeria is mostly overland runoff. Only in a few reaches are streams perennial. The sedimentary rocks of the basin range in age from Cretaceous to Tertiary and are composed mostly of interbedded sand, clay, and some limestone; the beds dip gently toward the northwest. These rocks contain three important artesian aquifers, in addition to regional unconfined groundwater bodies. The Gundumi Formation, resting on the basement complex, is composed of clay, sand, and gravel and attains a thickness of 800 to 1,000 feet. Most of the formation does not yield large quantities of water to boreholes. Aquifer tests indicate low transmissivities, ranging from 300 to 5,000 gph per ft in the lower part of the Gundumi Formation; but in the upper sandy zone the transmissivities are much higher, reaching 66,000 gpd per ft. The Rima Group contains an extensive artesian aquifer which is economically important in the Sokoto and Birnin Kebbi areas. In the basal part of the Gwandu Formation is an extensive and productive arte-

sian aquifer contained in a sandy zone a few tens to a few hundred feet thick. In the River Sokoto fadama, considerable potential exists for development of unconfined groundwater from Quaternary alluvium. With the exception of high iron content, the chemical quality of groundwater in the Sokoto Basin is suitable for most uses. Under existing economic conditions, the artesian water can best be utilized for livestock watering, for the domestic requirements of villages, and for municipal and industrial purposes. (Knapp-USGS)
W74-07184

RECORDS OF GROUND-WATER LEVELS IN WYOMING, 1940-1971,
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 4B.
W74-07186

WATER RESOURCES OF THE TAUNTON RIVER BASIN SOUTHEASTERN MASSACHUSETTS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-07190

LONG-TERM TRENDS IN GROUNDWATER LEVEL FLUCTUATIONS (MNOGOLETNIYE TENDENTSII V KOLEBANIYAKH UROVNEY POSZEMNYKH VOD),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
V. S. Kovalevskiy, N. G. Maksimova, and T. V. Pudova.
Vodnyye Resursy, No 5, p 78-85, 1973. 3 fig, 1 tab, 11 ref.

Descriptors: *Groundwater, *Groundwater resources, *Groundwater movement, *Water level fluctuations, *United States, Observation wells, Maps.
Identifiers: *USSR.

Analysis of longest periods of record of the groundwater regime in the USSR and the United States shows long-term trends toward a rise or decline in groundwater levels characteristic of large regions. The average rate of decline in groundwater levels in observation wells of the United States during the last 30-35 years is 0.16 m/yr, and the average rate of rise in levels is 0.03 m/yr. Groundwater storage in the United States during this period was depleted at an average rate of 0.1 m/yr. During the last 10 years there has been a general depletion of groundwater storage in both the United States and the Soviet Union despite the fact that a reduction in groundwater recharge in some areas was partially compensated by an increase in groundwater recharge in others. These changes are associated with changes in climate and with the economic activities of man. During the last 10 years, groundwater storage in the United States was depleted at an average rate of about 1 cm/yr. Definite patterns of long-term changes in groundwater storage in the USSR are difficult to determine because of the uneven areal distribution of the country's observation network and the short (10-12 year) periods of record in Siberia and the Soviet Far East. Distribution of regions in the United States and the Soviet Union with a predominant long-term rise or decline in groundwater levels is mapped. (Josefson-USGS)
W74-07191

GROUND-WATER RESOURCES OF MCLEAN COUNTY, NORTH DAKOTA,
Geological Survey, Bismarck, N. Dak.
R. L. Klausing.
North Dakota Geological Survey Bulletin 60, Part III, and North Dakota State Water Commission County Ground-Water Studies 19, Part III, 1974. 73 p, 24 fig, 3 plate, 7 tab, 45 ref, append.

Descriptors: *Groundwater, Water resources, *North Dakota, *Glacial drift, Hydrogeology, *Aquifer characteristics, Water yield, Water quality, Hydrologic data.
Identifiers: McLean County(N Dak).

Groundwater in McLean County, North Dakota, is obtainable from aquifers composed of sand and gravel in the glacial deposits and sandstone and lignite in the preglacial rocks. The aquifers with greatest potential for development are those in the glacial deposits. Most are associated with buried valleys and melt-water channels. A large interconnected system of aquifers is associated with buried valleys in east-central McLean County. The aquifers contain about 940,000 acre-feet of groundwater in available storage. Well yields of as much as 1,500 gallons per minute are possible from the Lake Nettie aquifer. Other glacial aquifers have well yields of as much as 1,500 gpm. Well yields of as much as 1,000 gpm should be obtainable from the White Shield aquifer, which occupies a former valley of the Missouri River in western McLean County. Water from the aquifers in the glacial deposits is predominantly a sodium bicarbonate or calcium bicarbonate type and is usually hard to very hard. Wells tapping the Fort Union Group of Paleocene age generally yield from 5 to 75 gpm; however, in places yields as great as 200 gpm may be possible. The water is predominantly a sodium bicarbonate type. Wells tapping the Hell Creek and Fox Hills Formations yield from 10 to 50 gpm. The water is predominantly a sodium bicarbonate type. (Knapp-USGS)
W74-07313

HYDROLOGIC CONDITIONS IN THE LAKELAND RIDGE AREA OF POLK COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 4B.
W74-07318

DATA FOR MUNICIPAL WELLS IN THE CITY OF MODESTO, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 4B.
W74-07320

WATER-RESOURCES INVESTIGATIONS IN TEXAS, FISCAL YEAR 1974.
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 2E.
W74-07321

SANDSTONE AQUIFERS IN EASTERN SULLIVAN COUNTY, INDIANA,
Indiana Univ., Bloomington.
For primary bibliographic entry see Field 4B.
W74-07401

PUBLIC GROUNDWATER SUPPLIES IN BOND COUNTY,
Illinois State Water Survey, Urbana. Hydrology Section.
For primary bibliographic entry see Field 4B.
W74-07429

UNDERFLOW IN RIVER VALLEYS OF THE CARPATHO-UKRAINE (PODRUSLOVYY STOK V RECHNYKH DOLINAKH ZAKARPAT'YA),
Akademiya Nauk USSR, Kiev. Instytut Geologichnykh Nauk.
B. Yu. Lyaskovskiy.
Meteorologiya i Gidrologiya, No 6, p 77-83, June 1973. 2 tab, 14 ref.

Descriptors: *Underflow, *Subsurface flow, *Groundwater movement, *Surface-groundwater relationships, *Alluvial channels, *Valleys, Mountains, Streams, Water balance, Geophysics, Hydrometry, Estimating.
Identifiers: *USSR(Carpatho-Ukraine).

Estimates of underflow in major river valleys on the southern slope of the Carpatho-Ukraine (Carpathian Ruthenia) were based on geophysical and hydrometric data. Investigations of underflow were conducted in June-August 1971 in valleys of the Uzh, Latoritsa, Borzhava, Rika, Tereblya, Teresva, Shopurka, and Tisza Rivers. The amount of groundwater discharged in the form of underflow from the southern slope of the Carpathian fold mountains in the region of the Carpatho-Ukraine Neogene Depression is approximately 20 million cu m/yr and must be taken into account in analyzing total water balance of the region. Josefson-USGS)
W74-07504

GROUND-WATER FLOW PATTERNS IN CONFINED AQUIFERS AND POLLUTION,
Iowa State Water Resources Research Inst., Ames.
For primary bibliographic entry see Field 5B.
W74-07510

THE INFLUENCE OF GEOLOGICAL MEMBRANES ON THE GEOCHEMISTRY OF SUBSURFACE WATERS FROM MIOCENE SEDIMENTS AT KETTLEMAN NORTH DOME IN CALIFORNIA,
California Univ., Berkeley. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 2K.
W74-07513

EFFECT OF PARTIAL PENETRATION ON FLOW IN UNCONFINED AQUIFERS CONSIDERING DELAYED GRAVITY RESPONSE,
Agricultural Research Organization, Bet-Dagan (Israel). Inst. of Soils and Water.
S. P. Neuman.
Water Resources Research, Vol 10, No 2, p 303-312, April 1974. 7 fig, 28 ref.

Descriptors: *Groundwater movement, *Unsaturated flow, Water table, Water level fluctuations, Pumping, Water yield, *Storage coefficient, Specific yield, Simulation analysis.

The delayed response process characterizing flow to a well in an unconfined aquifer can be simulated by using constant values of specific storage and specific yield without recourse to unsaturated flow theory. The theory is extended to account for the effect of a well partially penetrating a homogeneous anisotropic unconfined aquifer. Field and laboratory evidence suggests that the elastic storage properties of unconfined aquifers may often be much more pronounced than those of deep-seated confined aquifers composed of similar materials. (Knapp-USGS)
W74-07514

A NUMERICAL MODEL BASED ON COUPLED ONE-DIMENSIONAL RICHARDS AND BOUSSINESQ EQUATIONS,
Stanford Univ., Calif. Dept. of Geology.
M. F. Pikul, R. L. Street, and I. Remson.
Water Resources Research, Vol 10, No 2, p 295-302, April 1974. 9 fig, 1 tab, 21 ref. NSF Grant GK-26153X.

Descriptors: *Numerical analysis, *Groundwater movement, *Soil water movement, Dupuit-Forchheimer theory, Water table, Vegetation effects, Infiltration, Simulation analysis, Mathematical models.
Identifiers: *Boussinesq theory.

An approximate numerical method to solve transient two-dimensional unsaturated-saturated subsurface flow problems uses several one-dimensional vertical unsaturated column models linked to a one-dimensional saturated flow model. The Dupuit-Forchheimer assumptions are used for the saturated flow, and the unsaturated flow is as-

sumed to be strictly vertical. The systems are linked because solutions of the equation governing unsaturated flow determine recharge and storage and this information is used to solve the equation governing saturated flow. In addition, the position of the water table locates the lower boundaries of the unsaturated models. The solution of a test problem using a linked model was compared with results from a rigorous two-dimensional model. The comparison was good at early times when recharge to the water table is small but poor at later times when recharge increases. Results compare closely with an actual groundwater hydrograph. In addition, a linked model shows that in a humid climate watershed the type of vegetation does not significantly affect the groundwater regimen, whereas in an arid climate watershed the type of vegetation would determine whether groundwater recharge occurred. For field-size problems, where water table movement is relatively small, where the Dupuit-Forchheimer assumptions are valid, and where lateral unsaturated flow is not important, the linked model offers an efficient approximate way to solve unsaturated-saturated flow problems. (Knapp-USGS)
W74-07515

MATHEMATICAL SIMULATION OF SUBSURFACE FLOW CONTRIBUTIONS TO SNOWMELT RUNOFF, REYNOLDS CREEK WATERSHED, IDAHO,
Agricultural Research Service, Boise, Idaho. Northwest Watershed Research Center.
G. R. Stephenson, and R. A. Freeze.
Water Resources Research, Vol 10, No 2, p 284-294, April 1974. 10 fig, 2 tab, 14 ref.

Descriptors: *Simulation analysis, *Subsurface runoff, *Snowmelt, Groundwater movement, Soil water movement, Base flow, Snowpacks, Mathematical models, *Idaho, Infiltration.
Identifiers: Reynolds Creek(Idaho).

A mathematical model of subsurface flow complements a field study of snowmelt runoff in a small upstream source area in the Reynolds Creek Experimental Watershed near Boise, Idaho. Field measurements from an instrumented cross section of this small watershed show that the mechanism of streamflow generation is subsurface delivery of meltwater over limited distances through shallow high-permeability low-porosity formations of altered and fractured basalt. The mathematical model provides a two-dimensional transient saturated-unsaturated analysis of the subsurface flow at the field site. It was a valuable aid to a unified interpretation of the field measurements. For mathematical models that consist of boundary value problems with boundary conditions that are time and space dependent, the boundary condition sensitivity can thwart the rational calibration-validation procedure. This, together with the more serious limitations of data availability, funds for data acquisition, and computer capacity, precludes the imminent use of fully deterministic hydrologic response models on larger basins or on a regional scale. (Knapp-USGS)
W74-07516

STEADY STATE FLOW IN RIGID NETWORKS OF FRACTURES,
Leeds, Hill and Jewett, Inc., San Francisco, Calif.
C. R. Wilson, and P. A. Witherspoon.
Water Resources Research, Vol 10, No 2, p 328-335, April 1974. 13 fig, 21 ref.

Descriptors: *Groundwater movement, *Fractures(Geologic), *Laminar flow, Saturated flow, *Finite element analysis, Numerical analysis, Permeability, Steady flow, Networks.

The finite element was used to develop two numerical methods of calculating the flow characteristics of rigid networks of planar fractures. One method uses triangular elements to investigate details of laminar flow in fractures of irregular cross section combined with that of a permeable rock matrix. The other method uses line elements and is designed only for flow in networks of planar fractures in an impermeable matrix. As an example of the application of the finite element approach, the line element method was used to develop a series of dimensionless graphs that characterize seepage in idealized fracture systems beneath dams. These methods treat two-dimensional flow in the laminar regime for networks of fractures of arbitrary orientation and aperture distribution. (Knapp-USGS)
W74-07521

A GROUNDWATER PROFILE SAMPLER,
Forest Service (USDA), Cadillac, Mich. North Central Forest Experiment Station.
E. A. Hansen, and A. R. Harris.
Water Resources Research, Vol 10, No 2, p 375, April 1974. 1 fig, 1 ref.

Descriptors: *Sampling, *Groundwater, Water wells, Boreholes, Water quality.

A series of fiberglass probes spaced in sand-packed compartments in a screened well point permits the collection of a number of discrete groundwater samples from predetermined depths in a single borehole. (Knapp-USGS)
W74-07523

AN EXPERIMENTAL STUDY OF IMMISCIBLE DISPLACEMENT WITH AN UNFAVORABLE MOBILITY RATIO IN POROUS MEDIA,
Purdue Univ., Lafayette, Ind. School of Chemical Engineering.
S. P. Gupta, and R. A. Greenkorn.
Water Resources Research, Vol 10, No 2, p 371-374, April 1974. 3 fig, 1 tab, 16 ref.

Descriptors: *Mixing, *Porous media, *Groundwater movement, Saline water intrusion, Path of pollutants, Flow, Interfaces, Saline water-freshwater interfaces.

Viscous fingering was studied in a glass bead model covering the entire scope of finger development from incipient fingers to a parallel-sided single finger in both miscible and immiscible displacement. As incipient fingers move, they decrease in number. Both decay and merging are simple viscous effects. The rate of growth develops almost immediately, well before the finger is parallel sided. The mechanisms of wavelength generation and degeneration are discussed on physical grounds. (Knapp-USGS)
W74-07524

2G. Water In Soils

BROAD SPECTRUM MICROWAVE SYSTEMS FOR REMOTELY MEASURING SOIL MOISTURE CONTENT,
Arkansas Univ., Fayetteville. Dept. of Electrical Engineering.
W. P. Waite, K. R. Cook, and B. B. Bryan.
Available from the National Technical Information Service as PB-231 558, $4.75 in paper copy, $1.45 in microfiche. Arkansas Water Resources Center, Fayetteville, Publication No. 18, November 1973. 166 p, 67 fig, 2 tab, 21 ref. OWRR B-020-ARK(1). 18-31-0001-3557.

Descriptors: *Remote sensing, *Soil moisture, *Microwaves, *Radar, Temperature, Reflectance, Measurement, Soil surfaces, Instrumentation, Surfaces, Algorithms, Electromagnetic waves.
Identifiers: *Radiometric temperature, *Dielectric constant, *Rough surface distortion, Smooth surfaces.

A theoretical and experimental study of the microwave reflectivity of soils with varying moisture content was conducted. A system was developed to measure reflectivity over a continuous frequency range of 4 to 26.5 GHz, at incidence angles from 10 to 70 deg, and with both horizontal and vertical polarization. The measurements were found to be extremely accurate for smooth homogeneous surfaces; however, the effects of surface roughness were more severe than predicted due to the discontinuous nature of naturally occurring rough surfaces. An algorithm was developed which used the frequency dependence of the reflectivity to estimate the effective roughness of the surface and permit correction to an equivalent smooth surface reflectivity which in turn could be related to dielectric constant or percent moisture content. For the frequency range of investigation the maximum mean square height deviation that could be accommodated was approximately one inch. From this it may be concluded that operational airborne or spacecraft sensors must operate in the 500 MHz to 1 GHz range. Even at this reduced frequency it will be impossible to neglect the effects of roughness and a diversity technique such as developed here is essential if an absolute measure of soil moisture is to be made.
W74-07052

SUBSURFACE HEATING AND IRRIGATION OF SOILS: ITS EFFECT ON TEMPERATURE AND WATER CONTENT AND ON PLANT GROWTH,
Oregon State Univ., Corvallis. Dept. of Soil Science.
E. W. R. Barlow, A. R. Sepaskhah, and L. Boersma.
Available from the National Technical Information Service as PB-231 555, $4.50 in paper copy, $1.45 in microfiche. Oregon Water Resources Research Institute, Corvallis, Completion Report WRRI-23, March 1974. 109 p, 39 fig, 27 tab, 108 ref. OWRR B-028-ORE(5).

Descriptors: *Soil temperature, Heating, *Soil treatment, Subsurface irrigation, Plant physiology, *Corn(Field), Crop production, *Heat treatment, *Plant growth.
Identifiers: *Soil heat.

Subsurface irrigation even without heating the soil has given good results in terms of increased yields of crops and decreased water requirements in comparison with other methods of water application. Laboratory experiments were used to study the effect of heat source temperature on the temperature distribution around a line heat source in different soils. Different soil surface heat loads were applied to study the effect of varying climatic conditions on the temperature distributions. Effects of heat source temperature, soil surface temperature, and soil texture on rate of heat dissipation were studied. Water was applied near the heat source to determine the rate of water application required to maintain a constant soil water content at different heat source temperatures. Water content distributions and rates of water application were measured. Concurrent experiments were conducted to determine the effect of lowering root temperature on plant growth by measuring the effects on plant water potential and its relation to leaf elongation, photosynthesis, and transpiration, using young corn plants.
W74-07054

EXPERIMENTAL EVALUATION OF A METHOD FOR DETERMINING UNSATURATED HYDRAULIC CONDUCTIVITY,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
R. W. Skaggs, E. J. Monke, and L. F. Huggins.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 16, No 1, p 85-88, 1973. 9 fig, 17 ref. OWRR A-021-IND (3).

Descriptors: *Hydraulic conductivity, *Infiltration, *Unsaturated flow, Porous media, Soil water content.
Identifiers: Gamma ray attenuation.

An approximate method for determining unsaturated hydraulic conductivity was based on the assumption that the conductivity-pressure head relationship could be effectively represented by an empirical 3-parameter equation by Gardner. The conductivity functions of two artificially packed soils were determined. Infiltration rate-time relationships were then measured for infiltration into soil columns having different initial water content distribution. These relationships were compared to influx curves predicted through the use of the determined K (h) functions, that is, the hydraulic conductivity-pressure head relationship. The K (h) functions obtained for the two soils experimentally investigated gave reliable predictions of the influx curves for different initial water content distribution. Further evidence of the validity of the K (h) functions was given by the close agreement between the predicted and measured wetting front movement for tests on dry soils. (Wiersma-Purdue)
W74-07088

REACTIVATING SOIL RIPPING TREATMENTS FOR RUNOFF AND EROSION CONTROL IN THE SOUTHWESTERN U.S.,
Forest Service (USDA), Albuquerque, N. Mex. Rocky Mountain Forest and Range Experiment Station.
E. F. Aldon.
Annals of Arid Zone, Vol 11, Nos 3 and 4, p 154-160, Sept. and Dec. 1972. 1 fig, 2 tab, 4 ref.

Descriptors: *Deep tillage, *Erosion control, *Soil treatment, *Soil management, Runoff, Percolation, Soil moisture, Moisture availability, Evapotranspiration, Precipitation(Atmospheric), Infiltration, Induced infiltration, Retention, Soil water, Storage capacity, Water storage, Soil-water-plant relationships, *Southwest U.S.
Identifiers: *Soil ripping.

The process of breaking up soil for increased moisture penetration is called soil ripping. It is an effective method for controlling erosion and runoff for 3 to 5 years in the southwestern United States. The re-ripping of soils which have been closed after an initial soil ripping treatment is an economical method of reducing runoff to two thirds the undisturbed level. This was as effective as ripping new areas and did not destroy the vegetation of the originally undisturbed area. Thus vegetation may be established in areas for long-term runoff control while interspersed areas are repeatedly ripped for immediate control. Indiscriminant ripping can encourage soil piping, so care must be taken when ripping shallow shale soils. (Muller-Arizona)
W74-07089

EFFECT OF CONTOUR FURROWS AND CONTOUR BUNDS ON WATER CONSERVATION IN GRASSLANDS OF WESTERN RAJASTHAN,
Central Arid Zone Research Inst., Jodhpur (India).
For primary bibliographic entry see Field 3F.
W74-07090

EFFECT OF GYPSUM IN REDUCING BORON HAZARD OF SALINE WATERS AND SOILS,
Central Soil Salinity Research Inst., Karnal (India).
For primary bibliographic entry see Field 3C.
W74-07095

MINERALOGICAL COMPOSITION OF CLAYS IN SOIL PROFILES OF ISRAEL: I. THE SOILS OF THE MEDITERRANEAN ZONE,
Hebrew Univ., Rehovot (Israel). Dept. of Soil and Water Science.
M. Gal, S. Ravikovitch, and A. J. Amiel.
Hebrew University of Jerusalem, Faculty of Agriculture, Rehovot, Israel. October 1972. p 1-18. 6 fig, 2 tab, 31 ref.

Descriptors: *Clay minerals, *Soil profiles, *Montmorillonite, Cation exchange, Soil analysis, Bedrock, Aeolian soils, Calcite, Soil types, Alluvium.
Identifiers: *Israel, *Mediterranean zone.

Soil formation of the Mediterranean zone of Israel takes place under the influence of alternate wetting (short rainy winter) -- drying (long dry hot summer) cycles. Soil samples were taken from upland arid valley sites, and are grouped first by origin: the soils formed of bedrock, and those developed from alluvial and aeolian sediments from parent rocks outside the area of distribution of the soils. Soils in these groups are subdivided by the minerals found in their clays. Montmorillonite is the dominant mineral in the clay fraction of two soil groups. The third group contains an appreciable amount of calcite in its clay. Cation exchange capacity is highest in the group of soils where montmorillonite accounts for more than two thirds of the minerals. (See also W74-07100) (Ferreira-Arizona)
W74-07099

MINERALOGICAL COMPOSITION OF CLAYS IN SOIL PROFILES OF ISRAEL: II. THE SOILS OF THE DESERT ZONE,
Hebrew Univ., Rehovot (Israel). Dept. of Soil and Water Science.
S. Ravikovitch, M. Gal, and V. Cossman.
Hebrew University of Jerusalem, Faculty of Agriculture, Rehovot, Israel. October 1972. p 19-31. 4 fig, 2 tab, 12 ref.

Descriptors: *Soil analysis, *Soil profiles, *Montmorillonite, *Clay minerals, Illite, Kaolinite, Deserts, Cation exchange, Calcite, Aeolian soils, Bedrock, Gravels, Soil types.
Identifiers: *Israel.

From samples taken from areas with 200-300 mm annual precipitation, the soils of Israel's desert steppe regions were classified into three groups on the basis of the mineral composition of the clay fraction. The first group contains montmorillonite as the dominant mineral, with kaolinite and illite as main accessory minerals. Group 2 soils contain montmorillonite as the dominant mineral in the clay fraction, with calcite as the main accessory. Group 3 soils contain montmorillonite as the dominant mineral, accounting for between one-third and one-half of all the clay. The main accessory minerals are kaolinite and calcite. Soils of the third group are very common in the desert region. Cation exchange capacity of the clays ranges widely in desert soil. Soils formed from desert aeolian dust and alluvial sediments are compared with soils formed from bedrock and stony alluvium. (See also W74-07099) (Ferreira-Arizona)
W74-07100

MANGANESE AND IRON SOLUBILITY CHANGES AS A FACTOR IN TILE DRAIN CLOGGING: I. OBSERVATIONS DURING FLOODING AND DRYING,
Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
L. R. Grass, A. J. MacKenzie, B. D. Meek, and W. F. Spencer.
Soil Sci Soc Am Proc. Vol 37, No 1, p 14-17. 1973, Illus.
Identifiers: Carbon, Clogging, Drying, Flooding, *Iron, Irrigation, *Manganese, Nitrates, Nitrogen, Redox, Salinity, Saturation, Soils, *Solubility, *Tile(Drains), Waterlogging, *California(Imperial Valley).

A field study of waterlogging and subsequent drying of the soil profile showed that under irrigation culture in Imperial Valley (California) reducing conditions became prevalent. Reducing conditions, as indicated by declining Eh (redox potential) values, became most favorable for dissolution of Mn and Fe near the soil surface. However, the concentrations of Mn2+ and Fe2+ were lowest near the surface, probably because of their leaching from this zone, and the shorter time of contact between soil solution and soil particles. The concentrations of Fe2+ and Mn2+ were higher in the deeper horizons of the soil profile. In the plow layer, the reducing intensity increased, beginning 9 m away from the tile and reaching a maximum 18-23 m from the tile drain. The Eh levels in the soil profile declined immediately after irrigation began and rose immediately after irrigation stopped indicating the importance of atmospheric O2 to the oxidation-reduction status and, therefore, to the solubility of Fe and Mn compounds. Soluble organic C apparently was not related to the concentration of Mn2+ or Fe2 in the soil solution even though the decomposition of soil organic matter is important in oxidation-reduction reactions in the soil profile. (See also W74-07152), Copyright 1973, Biological Abstracts, Inc.
W74-07151

MANGANESE AND IRON SOLUBILITY CHANGES AS A FACTOR IN TILE DRAIN CLOGGING: II. OBSERVATIONS DURING THE GROWTH OF COTTON,
Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
L. B. Grass, A. J. MacKenzie, B. D. Meek, and W. F. Spencer.
Soil Sci Soc Am Proc. Vol 37, No 1, p 17-21, 1973, Illus.
Identifiers: Carbon, Clogging, Cotton, Drain clogs, Gossypium-Hirsutum, Growth, *Iron, Irrigation, *Manganese, Nitrates, Nitrogen, Redox, Salinity, Saturation, Soil, *Solubility, *Tile drains, Waterlogging, *California(Imperial Valley).

Various levels of oxidation-reduction develop in the soil profile during the irrigation and growing season of the cotton (Gossypium hirsutum L.) crop. Reducing intensity increased with depth during the growing season and reached maximum intensity at the 6.10-m depth. Reducing conditions favorable to increased solubility of Fe and Mn were observed in the surface horizons of the profile during most of the season. Changes in the solubility of Mn and Fe occurred with changes in the oxidation-reduction status in the soil profile. Mn began to dissolve at 400 m V and became significant at less than 300 m V. Increased concentration of nitrate retarded reduction of oxidized Fe and Mn compounds. The salinity of the soil solution affected the concentration of soluble Mn and Fe. The presence of NO3--N in the soil solution in amounts > 0.2 ppm retarded the dissolution of Mn compounds. The solubility of Mn and Fe can probably be controlled by controlling or regulating the oxidation-reduction status of the soil profile by reducing the waterlogging period after irrigation to a minimum. (See also W74-0715), Copyright 1973, Biological Abstracts, Inc.
W74-07152

INTENSIVE INFILTROMETER STUDIES ON A PLOWED BIG SAGEBRUSH SITE,
Utah State Univ., Logan. Watershed Science Unit.
G. F. Gifford, and F. E. Busby.
Journal of Hydrology, Vol 21, No 1, p 81-90, January 1974. 3 fig, 5 tab, 3 ref.

Descriptors: *Infiltration, *Infiltrometers, *Idaho, *Grazing, Rainfall-runoff relationships, Sagebrush, *Range management, Evapotranspiration, Vegetation effects.
Identifiers: *Plowing.

Intensive infiltrometer studies were made over a 4-year period on a plowed big sagebrush (Artemisia tridentata) site in southern Idaho. There was a natural decay in absorptive capabilities of surface soils due to the plowing treatment. The apparent result of grazing was to eliminate seasonal trends so that infiltration rates were low throughout the year. Grazing did not increase sediment production potentials beyond the increases expected as a result of mechanical disturbance associated with

plowing. Easily measured soil cover characteristics do not adequately reflect the potential hydrologic performance of a big sagebrush site which has been grossly modified by activity such as plowing or grazing. (Knapp-USGS)
W74-07166

NUMERICAL STUDIES OF TWO-DIMENSIONAL SATURATED-UNSATURATED DRAINAGE MODELS,
Oslo Univ. (Norway). Inst. of Geophysics.
M. Todsen.
Journal of Hydrology, Vol 20, No 4, p 311-326, December 1973. 10 fig, 15 ref.

Descriptors: *Soil water movement, *Saturated flow, Drainage, *Numerical analysis, Mathematical models, *Seepage, Moisture tension, Specific retention.

The partial differential equation which governs the seepage of water in unsaturated and saturated porous media was solved numerically by a generalized Newton iteration technique for two models, one of ditch drainage and one of an earth dam model. For both two-dimensional models, a few hypothetical soils with different moisture retention curves were considered. In both models only drainage from an initially saturated soil occurs; thus, the problem of hysteresis is avoided. The results of the computations were compared with those of corresponding saturated (pure groundwater) models. Computational instability phenomena appear when the slope of the retention curves is made steep, (for poorly-graded soils). (Knapp-USGS)
W74-07168

EVAPORATION OF WATER FROM SAND: 5. THE EFFECT OF EVAPORATION ON THE CONCENTRATION OF SALTS DISSOLVED IN WATER STORED IN SAND,
National Inst. for Water Research, Windhoek (South-West Africa).
For primary bibliographic entry see Field 2D.
W74-07169

WATER RETENTION OF GRANITIC SOILS IN THE IDAHO BATHOLITH,
Forest Service, (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
J. L. Clayton, and C. E. Jensen.
USDA Forest Service Research Paper INT-143, December 1973. 20 p, 8 fig, 6 tab, 17 ref, append.

Descriptors: *Soil moisture, *Moisture tension, *Organic matter, Moisture content, Soil texture, Forest soils, Soil-water-plant relationships, Clays, Particle size, Mathematical models, Forestry, Granites, Idaho.
Identifiers: *Moisture retention, *Idaho Batholith.

Volumetric soil-water retention was evaluated at 1/3 and 15 bars for its relation to the effects of organic matter, fines (<50 micrometer diameter) and soil bulk density. Samples were from soils formed from granitic parent materials of the Idaho Batholith. These soils are coarse-textured and have a broad range of organic matter content. Texture has only a secondary effect in the Batholith soils. In contrast, retention is strongly affected by organic matter, because of the broad organic matter range and the enhanced potential for organic matter to exert its retention effects. Organic matter alone explains 57% of the variance in water retention at 1/3 bar, and 62% at 15 bars tension. Incorporating the interacting effects of the remaining two variables explains an additional 17% of the variance in water retention at 1/3 bar, and an additional 11% at 15 bars. Tables and equations for the two retention models are presented. The final models were subsequently adjusted by least squares to two data sets of geographically diverse soils from the Idaho Batholith. The adjusted retention models operate well for predicting water retention at both energy levels. (Knapp-USGS)
W74-07170

ACTIVITY OF THE MICROORGANISMS AND THE MINERALIZATION OF THE ORGANIC MATTER PEAT SOILS WITH A VARYING LEVEL OF SUB SOIL WATERS, (IN RUSSIAN),
T. G. Zimenko.
Izv Akad Nauk SSSR Ser Biol. 6, p 846-854. Illus. 1972. English summary.
Identifiers: Amino acids, Enzymes, Microbial studies, *Microorganisms, *Mineralization, *Organic matter, *Peat soils, Respiration, Soils, Subsoil waters.

The group composition and activity of the microorganisms in peat soils depends on the level of subsoil waters. At a depth equal to 58-60 cm, unfavorable conditions of a hydroair regime are created in the soil leading to a suppression of the development of the microorganisms. Lowering of subsoil waters is followed by a progressive increase of the number and activity of microorganisms. This is immediately followed by an activation of the processes of soil respiration, accumulation of free amino acids and enzyme formation. The biological mineralization of peat is enhanced. The contents of the general organic matter, N and C are reduced.--Copyright 1973, Biological Abstracts, Inc.
W74-07230

RESEARCH ON THE MICROMORPHOLOGY OF THE FLOODED POSZOLIC SOILS OF SHALLOW WATER RESERVOIRS, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Soil Melioration.
V. G. Vinogradov.
Vestn Mosk Univ Ser 6 Biol Pochvoved. Vol 27, No 5, p 83-87. 1972. Illus. (English Summary).
Identifiers: *Flooding, *Micromorphology, Oxygen, *Podzolic soils, Podzols, Redox, Reservoirs, Soils, Saturated soils.

Under conditions of prolonged flooding (over 30 yr) of podzolic soils with water saturated with O2 (having a high level of Eh (redox potential) and pH) the morphology practically did not change. The process of their transformation occurred under specific conditions quite different from swamping.--Copyright (c) 1973, Biological Abstracts, Inc.
W74-07235

EFFECT OF IRRIGATION ON DYNAMICS OF MICROORGANISM QUANTITY IN DARK-BROWN SOILS IN SOUTHERN UKRAINE, (IN UKRAINIAN),
Akademiya Nauk URSR, Kiev. Inst. of Microbiology and Virology.
V. T. Smalii, O. M. Dul'herov, L. I. Sira, and V. K. Dovzhenko.
Microbiol Zh (KYYIV). Vol 34, No 5, p 566-570. 1972 (English summary).
Identifiers: Actinomycetes, *Bacteria, *Fungi, *Irrigation, Microorganisms, *Soils(Dark brown), *USSR(Ukraine), Soil moisture.

During irrigation a number of fungi and bacteria increase considerably. Actinomycetes were not affected by an increase in soil moisture. The optimal conditions for intensive reproduction of bacteria and fungi with irrigation at 70% of maximum field moisture capacity are described.--Copyright 1973, Biological Abstracts, Inc.
W74-07279

INFILTRATION AND WATER TABLE EFFECTS OF SOIL AIR PRESSURE UNDER BORDER IRRIGATION,
Agricultural Research Service, Reno, Nev. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 3F.
W74-07301

APPLICATION OF THE SPLINE FUNCTION T SOIL SCIENCE,
California Univ., Davis.
K. T. Erh.
Soil Sci. Vol 114, No 5, p 333-338, 1972. Illus.
Identifiers: Diffusivity, Infiltration, Pressure, *Soil water, *Spline function, *Soil profiles, *Water storage, Hydraulic conductivity.

The most attractive feature of the spline functio approximation method is its capability of transfer ring an empirical and phenomenological relation ship into a definite mathematical formula. It is no a statistical method and bears no statistical sig nificance. Spline function approximation has bee tested extensively for its validity and results ob tained were satisfactory. Examples are presented in which the spline function approximation can b applied. Post-infiltration water pressure profiles were measured in the field. By applying the spline function approximation, the soil-water pressure and water-content profile were treated as a con tinuous and differentiable function of depth. Thus the water storage capacity, the hydraulic gradient and the soil-water flux in any time interval at any depth was readily evaluated. The unsaturated hydraulic conductivity values as well as those of the soil water diffusivity were easily estimated. The use of this approximation greatly simplifies attempts to solve a partial differential equation for nonlinear adsorption isotherm by numberical methods. An example is given for soil-water profiles for 2 periods of water infiltration into air-dry Sacramento clay. For estimating the soil-water diffusivity, the application of the spline function to describe the soil-moisture profile would remove any uncertainty in determining the slope. This approximation method is a logical and reasonable approach for those situations in which a statistical technique is not applicable. --Copyright 1973, Biological Abstracts, Inc.
W74-07344

PHOSPHORUS SUPPLY CHARACTERISTICS OF ACID ORGANIC SOILS AS MEASURED BY DESORPTION AND MINERALIZATION,
North Carolina State Univ., Raleigh.
Z. W. Daughtrey, J. W. Gilliam, and E. J. Kamprath.
Soil Sci. Vol 115, No 1, p 18-24, 1973. Illus.
Identifiers: Acid *Desorption, Fertilization, Measurement, *Mineralization, Nutrition, *Phosphorus, *Soils(Acid organic), *North Carolina(Tidewater region).

Sixteen soils ranging from poorly drained mineral soils high in organic matter in surface horizons to deep colloidal mucks were collected in the Tidewater region of North Carolina. Crops on the selected soils had previously shown a varied response to applied P. P was desorbed from the soils by 12 successive equilibrations with water. Mineralization of organic P during incubation was also measured. The soils were placed into 3 categories based on the desorption patterns and amount of P released during desorption. One group, composed of the poorly drained mineral soils, exhibited an increase in P desorbed with each successive extraction but the total amount desorbed was low. This group also had a relatively small amount of P mineralized. The second group, composed of muck soils and 2 intergrade soils, exhibited a decreasing amount of P released with successive equilibrations but the total amount of P released was large. The third group of soils, composed of reed bed and intergrade soils, had either an increasing amount of P released with successive extraction and a relatively high amount of P desorbed or a very high amount of P desorbed such that the pattern of release was insignificant. Most of the soils in the third group also had large amounts of organic P mineralized during incubation. The soils of the first group were relatively infertile with respect to P supply. The soils in the second group might supply adequate P initially, but could not continue to supply sufficient P and crops grown on these soils would probably

espond to P fertilization. Soils in the third group hould supply adequate P for plant growth hroughout the growing season. --Copyright 1973, Biological Abstracts, Inc.
W74-07345

THE HEAT FLUX DENSITY IN A NON-HOMOGENEOUS BARE LOESSIAL SOIL,
Israel Meteorological Service, Bet-Dagan. Div. of Agricultural Meteorology.
M. Fuchs, and A. Hadas.
Boundary-Layer Meterol. Vol 3, No 2, p 191-200, 1972. Illus.
Identifiers: Density, Diurnal, Energy exchange, *Heat flux, *Loessial soil, *Soil thermal properties.

The relationship between the diurnal patterns of the radiant energy exchange in the atmospheric surface layer and the soil heat flux density of a bare irrigated soil in an arid environment is described. The soil heat flux density is a large fraction of the net radiation. The soil moisture content has little effect on this fraction but modified the phase relationship between the net radiation and the soil heat flux density waves. Differences between the thermal regimes of the 'wet' and 'dry' soil appear to be caused by latent heat exchanges rather that changes of the soil thermal properties. The variation with depth of the soil thermal properties strongly influences the propagation of the temperature and heat flux density waves in the soil. A heat diffusion theory for non-homogeneous conductors(Lettau) which enables the thermal properties of the soil to be predicted is tested by comparison with experimental determinations in the field. --Copyright 1973, Biological Abstracts, Inc.
W74-07346

STRUCTURAL CHANGES IN TROPICAL SOILS DUE TO ANIONS IN IRRIGATION WATER,
Hawaii Univ., Honolulu.
S. A. El-Swaify.
Soil Sci. Vol 115, No 1, p 64-72, 1973. Illus.
Identifiers: *Anions, Bicarbonates, Cations, Chlorides, Hydraulic conductivity, *Irrigation water, Silicates, Soils, Sulfates, *Tropical soils, Hydrogen ion concentration.

The effects of chlorides, sulfates, bicarbonates, and silicates on the hydraulic conductivities of some tropical soils were investigated. The soils, an Oxisol, and Aridisol, an Inceptisol and a Vertisol, were selected so that a wide variety of mineralogical components would be represented. The soils also represent a range of charge dependence on pH and on the presence of specifically adsorbed ions. In their natural states, they exhibit from predominantly net negative (Vertisol) to net positive (Inceptisol) charges. Anion effects became increasingly important as the proportion of amorphous materials increased, as in the Inceptisol. Such effects were due primarily to the anio's ability to change the charge characteristics of the soil, either directly or indirectly, by changing the pH of the system; and secondarily, to their effects on cation activities. When the proportion of 2:1 clays increased, cation activity changes, reflected by changes in electrolyte concentration, produced more significant structural changes than did change in anion type. This was true in the Vertisol whose charges are but little dependent on the composition of soil solution. Structural changes in the Oxisol and Aridisol, both made up of kaolins and iron oxides, depended to varying degrees on both anion type and electrolyte concentration, the first being relatively more significant in lower horizons and the second in upper horizons. --Copyright 1973, Biological Abstracts, Inc.
W74-07348

LAND DISPOSAL OF WASTE GASES: III. SORPTION PATTERNS FROM BURIED GAS INJECTION PIPES,
Arizona Agricultural Experiment Station, Phoenix.
For primary bibliographic entry see Field 5B.
W74-07422

RELATIVE MOVEMENT OF BROMIDE AND NITRATE THROUGH SOILS,
Agricultural Research Service, Durant, Okla. Water Quality Management Lab.
For primary bibliographic entry see Field 5B.
W74-07423

VOLATILITY OF DDT RESIDUES IN SOIL AS AFFECTED BY FLOODING AND ORGANIC MATTER APPLICATIONS,
Agricultural Research Service, Riverside, Calif. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 5B.
W74-07424

EFFECTIVENESS OF TWO NITRIFICATION INHIBITORS FOR ANHYDROUS AMMONIA UNDER IRRIGATED AND DRYLAND CONDITIONS,
Agricultural Research Service, Pullman, Wash. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 5G.
W74-07436

DEVELOPMENT OF AN AGRICULTURAL DRAINAGE GUIDE,
Soil Conservation Service, Berkeley, Calif.
For primary bibliographic entry see Field 4A.
W74-07438

MICRO-DETERMINATION OF CATION-EXCHANGE CAPACITY BY NEUTRON ACTIVATION ANALYSIS,
Oregon Agricultural Experiment Station, Corvallis.
M. J. Dudas.
Soil Science Society of America Proceedings, Vol 37, No 5, p 804-805, September-October, 1973. 1 fig, 2 tab, 4 ref.

Descriptors: *Cation exchange, *Gamma rays, *Clays, Kaolinite, Montmorillonite, *Neutron activation analysis.

Neutron activation analysis was evaluated as a method to determine the cation-exchange capacity (CEC) of clay samples. Cation-exchange capacity values of satisfactory reproducibility and accuracy were obtained on 5- to 50-mg subsamples of a kaolinite and montmorillonite clays previously saturated with Na, Rb, or Cs. Use of Cs as the index ion provided the simplest and most flexible conditions for the activation analysis method. (Skogerboe-Colorado State)
W74-07439

DETERMINATION OF NITRATES IN SOIL EXTRACTS,
British Columbia Univ., Vancouver. Dept. of Soil Science.
C. G. Kowalenko, and L. E. Lowe.
Soil Science Society of American Proceedings, Vol 37, No 4, p 660, July-August, 1973. 7 ref.

Descriptors: *Water chemistry, *Nitrates, Soil chemistry, Ions, Pollutant identification.

A variation of a method for nitrate analysis of water samples developed by West and Ramachandran (1966) is presented. The method can be used on soil samples in place of the phenoldisulfonic acid method with very comparable results. (Skogerboe-Colorado State)
W74-07443

NITRATE CONCENTRATIONS IN THE UNSATURATED ZONE BENEATH IRRIGATED FIELDS IN SOUTHERN CALIFORNIA,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W74-07445

EFFECTS OF SUBSURFACE ASPHALT LAYERS ON CORN AND TOMATO ROOT SYSTEMS,
Florida Univ., Gainesville. Dept. of Soil Science.
For primary bibliographic entry see Field 3F.
W74-07447

PLANT AND IRRIGATION WATER REQUIREMENTS,
For primary bibliographic entry see Field 3F.
W74-07452

EFFECT OF IRRIGATION WITH THERMAL WATER ON TRACE-ELEMENT CONTENT IN SOME SOILS OF GEORGIA (VLIYANIYE OROSHENIYA TERMAL'NYMI VODAMI NA SODERZHANIYE MIKROELEMENTOV V NEKOTORYKH POCHVAKH GRUZII),
For primary bibliographic entry see Field 3F.
W74-07508

SOIL MOISTURE DYNAMICS AND ITS VARIATIONS IN SOILS UNDER FIELD CROPS (DINAMIKA VLAZHNOSTI I STEPEN' YEYE VAR'IROVANIYA V POCHVAKH POD POLEVYMI KUL'TURAMI),
Kostromskoi Selskokhozyaystvennyi Institut (USSR).
Ye. G. Kabalin, and I. K. Bodrov.
Pochvovedeniye, No 4, p 59-64, April 1973. 5 tab, 2 ref.

Descriptors: *Soil physics, *Soil water movement, *Soil moisture, *Variability, *Field crops, Potatoes, Barley, Grasses, Statistical methods, Probability.
Identifiers: *USSR, Peas.

Variations in soil moisture of the O-30-cm layer caused by crops were studied in a test plot of the Kostroma Agricultural Institute 'Karavayevo' in 1963-66. Reliable differences in soil moisture contents under potatoes, peas, and barley were determined by statistical analysis. Necessary replication of soil moisture determinations was calculated to ensure an accuracy within 10% of the determined value for different fiducial probabilities (0.80, 0.90, and 0.95). Field crops were found to have a significant effect on soil moisture content and its variations. Differences in soil moisture content at depths of 0-10, 10-20, and 20-30 cm were greater under potatoes than under peas and barley. The degree of variation and the determination error in soil moisture content increased as the soil dried and reached maximum values under peas, barley, and perennial grasses. An 8-fold replication of soil sampling at depths of 0-10 and 10-20 cm ensured an average determination accuracy within 3.1-7.2%, and a 4-fold replication at a depth of 20-30 cm, an accuracy within 6.2-7.0%. In most cases an 8-fold replication of soil moisture determinations at depths of 0-10 and 10-20 cm under all crops ensured an accuracy within 10% of the determined value for a fiducial probability of 0.90 and 0.95. A 4-fold replication of soil moisture determinations at a depth of 20-30 cm made it possible to obtain an accuracy within 10% of the determined value for a fiducial probability of 0.80. (Josefson-USGS)
W74-07509

FLUX-GRADIENT RELATIONSHIPS AND SOIL-WATER DIFFUSIVITY FROM CURVES OF WATER CONTENT VERSUS TIME,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.

D. L. Nofziger, L. R. Ahuja, and D. Swartzendruber.
Soil Science Society of America Proceedings, Vol 38, No 1, p 17-23, January-February 1974. 6 fig, 11 ref. OWRR B-014-IND(6).

Descriptors: *Soil water movement, *Unsaturated flow, Seepage, Percolation, Equations, Wetting, *Diffusivity, Diffusion.

Direct analysis of a family of curves of soil-water content versus time at different fixed positions enables assessment of the flux-gradient relationship prior to the calculation of soil-water diffusivity. The method was evaluated on both smooth and random-error data generated from the solution of the horizontal soil-water intake problem with a known diffusivity function. Interpolation, differentiation, and integration were carried out by least-squares curve fitting based on the two recently developed techniques of parabolic splines and sliding parabolas. Results were excellent for both smooth and random-error input data, whether in terms of recovering the original known diffusivity function, assessing the nature of the flux-gradient relationship, or in making the numerous checks and validations at various intermediate stages of computation. The method applies for any horizontal soil-wetting process independently of the specific boundary conditions, including water entry through a nonzero inlet resistance. It should be adaptable to horizontal dewatering, and extendable to vertical flow. (Knapp-USGS)
W74-07512

A NUMERICAL MODEL BASED ON COUPLED ONE-DIMENSIONAL RICHARDS AND BOUSSINESQ EQUATIONS,
Stanford Univ., Calif. Dept. of Geology.
For primary bibliographic entry see Field 2F.
W74-07515

SEEPAGE THROUGH A HILLSIDE: THE STEADY WATER TABLE,
Arizona Univ., Tucson. Dept. of Soils, Water, and Engineering.
A. W. Warrick, and D. O. Lomen.
Water Resources Research, Vol 10, No 2, p 279-283, April 1974. 3 fig, 1 tab, 12 ref.

Descriptors: *Seepage, *Groundwater movement, *Water table, Mathematical studies, Slopes, Topography, Hydraulic conductivity.

An analytical solution is given for seepage through a hillside in which a curved water table is maintained by steady percolating water. The two-dimensional surface is assumed to be a straight slope from the base to a seepage point but may be irregular at higher elevations. Conformal transformations determine seepage elevations and water table profiles as a function of the seepage rate and the slope. For small slopes and small percolation rates the seepage elevation is equal to the rainfall rate times the width of the slope divided by the saturated hydraulic conductivity. (Knapp-USGS)
W74-07517

SALT DISPLACEMENT INTO DRAIN TILES UNDER PONDED LEACHING,
Arizona Univ., Tucson. Dept. of Soils, Water, and Engineering.
S. Miyamoto, and A. W. Warrick.
Water Resources Research, Vol 10, No 2, p 275-278, April 1974. 6 fig, 1 tab, 7 ref.

Descriptors: *Leaching, *Soil water movement, *Tile drainage, Infiltration, Mathematical models, Saturated flow, Saline water, Path of pollutants.

Steady state piston-type displacement into drain tiles when the ground surface is partially covered by an impermeable material or by ponded water away from the drains was analyzed mathematically. By preventing the water from infiltrating directly over the drains a more uniform leaching pattern is attained. The result is to reduce the water required for leaching to the depth of drains by as much as one half. Experimental data obtained from sand tank models support this prediction. (Knapp-USGS)
W74-07518

INVESTIGATION OF THE RELATION OF GROUNDWATER EVAPORATION TO LITHOLOGICAL STRUCTURE OF THE ZONE OF AERATION (K IZUCHENIYU ZAVISIMOSTI ISPARENIYA GRUNTOVYKH VOD OT LITOLOGICHESKOGO STROYENIYA ZONY AERATSII),
Institute of Hydrogeology and Engineering Geology, Tashkent (USSR).
For primary bibliographic entry see Field 2D.
W74-07529

DISTRIBUTION AND CHEMISTRY OF PHOSPHORUS IN AN ALBAQUALF SOIL AFTER 82 YEARS OF PHOSPHATE FERTILIZATION,
Missouri Agricultural Experiment Station, Columbia.
For primary bibliographic entry see Field 5B.
W74-07532

MULTIPLE ORGANOCHLORINE PESTICIDE RESIDUES IN JAPAN,
Kitakyushu Municipal Inst. of Public Health (Japan).
For primary bibliographic entry see Field 5A.
W74-07560

ACETYLENE REDUCTION BY BEIJERINCKIA UNDER VARIOUS PARTIAL PRESSURES OF OXYGEN AND ACETYLENE,
Ibadan Univ. (Nigeria). Dept. of Agronomy.
For primary bibliographic entry see Field 5C.
W74-07572

ACID AMMONIUM ACETATE EXTRACTION AND ELECTRON CAPTURE GAS CHROMATOGRAPHIC DETERMINATION OF CARBOFURAN IN SOILS,
Agricultural Research Service, Beltsville, Md. Agricultural Environmental Quality Inst.
For primary bibliographic entry see Field 5A.
W74-07574

RESIDUES OF ATRAZINE, CYANAZINE, AND THEIR PHYTOTOXIC METABOLITES IN A CLAY LOAM SOIL,
Ontario Ministry of Agriculture and Food, Guelph. Pesticides Residue Lab.
For primary bibliographic entry see Field 5A.
W74-07585

POTENTIAL OF WESTLAND'S MORAINIC SOILS FOR FOREST MANAGEMENT,
New Zealand Forest Service, Hokitika.
For primary bibliographic entry see Field 4A.
W74-07594

2H. Lakes

DISTRIBUTION AND STANDING CROPS OF CHIRONOMID-LARVAE IN SHIOZU BAY OF LAKE BIWA (IN JAPANESE),
For primary bibliographic entry see Field 5C.
W74-07101

THE INTERLAKE AFFAIR,
Businessmen for the Public Interest, Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-07120

FACTORS AFFECTING PHYTOPLANKTO PRODUCTION IN A EUTROPHIC RESERVOI
Naval Academy, Annapolis, Md. Div. of Mat matics and Science
For primary bibliographic entry see Field 5C.
W74-07121

COMPONENTS OF THE WATER BALANCE THE ARAL SEA AND THEIR EFFECT ON I LONG-TERM LEVEL FLUCTUATIO (SOSTAVLYAYUSHCHIYE VODNOGO BALA SA ARAL'SKOGO MORYA I IKH VLIYANI NA MMNOGOLETNIYE KOLEBANIYA YEG UROVNYA),
All-Union Designing, Surveying and Scienti Research Inst. Hydroproject, Leningrad (USSR)
A. Ye. Asarin.
Vodnyye Resursy, No 5, p 29-40, 1973. 6 tab, ref.

Descriptors: *Lakes, *Water level fluctuation *Water balance, Inflow, Evaporation, Runof Water loss, Water utilization, Withdrawal, Irrig tion, Deltas.
Identifiers: *USSR(Aral Sea).

Water balance of the Aral Sea was investigated f a 45-year period (1926-70). Long-term fluctuatio in sea level reflect both natural fluctuations in th discharge of its contributing rivers and, to an eve increasing degree, economic activity in the basi An increase in water withdrawals for irrigation i the sea basin in the 1950's had no effect on th level of the sea in view of the increased wat discharges during this period. An intense decline i the Aral Sea level, which began in 1961 and co tinues to the present day, is due primarily to large water withdrawals in the Syrdar'ya and Amu dar'ya basins. The level of the sea and the range o its long-term fluctuations depend on fluctuation in the annual amount of evaporation which varie to a greater degree than variability of annual ru noff of rivers flowing into the sea. Runoff losses i the Amudar'ya and Syrdar'ya deltas are directl dependent on amount of inflow to the deltas an thus reduce the range of level fluctuations of th sea. The subsurface component of the sea's wate balance is small and has little effect on the sea' level fluctuations. (Josefson-USGS)
W74-07194

OPTIMAL LINEAR EXTRAPOLATION OF LEVEL FLUCTUATIONS OF CLOSED WATER BODIES (OPTIMAL'NAYA LINEYNAYA EK STRAPOLYATSIYA KOLEBANIY UROVNYA ZAMKNUTYKH VODOYEMOV),
Akademiya Nauk SSSR, Moscow. Institut Vod nykh Problem.
For primary bibliographic entry see Field 4A.
W74-07195

ON THE DETERMINATION OF TURBULENT DIFFUSIVITY IN SHALLOW WATERS BY AERIAL PHOTOGRAPHY OF FLOATING MARKERS,
Texas A and M Univ., College Station. Dept. of Meteorology.
D. Djuric, and H. R. Leribaux.
Limnology and Oceanography, Vol 19, No 1, p 138-144, January 1974. 6 fig, 3 ref.

Descriptors: *Dispersion, *Lakes, *Aerial photography, Measurement, *Diffusivity, Currents(Water), *Remote sensing.

Aerial photography was used in an experiment with 200 floating markers to determine their dispersion on the surface of a lake. The dispersion proceeded with a practically constant diffusivity coefficient, independent of the size of the diffusing cluster. (Knapp-USGS)
W74-07316

EDIMENT DISCHARGE IN THE LAKE AHOE BASIN, CALIFORNIA, 1972 WATER EAR,
eological Survey, Menlo Park, Calif.
or primary bibliographic entry see Field 2J.
74-07326

JMMERTIME TEMPERATURE AND CIRCU-ATION PATTERNS IN LAKE SUPERIOR,
isconsin Univ., Madison. Dept. of Meteorology.
. P. Smith.
vailable from the National Technical Informa-n Service as PB-231 785 $14.50 in paper copy, .45 in microfiche. Ph.D. Thesis, 1972, 205 p, 102 , 2 tab, 44 ref. OWRR B-009-WIS(7) 14-01-0001-57.

escriptors: *Lake Superior, Lakes, *Mixing, Vater Circulation, *Stratification, Movement, inds, Bathythermographs, *Water Temperature, Vater Currents, Coriolis forces, Model studies.
entifiers: Keweenaw Peninsula, Isle Royale.

ake Superior current and temperature data col-cted during the summer of 1966 and 1967 are mbined to provide a description of the summer rculation and temperature structure. Data are rgely from the central part of the lake, between e Keweenaw Peninsula and Isle Royale. Circula-n and temperature patterns appear to be closely terrelated. Infrared surface temperature patterns om eight flights between July 7 and October 1, 66, trace the formation of the epilimnion and in-cate nearshore packing of surface isotherms ong the southern shore of the lake in early mmer. Bathythermograph temperature cross-ctions from five cruises during the summer of 67 indicate sharply sloping isothermal surfaces rth of the Keweenaw Peninsula in early summer d a well defined thermocline established by rly August. The dynamic height method is used compute the corresponding geostrophic cur-nts. Early summer speeds are as high as 40 n/sec in an easterly, nearshore current. Mea-red currents from two buoy stations moored just rth of the Keweenaw Peninsula in 1966 are milar in speed and direction, suggesting that the rly summer current is primarily baroclinic in na-re. Nearshore and mid-lake temperature corder data from both 1966 and 1967 indicate pid warming in the upper 20 to 25 meters once e water column has reached the temperature of aximum density. Progressive vectors and vector equency diagrams indicate that current speeds crease in early August. The average computed ow is 22,210 m3/sec. Energy density spectra in-cate that inertial motion is a major component of e current at locations from shore.
74-07338

COMPARISON OF THE FOOD OF SALA-ANDERS AND FISH IN MARION LAKE, RITISH COLUMBIA,
ritish Columbia Univ., Vancouver. Inst. of nimal Resource Ecology.
. Efford, and K. Tsumura.
rans Am Fish Soc. Vol 102 No 1 p 33-47, 1973. us.
dentifiers: Ambystoma-Gracile, *Canada(Marion ake-B.C.), *Fish food, Lakes, Oncorhynchus-erka, *Salamanders, Salmo-Gairdneri, Taricha-ranulosa, Rainbow trout, Kokanee.

he gut content of rainbow trout (Salmo gaird-eri), kokanee (Oncorhynchus nerka), and 2 sala-anders (Ambystoma gracile and Taricha granu-osa) from Marion Lake, British Columbia, anada, were compared. The species found in ese 4 predators were very similar but each redator concentrated on different prey. The okanee concentrated on species present at the urface or in the water column, and the trout on rger benthos. The salamanders also fed on enthos but usually chose smaller size classes. In omparing the effect of the 4 predators, the verage volume of food present by weight in the gut was multiplied by a proportional converter for the rate of passage through the gut, the mean meal size, and by the number of individuals in the population. The results suggested that S. gairdneri ate over half by weight (56%) of all the food taken by the 4 predators combined; kokanee and A. gracile were less important and consumed 25% and 19%, respectively; and T. granulosa because of its low number and slow growth was unimportant (1%). -- Copyright 1973, Biological Abstracts, Inc.
W74-07349

A PRELIMINARY DESCRIPTION OF THE PHYSICO-CHEMICAL CHARACTERISTICS AND BIOTA OF THREE STRIP MINE LAKES, SPENCER COUNTY, INDIANA,
Saint Meinrad Coll., Ind. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W74-07403

SURFACE TEMPERATURES OF LAKE ERIE,
Atmospheric Environment Service, Downsview (Ontario).
M. S. Webb.
Water Resources Research, Vol 10, No 2, p 199-210, April 1974. 18 fig, 1 tab, 19 ref.

Descriptors: *Water temperature, *Lake Erie, Air temperature, Limnology, *Remote sensing, Surveys, Solar radiation, Seasonal, Great Lakes, *Mapping.
Identifiers: *Radiometers.

The spatial patterns of the mean surface temperature of Lake Erie were mapped by data from 58 airborne radiation thermometer surveys obtained over a 6-year period. The lakes southern location within the Great Lakes system and the large differences in water depth between its three basins are important controls affecting the surface temperature regime. Except in winter, when it is largely ice covered, the surface of Lake Erie is warmer than the surfaces of any of the other Great Lakes. Month-by-month relationship between the mean surface temperature and the mean air temperature is domonstrated. (Knapp-USGS)
W74-07415

THE ESTIMATION OF VERTICAL EDDY DIFFUSIVITIES BELOW THE THERMOCLINE IN LAKES,
California Univ., Davis. Dept. of Physics.
T. Powell, and A. Jassby.
Water Resources Research, Vol 10, No 2, p 191-198, April 1974. 4 fig, 4 tab, 44 ref. Rockefeller Grant 3-440405-57151-2 NSF Grant GA-34099.

Descriptors: *Limnology, *Thermocline, *Mixing, *Diffusivity, *Turbulence, Dispersion, Diffusion, Mass transfer, Heat transfer, Convection, Advection, Water temperature, Density currents, Path of pollutants, Energy budget.

Methods of estimating vertical eddy diffusivity coefficients in lakes for such substances as temperature, inorganic ions, or biologically active materials are briefly reviewed. One widely used method, and McEwan method, is discussed, and it is shown how this method can lead to erroneous results. Another method, the flux gradient method, is examined and compared with the McEwan method in specific case studies of thermal energy transfers. Lack of agreement between values obtained by the McEwan method and the flux gradient method has led some investigators to postulate a flux of thermal energy into the deep layers of a lake by density currents. An alternative explanation of the discrepancy is that deepwater turbulent mixing may result from a microstructure of layers and sheets caused by, for example, a Kelvin-Helmholtz shear instability in the flows or other instability mechanisms. (Knapp-USGS)
W74-07416

INSTABILITY OF WATER COOLED FROM ABOVE,
Purdue Univ., Lafayette, Ind. School of Mechanical Engineering.
D. M. Snider, and R. Viskanta.
Paper presented at First World Congress on Water Resources, Chicago, Illinois, September 24-28, 1973. 12 p, 6 fig, 12 ref. OWRR A-029-IND(4).

Descriptors: *Thermal properties, *Thermal stratification, *Thermoline, *Convection, *Conduction, *Evaporation, Heat transfer, Energy transfer, Thermal radiation, Infrared radiation, Interferometry.
Identifiers: Mach-Zehnder interferometer.

The temperature field and convection currents induced in water by convection, evaporation and radiation cooling of its surface are studied. These phenomena occur naturally and continuously in any lake, pond, reservoir or a river but they remain usually unobserved. Mach-Zehnder interferograms taken from the side of a tank of water were used to measure the temperature distribution and to study the convective currents induced by cooling from the surface. Experiments were performed with initially uniform and thermally-stratified layers of water. Both qualitative and quantitative results of preliminary nature for temperature distribution are presented. Interferograms vividly reveal mixing motions induced by instabilities arising in the surface layer. The onset of manifest convective behavior was determined by visual observations of interferograms.
W74-07458

NUTRIENT CYCLING AND PRODUCTIVITY OF DYSTROPHIC LAKE-BOG SYSTEMS (PART B),
Notre Dame Univ., Ind. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W74-07466

SEASONAL ABUNDANCE AND VERTICAL DISTRIBUTION OF CRUSTACEAN ZOOPLANKTON IN A COLOURED DYSTROPHIC LAKE IN NORTHEASTERN ONTARIO,
Atomic Energy of Canada Ltd., Chalk River (Ontario). Environmental Research Branch.
For primary bibliographic entry see Field 5C.
W74-07467

UTILIZATION OF ERTS-1 DATA TO MONITOR AND CLASSIFY EUTROPHICATION OF INLAND LAKES,
Bendix Aerospace Systems Div., Ann Arbor, Mich.
For primary bibliographic entry see Field 5C.
W74-07484

A STUDY OF THE COMMUNITIES OF INVERTEBRATES OF PLANTS OF LAKE CHAD: PRELIMINARY INQUIRES, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, Fort-Lamy (Chad).
C. Dejoux, and L. Saint-Jean.
Cah ORSTOM Ser Hydrobiol. Vol 6, No 1, p 67-83. 1972, Illus, (English summary).
Identifiers: Ceratophyllum, *Chad(Lake Chad), Cladocera, Copepoda, *Invertebrates, Lakes, Potamogeton, *Aquatic plants.

A new apparatus was used to collect plant samples from a constant volume. A method is proposed to estimate variations of vegetal biomass of a weed. The horizontal distribution in invertebrates looks like a binomial distribution, the first approximation. The organisms are distributed in aggregates. In the eastern part of lake Chad, the vertical variations which occur in the distribution of invertebrates populations in water plants are such that superficial samples could be considered as representative. The fauna sheltered by aquatic

plants is original in regard to the benthic or pelagic fauna. The places inside Potamogeton or Ceratophyllum weeds which are free of vegetation show the same planktonic forms (Copepoda and Cladocera) as the adjacent pelagic area, sensu stricto. All ecological study which includes cyclic factors must be followed in the same weed or located in the same area of a large weed.--Copyright 1973, Biological Abstracts, Inc.
W74-07538

LEECH COMMUNITIES (HIRUDINEA) IN THE MAZURIAN AND BIALYSTOK REGIONS AND THE POMERANIAN LAKE DISTRICT,
Polish Academy of Sciences, Warsaw. Inst. of Ecology.
For primary bibliographic entry see Field 5C.
W74-07542

VERTICAL MIGRATION OF SPANIOTOMA AKAMUSI LARVAE (DIPTERA:CHIRONOMIDAE) THROUGH THE BOTTOM DEPOSITS OF LAKE SUWA,
Teikyo Univ., Hachioji (Japan). Dept. of Zoology.
H. Yamagishi, and H. Fukuhara.
Jap J Ecol. Vol 22, No 5, p 226-227. 1972, Illus.
Identifiers: Bottom deposits, *Chironomidae, Chironomus-Plumosus, *Diptera, *Japan(Lake Suwa), Larvae, Spaniotoma-Akamusi, *Vertical imigration, Standing crops.

The burrowing behavior of S. akamusi larvae tends to isolate them from other benthic animals, especially Chironomus plumosus larvae. Consequently, C. plumosus larvae do not compete with S. akamusi for food, and they therefore grow rapidly, resulting in a high annual maximum standing crop (about 2000 individuals/m2 in June, 1969).--Copyright 1973, Biological Abstracts, Inc.
W74-07543

BYGLANDSFJORDEN. PRIMARY PRODUCTION AND OTHER LIMNOLOGICAL FEATURES IN AN OLIGOTROPHIC NORWEGIAN LAKE,
Oslo Univ. (Norway). Dept. of Limnology.
For primary bibliographic entry see Field 5C.
W74-07554

EFFECT OF RESTRICTED USE OF PHOSPHATE-BASED DETERGENTS ON ONONDAGA LAKE,
O'Brien and Gere Engineers Inc., Syracuse, N. Y.
For primary bibliographic entry see Field 5C.
W74-07566

ABUNDANCE AND MORTALITY OF THE PERCH FRY (PERCA FLUVIATILIS, LINNACUS, 1758) IN THE KLICAVA RESERVOIR,
Karlova Universita, Prague (Czechoslovakia). Inst. of Zoology.
For primary bibliographic entry see Field 8I.
W74-07588

NEMATODE FISHE PARASITES FROM SANGALKAM, SENEGAL,
Laboratoire National de l'Elevage et de Recherches Veterinaires, Dakar (Senegal).
G. Vassiliades.
Bull Inst Fondam Afr Noier Ser A Sci Nat. Vol 34, No 3, p 529-533. 1972.
Identifiers: Camellanus-Ctenopomae, Clarias-Senegalensis, Ctenopoma-Kingsleyae, *Fish parasites, *Nematodes, Procamallanus-Laeviconchus, Procamallanus-Senegalensis, Quimperia-Lanceolata, *Senegal(Sangalkam marsh), *Marshes.

Sangalkam is a freshwater marsh region 36 km northeast of Dakar, where perennial water leads to luxuriant vegetation. Procamallanus laeviconchus and P. senegalensis occur in Clarias senegalensis; Camellanus ctenopomae and Quimperia lanceolata in Ctenopoma kingsleyae. The life cycles of the Camellanidae include a copepoid intermediate host; that of Q. lanceolata is incompletely known. Laboratory studies indicate that development is sometimes direct or sometimes involves an intermediate host which may be a fish or an insect.--Copyright 1973, Biological Abstracts, Inc.
W74-07589

FERTILITY OF THE FISH FROM VARVARA RESERVOIR, (IN RUSSIAN),
For primary bibliographic entry see Field 8I.
W74-07591

EFFECT OF ANHYDROUS AMMONIA ON A CENTRAL TEXAS POND, AND A REVIEW OF PREVIOUS RESEARCH WITH AMMONIA IN FISHERIES MANAGEMENT,
Texas A and M Univ., College Station. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W74-07595

2I. Water In Plants

SUBSURFACE HEATING AND IRRIGATION OF SOILS: ITS EFFECT ON TEMPERATURE AND WATER CONTENT AND ON PLANT GROWTH,
Oregon State Univ., Corvallis. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W74-07054

EFFECT OF SEEDING RATES AND ROW SPACINGS ON FODDER PRODUCTION OF MOTH BEAN (PHASEOLUS ACONITIFOLIUS),
Central Sheep and Wool Research Inst., Jaipur (India).
For primary bibliographic entry see Field 3F.
W74-07091

ANNOTATED CHECKLIST AND HOST INDEX FOR ARIZONA WOOD-ROTTING FUNGI,
Arizona Univ., Tucson.
R. L. Gilbertson, K. J. Martin, and J. P. Lindsey.
Agricultural Experiment Station, University of Arizona, Tucson, Technical Bulletin 209, February 1974. 48 p, 9 ref.

Descriptors: *Rots, *Pathogenic fungi, *Fungi, *Plant diseases, Trees, Forests, *Arizona, Vascular tissues, Brush.
Identifiers: *Wood-rotting fungi.

The wide variety of ecological zones, from hot deserts to alpine tundra, has given Arizona a rich flora of woody plants that provide a potential substratum for wood-rotting fungi. Although annual rainfall is relatively low in most areas of the state, much of it falls in the summer monsoon season during which conditions are favorable for fungal growth. A total of 385 species of wood-rotting fungi which have been identified in Arizona are catalogued by order, family, genus and species. Their general environment and associated fauna are also identified. A list includes the species of host on which each was found and the Arizona county in which the find was made. An index of 117 wood-rotting fungi hosts is presented with a list of fungi which attack the hosts and the nature of the rot which develops. (Muller-Arizona)
W74-07097

THE SAGUARO GIANT CACTUS, A BIBLIOGRAPHY,
National Park Service, San Francisco, Calif.
W. F. Steenbergh.
February 1974. 24 p, 217 ref.

Descriptors: *Bibliographies, *Desert plan *Cacti, *Plant physiology, Arid lands, Dese Vegetation, Xerophytes, Plant morphology, Pl populations, Water balance
Identifiers: *Saguaro Cactus.

A comprehensive bibliography is presented of literature pertaining to the saguaro giant cac (Cereus giganteus Engelm , Carnegiea gigan Engelm Britt and Rose) Two hundred and sev teen references datng from 1795 to 1972 refl the scientific preoccupation with this plant nati only to the Sonoran Desert Its physiolog morphology, distribution, and water balance among the many topics covered. (Muller-Arizon
W74-07098

PRODUCTIVITY AND WATER STRESS CACTI,
Arizona State Univ., Tempe
D. T. Patten, and R. A. Nisbet.
Desert Biome, U.S. International Biological Pr gram, Research Memorandum, RM 73-11, 19 Progress Report, May 1973. 18 p, 8 fig, 3 tab, 5 re

Descriptors: *Productivity, *Adaptation, *Cac *Moisture stress, *Biomass, Dehydratio Drought resistance, Drought tolerance, Regim Photosynthesis, Regressive analysis, Dese plants, Carbon dioxide, Solar radiation, Temper ture, Moisture content, Growth rates, Southwe U.S., Mexico.
Identifiers: *Sonoran Desert.

Temperature and moisture primarily affect t production of biomass in prickly pear cac (Opuntia phaeacantha var. discata). Buckho cholla (Opuntia acanthocarpa) was also studied f comparison purposes. Measurements of all plan were taken in situ, and included growth rate, and soil temperature, rainfall, plant temperatur carbon dioxide, and water rates. Evidence show that for cacti, optimum photosynthetic rates occ during the cool season or at cooler temperature Most new biomass accumulation occurs in wint prior to new pod and bud formation. Wint growth rates can appear to be offset by dehydr tion during abnormal drought periods; however, reduced dehydration rate is an indicator biomass accumulation. Prickly pear cacti appear t have a higher productivity potential than buckhor cholla, but the latter appears to be better adapte to higher temperatures. Prickly pear also appear to conserve water better although both are we able to survive drought conditions of the Sonora Desert. (Mastic-Arizona)
W74-07109

DISTILLATION-CONDENSATION OF WATE AND NUTRIENT MOVEMENT IN A DESERT ECOSYSTEM,
Nevada Univ., Reno. Desert Research Inst.
N. Stark.
Desert Biome, U.S. International Biological Pro gram, Research Memorandum, RM 73-44, 197 Progress Report, May 1973. 24 p, 9 tab, 17 ref.

Descriptors: *Distillation, *Condensation *Nutrients, *Desert plants, *Soil-water-plant rela tionships, Infiltration, Canopy, Root systems, Shrubs, Cation exchange, Throughfall, Stemflow, Litter, Moisture content, Growth rates, Permea bility, Leachate, Elements(Chemical), Ecosystems, Organic matter, Soils, Soil chemis try, Hydrogen ion concentration.
Identifiers: Water-holding capacity, Seedlings, Microwatershed, Mojave Desert, *Death Valley, Bursage, Creosotebush, Saltbush.

The importance of distillation-condensation in the soil as a water and nutrient source for desert plants was studied. The study concentrated on Larrea divaricata, Franseria dumosa, and Atriplex con fertifolia vegetation on rocky, gravelly soils in Death Valley. Soils immediately beneath shrubs displayed a higher permeability than soils of shrub

interspaces, despite a raised mound of soil at the base of each shrub. It is hypothesized that in addition to throughfall and stemflow, water supply is enhanced by microwatershed attributes of the surrounding soil surfaces. Variation in soil chemistry beneath the three species of shrubs is derived from pH values, water-holding capacity, cation exchange capacity, and elemental content. The data suggest that the plant roots modify their immediate chemical environment to increase nutrient concentrations and decrease potential toxicities. Methodology was inadequate to measure the quantity or quality of condensation water. (Mastic-Arizona)
W74-07110

EXTRUDED PEAT CYLINDERS: THEIR PHYSICAL CHARACTERISTICS AS AFFECTING TREE SEEDLING GROWTH AND GREENHOUSE DROUGHT TOLERANCE,
Research Council of Alberta, Edmonton.
D. L. Mitchell, D. Hocking, and W. C. Kay.
Can J For Res. Vol 2, No 4, p 479-486, 1972. Illus.
Identifiers: Absorption, Densities, *Drought tolerance, Greenhouse, Growth, Moisture, *Peat cylinders, *Pinus-contorta-var-latifolia, *Tree seedlings.

Seedlings (Pinus contorta Dougl. var. latifolia Engelm.) were grown in containers formed by extruding a peatwater mixture into flexible plastic tubing. The reduction in particle size of the peat that occurs during extrusion improved the rate of moisture absorption and decreased the rate of moisture loss. A range of peat densities of extruded peat cylinders (sausages) was prepared through control of the water content in the feed mixtures. Seedlings grown in sausages show decreased growth as the peat density is increased. Compared to rigid tubes filled with loose peat, seedlings in sausages are less subject to drought.--Copyright 1973, Biological Abstracts, Inc.
W74-07180

A CONTRIBUTION TO THE BOTANY OF GANGANAGAR DISTRICT, NORTH RAJASTHAN,
Seth G. N. Khalsa Coll., Sri Ganganagar (India).
For primary bibliographic entry see Field 3F.
W74-07357

PORTABLE REFLECTANCE METER FOR ESTIMATING CHLOROPHYLL CONCENTRATIONS IN LEAVES,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 7B.
W74-07437

AMMONIUM AND NITRATE UPTAKE BY CORN (ZEA MAYS L.) AS INFLUENCED BY NITROGEN CONCENTRATION AND NH4(+)/NO3(-) RATIO,
Michigan State Univ., Lansing.
For primary bibliographic entry see Field 3F.
W74-07459

THE PAST AND PRESENT FLORA AND VEGETATION OF THE HACKENSACK MEADOWS,
W. S. Sipple.
Bartonia. 41, p 4-56. 1971/1972.
Identifiers: Aerial photography, Destruction, *Flora, Forest habitat, Marshes, *Meadows, *New Jersey(Hackensack meadows), *Mapping, Ruderal, Sea, *Vegetation.

The Hackensack Meadows is located in the Triassic lowlands, a subdivision of the Piedmont Province in NE New Jersey. Most areas are less than 5 ft above sea level. Field work was done in the study area during Sept. 1969. Data were then correlated with patterns of apparent vegetation types appearing on aerial photographs taken in June 1969. Additional field work was done in spring and summer, 1970 to corroborate vegetation types and verify the mapping. Older publications were consulted, and herbarium specimens checked to reconstruct the vegetation. Nineteen vegetation types are described and grouped into the general categories: marshes, forested areas, meadows and ruderal plants. Using data from the literature, including pollen analysis, the vegetation is described from post-Wisconsinan glacial time to the present, with separate descriptions for 1819, 1889, 1919, 1949 and 1969. The major factors causing vegetation in recent times are the constant rise of sea level and the diking of various bog areas and many related effects from advancing civilization such as lumbering, water table subsidence, fire and the neglect of older dikes which restored some of the earlier tidal influence to some areas.--Copyright 1973, Biological Abstracts, Inc.
W74-07476

PHENOLOGY OF A TROPICAL RAIN FOREST IN MALAYA,
L. Medway.
Biol J Linn Soc. Vol 4, No 2, p 117-146. 1972. Illus.
Identifiers: Flowering, *Forests, Fruiting, *Malaya, Malaysia, *Phenology, *Rain forests, Seasonality, *Tropical rains.

During 1960-1969, observations were made of flowering, fruiting, and foliar activity of 61 canopy trees (representing 45 spp.) in a largely undisturbed tract of Hill Dipterocarp Forest (Malaysia). Rainfall was measured by an accumulating gauge and, at a nearby station, the number of rainy days recorded. Annually recurrent floral cycles were displayed by only 10 spp. In these and in 11 additional species, foliar cycles were also circannual. Gregarious flowering, apparently in response to drought, occurred in many species in 1963 and 1968. In other years, interspecific differences in periodicity maintained a minimal incidence of flowering at 44%, and fruiting at 27% of species in the sample. Despite specific variations in phenology, the community as a whole exhibited regular seasonality, with single annual peaks of flowering and fruiting and a double peak of leaf production.--Copyright 1973, Biological Abstracts, Inc.
W74-07482

SHORT-TERM RESPONSE IN UNGULATE NUMBERS TO RAINFALL IN THE NOSSOB RIVER OF THE KALAHARI GEMSBOK NATIONAL PARK,
Pretoria Univ. (South Africa). Dept. of Zoology.
J. Du P. Bothma.
Koedoe. 15 p 127-133, 1972. Illus.
Identifiers: Blue wildebeest, Gemsbok, *Grazing animals, Red hartebeest, National parks, Nossob River, Rainfall, Springbok, *Ungulate, Vegetation, Wildebeest, *South Africa(Kalahari Gemsbok National Park).

The ungulate fauna of the Kalahari Gemsbok National Park (South Africa), an area without permanent water, must adapt their movements rapidly to changing vegetation patterns after a good rainfall. Four ungulates, the gemsbok, springbok, red hartebeest and blue wildebeest were observed in the Nossob River bed area from 3 mo. following the onset of the 1972 summer rains. The springbok and red hartebeest moved into the area in increased numbers as grazing conditions improved. Gemsbok waited until the vegetation was tall enough to be utilized. Blue wildebeest numbers declined, despite improved grazing conditions; however, this might have been due to the start of their annual east-west movement during the winter months following the rains.--Copyright 1973, Biological Abstracts, Inc.
W74-07535

TAXONOMIC COMPOSITION OF AQUATIC INVERTEBRATES OF THE DON BASIN IN COMPARISON WITH FAUNA OF THE OTHER RIVERS OF THE BLACK SEA CASPIAN BASIN, (IN RUSSIAN),
T. V. Sklyarova.
Zap Voronezh S-Kn Inst. 47 p, 198-204. 1972.
Identifiers: Aquatic animals, Black Sea, Caspian Sea, Ecological studies, Fauna, *Invertebrates, Rivers, *Taxonomic studies, *USSR(Don basin).

In the Don basin (USSR) 1072 taxa of invertebrates were recorded. Owing to the diversity of ecological conditions, the Upper Don has more than double the number of species in comparison with the Lower Don. With respect to the character of the aquatic fauna among rivers of the Black Sea-Caspian basin the Don is most similar to the Dnepr and then to the Volga, which belong, just as the Don, to plains rivers. The similarity between the fauna of the Don and Dnestr is manifested to a lesser degree, since the Dnestr is a river with a mountainous catchment area and has different ecological conditions.--Copyright 1973, Biological Abstracts, Inc.
W74-07537

STRUCTURE OF FISH GROUPINGS IN THE RIVERS AND STREAMS OF THE RIVER NIDA DRAINAGE BASIN,
Lodz Univ. (Poland). Faculty of Biology and Earth Sciences.
T. Penczak.
Ekol Pol. Vol 20, No 26, p 327-344. 1972, Illus.
Identifiers: Drainage basins, *Poland(River Nida), Rivers, Streams, Suckers, *Fish species.

A collection of 16,005 fish and suckers collected at 117 fishing sites from the River Nida (Poland) drainage basin was arranged with the help of cenological methods. Similar river zones were distinguished on the basis of dominating and other fish species. These zones are different from the zones or reaches distinguished on the basis of river fall or on other morphological elements used to characterize the rivers and streams. The problems of combined or separated occurrence of fish species and the degree of their ecological relations were also investigated. An attempt was made to distinguish the characteristic, transistory and eurytopic fish species in the studied area.--Copyright 1973, Biological Abstracts, Inc.
W74-07539

THE MARINE DIATOM ETHMODISCUS REX: ITS MORPHOLOGY AND OCCURRENCE IN THE PLANKTON OF THE SARGASSO SEA,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5A.
W74-07547

PRELIMINARY DIAGNOSIS OF A NEW SPECIES OF MARINE ISOPOD FROM STEWART ISLAND,
Oceanographic Inst. (New Zealand). Department of Scientific and Industrial Research, Wellington.
K. P. Jansen.
New Zealand Journal of Marine and Freshwater Research, Vol 7, No 3, p 261-262, September 1973. 1 fig, 2 ref.

Descriptors: *Isopods, *Systematics, Marine animals, Speciation.
Identifiers: *Paravireia, *New Zealand(Stewart Island), Animal morphology.

Four isopod specimens were collected from bottom mud in shallow water in Paterson Inlet, Stewart Island, by the Zoology Department, Victoria University of Wellington, in June 1972. The isopods belong to the genus Paravireia Chilton, but morphological differences exclude them from Paravireia typicus Chilton 1925, from the Chatham Islands, the only previously described species in the genus. The present paper is to establish a valid specific name for a forthcoming ecological study

without the precipitate erection of a new major taxon. This species is distinguished from Paravireia typicus by the smoothly rounded profile of the pleotelson and by the produced apices and setal tufts of the epimers of pereonites 3 and 4. No other records of the species are known. (Mortland-Battelle)
W74-07570

STOMATAL MECHANICS,
Connecticut Agricultural Experiment Station, New Haven. Dept. of Ecology and Climatology.
D. E. Aylor, J.-Y. Parlange, and A. D. Krikorian.
Am J Bot. Vol 60, No 2, p 163-171, 1973. Illus.
Identifiers: *Stomatal studies, *Turgor, Model studies, *Plant cell models.

A model of stomatal movement due to changes in turgor is presented which systematically illustrates the role of certain anatomical features. During the expansion of paired guard cells, there are 2 physical constrainst that cause the guard cells to bend and thus open the stomatal pore. The radial orientation of the micellae is shown to be the crucial feature which directly transmits the movement of the dorsal wall of the polar and central section to the stomatal slit. Furthermore, it is necessary that either the overall length of the entire stomatal apparatus or length of the common wall between the polar segments of the guard cells be constrained during the expansion of the guard cells. The model also shows that asymmetrically thickened guard cell walls are not necessary to cause bending of the guard cell. The ideas set forth in the model are consistent with the opening movements of both elliptical and grass-type stomata.--Copyright 1973, Biological Abstracts, Inc.
W74-07593

2J. Erosion and Sedimentation

SAND DUNE RECLAMATION IN IRAQ -- PRESENT STATUS AND FUTURE PROSPECTS,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
J. Dougrameji, and R. N. Kaul.
Annals of Arid Zone, Vol 11, Nos 3 and 4, p 133-144, Sept. and Dec. 1972. 4 fig, 4 tab, 6 ref.

Descriptors: *Wind erosion, *Soil stabilization, *Windbreaks, *Dune sands, *Erosion control, Arid lands, Grazing, Soil treatment, Soil erosion, *Vegetation establishment, Vegetation regrowth, Droughts, Slope stabilization, Sands, Clays, Dry farming, Land reclamation, Mechanical control, Brush.
Identifiers: *Iraq.

Principal causes of shifting dunes over large areas of Iraq are drought, exploitation of natural vegetation, improper agricultural practices including overgrazing by livestock, and poor canal dredging operations. Extended rainless periods have prompted building of windbreaks near cultivated fields to cut down on erosion which, together with attempts at establishment of both native and introduced vegetation, will provide a beginning pattern for dune stabilization. Research has supplied information on soil physical factors, vegetation species best suited to the needs, and preliminary effects of mechanical barriers, the most successful of which is placement of brush barriers on the windward side of the dune in parallel lines oriented across the prevailing wind direction. This procedure is more efficient for inland dunes such as those in India and Iraq than the bituminous sprays used for coastal dunes in Libya, Morocco, and Tunisia. Also described are methods for seeding and transplantation. (Muller-Arizona)
W74-07104

DRAINAGE DENSITY AND EFFECTIVE PRECIPITATION,
For primary bibliographic entry see Field 2A.
W74-07155

BASIN PLAINS IN THE EASTERN MEDITERRANEAN: SIGNIFICANCE IN INTERPRETING ANCIENT MARINE DEPOSITS: 1. BASIN DEPTH AND CONFIGURATION,
Smithsonian Institution, Washington, D.C. Div. of Sedimentology.
D. J. Stanley.
Marine Geology, Vol 15, No 5, p 295-307, December 1973. 5 fig, 1 tab, 28 ref. Smithsonian Grant 430035.

Descriptors: *Bottom sediments, *Turbidity currents, Stratigraphy, Sediment transport, Deposition(Sediments).
Identifiers: *Mediterranean(Eastern basin), Flysch.

Basins in the eastern Mediterranean, and particularly those associated with the Hellenic Arc, accumulate rhythmically stratified deposits which resemble flysch formations. The eastern Mediterranean basin plains, except those off the Nile Cone, are bounded by slopes that exceed 3 deg and in some cases 40 deg; the topographic characteristics and distribution of these basins reflect the intense structural activity in this region. Depths in the Aegean Sea range from less than 200 to over 2500 m (basin plain area ranges from 10-1,380 sq km); plains in the Sea of Crete are less elongate than those in other provinces. Depressions south of the Peloponnesus-Crete-Rhodes island arc include a number of long, very narrow (1-3 km wide) trenches that are generally small (25-200 sq km) and deep (> 3000 m). The largest depressions, the Herodotus and Sirte abyssal plains, south of the Mediterranean Ridge also exceed 3000 m. Although most basins occur at depths exceeding 1000 m, there are excellent examples of shallower (< 3000 m) turbidite sand and mud sequences in basins and base-of-slope environments in the Aegean. Vertical tectonic movement locally exceeds rates of sediment accumulation resulting in structural lowering of deposits into deeper water. (Knapp-USGS)
W74-07158

AN IMPROVED CORE CATCHER FOR THE KIEL BOX CORER ('KASTENLOT'),
Kiel Univ. (West Germany). Geologisch-Palaeontologisches Institut und Museum.
For primary bibliographic entry see Field 7B.
W74-07159

SEDIMENTATION BY NON-TIDAL CURRENTS AROUND NORTHERN DENMARK,
Institute of Oceanographic Sciences, Wormley (England).
For primary bibliographic entry see Field 2L.
W74-07160

DEPOSITIONAL FEATURES OF BRAIDED-MEANDERING STREAM,
Oklahoma State Univ., Stillwater. Dept. of Geology.
J. W. Shelton, and R. L. Noble.
American Association of Petroleum Geologists Bulletin, Vol 58, No 4, p 742-749, April 1974. 5 fig, 1 tab, 40 ref.

Descriptors: *Sedimentary structures, *Braiding, *meanders, Alluvial channels, *Oklahoma, Channel morphology, Sediment sorting, Stratigraphy, Discharge(Water), Sand bars, Sedimentology.
Identifiers: *Cimarron River(Okla).

The Cimarron River in north-central Oklahoma shows characteristics intermediate between typical braided and meandering streams. The gradient is 1.8 ft per mi; the sinuosity is 1.5; and average channel depth at bankfull stage is 15 ft. Accretion ridges on the downstream sides of bars characterize the straighter reaches, whereas accretion ridges on both the upstream and downstream sides are in the more sinuous reaches. The deposits show upward fining; they are generally fine- to medium-grained, well-sorted sand, with scattered pebbles. Horizontal bedding and medium-scale and small-scale crossbedding are the dominant sedimentary structures. Compared to typical meandering-stream deposits, the Cimarron River deposits are thinner but wider, and they contain less fine-grained clastics in the upper part of the sequence and as clay interbeds. The Cimarron sediments are finer grained and better sorted than sands of typical braided streams. They contain more horizontal bedding than either braided- or meandering-stream deposits. The type of sand deposit represented by the Cimarron River sand may be similar to certain ancient alluvial sandstones which were deposited during either basinal subsidence or eustatic rise in sea level. ((Knapp-USGS)
W74-07163

GEOLOGIC ASPECTS OF WASTE SOLIDS AND MARINE WASTE DEPOSITS, NEW YORK METROPOLITAN REGION,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 5B.
W74-07171

REMANENT MAGNETIZATION OF MODERN TIDAL FLAT SEDIMENTS FROM SAN FRANCISCO BAY, CALIFORNIA,
Stanford Univ., Calif. Dept. of Geology.
For primary bibliographic entry see Field 2L.
W74-07173

LINE INTERSECTION METHOD FOR ESTIMATING DRAINAGE DENSITY,
British Columbia Univ., Vancouver. Dept. of Geography.
D. M. Mark.
Geology, Vol 2, No 5, p 235-236, May 1974. 1 fig, 1 tab, 3 ref.

Descriptors: *Drainage density, *Maps, *Terrain analysis, *Drainage patterns(Geologic), Geomorphology, Methodology, Estimating.
Identifiers: *Line intersection method.

The line intersection method for estimating drainage density using maps involves counting the number of intersections with the drainage net per unit length of sample traverse line and multiplying the result by a correction coefficient. Theoretical and empirical evidence indicates that this coefficient should be 1.571. (Knapp-USGS)
W74-07174

SAND-WAVE FIELDS IN TAIWAN STRAIT,
Oregon Univ., Eugene. Dept. of Geology.
S. Boggs, Jr.
Geology, Vol 2, No 5, p 251-253, May 1974. 2 fig, 10 ref.

Descriptors: *Sand waves, *Bottom sediments, *Sediment transport, Sedimentary structures, Currents(Water), Ocean currents, Particle size, Tides.
Identifiers: *Taiwan Strait.

Sand waves were detected by echo sounding in several areas of the shallow shelf northwest and west of Taiwan. They occur in fields 5 to 30 km in width, at water depths ranging from 20 to 90 m. The height of the sand waves primarily ranges from 5 to 8 m, and their average length ranges from about 100 to 500 m. The asymmetrical shape of most of the waves suggests that they migrate in response to present-day hydraulic conditions. Orientation of the steepest faces of the sand waves is quite variable, indicating that the pattern of bottom current movement in Taiwan Strait is probably quite complex. (Knapp-USGS)
W74-07175

A NOTE ON THE AREAL DISTRIBUTION OF SUSPENDED SEDIMENT YIELD IN SOUTH AFRICA,
Nottingham Univ. (England).
J. C. Doornkamp, and P. D. Tyson.
Journal of Hydrology, Vol 20, No 4, p 335-340, December 1973. 3 fig, 12 ref.

Descriptors: *Sediment yield, *Suspended load, Equations, Africa, Erosion, Soil erosion, Topography, Rainfall, Weathering, Silts, Sediment transport, Runoff.
Identifiers: *South Africa, Fournier equation.

Suspended sediment yield was calculated by means of Fournier's equations for 214 locations in South Africa. The areal distributions agree well with field data. Areas of pronounced relief yield most suspended sediment, especially from the Transvaal Escarpment zone, northeast Lesotho, the Natal Drakensburg, and the Cape Mountains. Locally high values occur inland (for example, in the Waterberg Plateau north of Nylstroom). Valley rainfall records inadequately define mountain precipitation leading to an underestimate of likely actual values of sediment yield in some areas. Man-induced soil erosion locally increases suspended sediment yields, as do areas of deeply weathered bedrock. (Knapp-USGS)
W74-07177

BIODEPOSITION AS A FACTOR IN SEDIMENTATION OF FINE SUSPENDED SOLIDS IN ESTUARIES,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 2L.
W74-07231

SPATIAL AND TEMPORAL DISTRIBUTION OF SUSPENDED SEDIMENT IN NARRAGANSETT BAY AND RHODE ISLAND SOUND,
Naval Underwater Systems Center, Newport, R.I.
For primary bibliographic entry see Field 2L.
W74-07232

SUSPENDED SEDIMENT TRANSPORT IN DELAWARE BAY,
Millersville State Coll., Pa.
For primary bibliographic entry see Field 2L.
W74-07233

DISTRIBUTION AND TRANSPORTATION OF SUSPENDED SEDIMENT IN UPPER CHESAPEAKE BAY,
Johns Hopkins Univ. Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 2L.
W74-07234

RIO DE LA PLATA ESTUARY ENVIRONMENTS,
Lamont-Doherty Geological Observatory, Palisades, N. Y.
For primary bibliographic entry see Field 2L.
W74-07236

MASS PHYSICAL AND ENGINEERING PROPERTIES OF SOME YORK RIVER SEDIMENTS,
Lafayette Coll., Easton, Pa. Dept. of Geology.
For primary bibliographic entry see Field 2L.
W74-07239

STRONTIUM ISOTOPE COMPOSITION AND SEDIMENT TRANSPORT IN THE RIO DE LA PLATA ESTUARY,
Lamont-Doherty Geological Observatory, Palisades, N. Y.
For primary bibliographic entry see Field 2L.
W74-07240

RECENT ESTUARINE SEDIMENT HISTORY OF THE ROANOKE ISLAND AREA, NORTH CAROLINA,
East Carolina Univ., Greenville. Dept. of Geology.
For primary bibliographic entry see Field 2L.
W74-07245

EROSIONAL AND DEPOSITIONAL ESTUARINE 'TERRACES,' SOUTHEASTERN UNITED STATES,
Georgia Univ., Sapelo Island. Marine Inst.
For primary bibliographic entry see Field 2L.
W74-07246

SANTEE SUBMERGENCE, EXAMPLE OF CYCLIC SUBMERGED AND EMERGED SEQUENCES,
South Carolina Univ., Columbia. Dept. of Geology.
For primary bibliographic entry see Field 2L.
W74-07247

MARINE GEOLOGY AND ESTUARINE HISTORY OF MOBILE BAY, ALABAMA: PART 1. CONTEMPORARY SEDIMENTS,
Florida State Univ., Tallahassee. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W74-07248

EFFECTS OF MAN-MADE WORKS ON THE HYDRAULIC, SALINITY, AND SHOALING REGIMENS OF ESTUARIES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Div.
For primary bibliographic entry see Field 5C.
W74-07249

DETERMINATION OF CHLORINATED INSECTICIDES IN SUSPENDED SEDIMENT AND BOTTOM MATERIAL,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5A.
W74-07317

AVALANCHE STUDIES (1971-1972),
Washington Univ., Seattle. Geophysics Program; and Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2C.
W74-07319

A NEW LOOK AT RIVER CAPTURE AND AT THE DENUDATION HISTORY OF THE WEALD,
Natural Environment Research Council, London (England). Inst. of Geological Sciences.
B. C. Worssam.
Report No 73/17, 1973. 21 p, 6 fig, 1 tab, 69 ref.

Descriptors: *Erosion, *Geomorphology, *Gradients(Streams), Terraces(Geologic), Terrain analysis, Topography, Slopes, Valleys, Land forming, Quaternary period.
Identifiers: *Great Britain(England).

Terraces in the upper parts of the valleys of the rivers Mole, Wey and Arun, in the western part of the Weald, southeast England, are primarily climatic rather than graded to various Pleistocene sea levels. Many instances of river capture in the Weald, including the well-known case of capture of the Blackwater by the Wey at Farnham, are described. All of them could well have been brought about by a downstream-acting overflow process. The term 'diversion' is preferable to 'river capture' or 'piracy'. The concept of dynamic equilibrium, put forward by J. T. Hack in 1960, provides a simpler explanation of the present topography of the Weald than does the cycle of erosion theory of W. M. Davis. Geological evidence for peneplanation of the Weald appears to be lacking. (Knapp-USGS)
W74-07324

SEDIMENT DISCHARGE IN THE LAKE TAHOE BASIN, CALIFORNIA, 1972 WATER YEAR,
Geological Survey, Menlo Park, Calif.
C. G. Kroll.
Open-file report, September 19, 1973. 33 p, 3 fig, 8 tab, 6 ref, 2 append.

Descriptors: *Sediment discharge, *California, *Sediment yield, *Soil erosion, *Highways, Sampling, Data collections, Runoff, Sediment transport.
Identifiers: *Lake Tahoe(Calif).

Streamflow and fluvial-sediment discharge data are being collected at selected streams and highway gutters in the Lake Tahoe basin to determine the extent of erosion from highway cuts and to evaluate the effects of various land treatment practices to reduce erosion. Precipitation in the Lake Tahoe area during 1972 was 77 percent of normal; consequently, runoff was well below normal. Seventy-six percent of the total annual runoff during the 1972 water year occurred from March through June 1972. Sediment samples were collected during the year at streamflow gaging stations and at gutter stations at highway cuts to define the range of transport conditions. The major part (87 percent) of the annual suspended-sediment discharge during the 1972 water year occurred during the snowmelt runoff period, March through June. (Knapp-USGS)
W74-07326

SIZE AND SHAPE SORTING IN A DUTCH TIDAL INLET,
Groningen Rijksuniversiteit (Netherlands). Geological Inst.
For primary bibliographic entry see Field 2L.
W74-07329

THE RELATIONSHIP OF POROSITY AND ANGLE OF REPOSE TO MIXTURE PROPORTIONS IN ASSEMBLAGES OF DIFFERENT SIZED MATERIALS,
Bristol Univ. (England). Dept. of Geography.
I. Statham.
Sedimentology, Vol 21, No 1, p 149-162, February 1974. 7 fig, 2 tab, 23 ref.

Descriptors: *Porosity, *Sedimentology, *Shear, *Shear strength, Sedimentation, Deposition(Sediments).
Identifiers: Angle of repose(Sediments).

Repose angles of mixtures of glass spheres were studied in rotating drums. Angle of shear is strongly influenced by the proportions of the mixture; it reached a peak value for the minimum porosity mixture. This was attributed to increased dilatation on the shear plane during avalanching. The geomorphic significance of these observations, in terms of slope development, is discussed. Angle of shear, as measured in a rotating drum, is variable, not a true constant, and cannot be exactly analogous to angle of internal sliding friction at constant volume as measured in a shearbox test. It is tentatively suggested that at least some of the variability is attributable to kinetic energy released on failure. (Knapp-USGS)
W74-07330

A SCANNING ELECTRON MICROSCOPE STUDY OF SURFACE TEXTURES OF QUARTZ GRAINS FROM GLACIAL ENVIRONMENTS,
Cambridge Univ. (England). Dept. of Geography.
W. B. Whally, and D. H. Krinsley.
Sedimentology, Vol 21, No 1, p 87-105, February 1974. 15 fig, 1 tab, 30 ref.

Descriptors: *Sediments, *Quartz, Electron microscopy, *Glacial drift, Alluvium, Till, Glaciology, Sedimentology.
Identifiers: *Switzerland(Feegletscher).

Surface textures of quartz sand grains from several glacial environments at the Feegletscher, Switzerland were examined by means of scanning electron microscopy. The difference between supraglacial and subglacial material is very slight. Glacial and extraglacial environments in the vicinity of glaciers are apparently not distinguishable. Examination of surface precipitation features suggests a sequence of events which can be used to help discriminate between different ages of deposits in an area. A similarity between some of the surface debris from moraine samples and those seen in loess and quickclay deposits is also suggested. (Knapp-USGS)
W74-07331

EROSIONAL LOSSES OF S-TRIAZINE HERBICIDES,
Pennsylvania State Univ., University Park. Dept. of Soil Chemistry.
For primary bibliographic entry see Field 5B.
W74-07421

METHYLMERCURY FORMATION IN MERCURY-TREATED RIVER SEDIMENTS DURING IN SITU EQUILIBRATION,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W74-07425

DISPERSION OF CONTAMINATED SEDIMENT BED LOAD,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W74-07446

RELATIONSHIP BETWEEN LOGGING ACTIVITIES AND SALMON PRODUCTION,
Alaska Dept. of Fish and Game, Juneau.
For primary bibliographic entry see Field 4C.
W74-07468

SUPPLY OF TERRIGENOUS MATERIAL TO THE BALTIC SEA (PITANIYE BALTIYSKOGO MORYA TERRIGENNYM MATERIALOM),
Akademiya Nauk SSSR, Kaliningrad. Institut Okeanologii.
A. I. Blazhchishin, and Yu. D. Shuyskiy.
Litologiya i Poleznyye Iskopayemyye, No 3, p 141-145, May-June 1973. 1 fig, 1 tab, 18 ref.

Descriptors: *Sedimentation, *Deposition(Sediments), *Sediment transport, *Sediment load, *Dissolved solids, Suspended solids, Suspended load, Bed load, Erosion, Beach erosion, Water pollution sources.
Identifiers: *USSR, *Baltic Sea.

The drainage area of the Baltic Sea, including the Lake Ladoga basin, is 1,566,000 sq m or 3.7 times larger than the area of the sea itself. Average annual dissolved-ion discharge into the sea is 46.6 million metric tons, of which 28.1 million metric tons is HCO3, 10.4 million metric tons--Ca, 3.1 million metric tons--SO4, 1.8 million metric tons--Mg, 1.8 million metric tons--Na + K, and 1.4 million metric tons--Cl. Rivers of the basin discharge annually about 3 million metric tons of biogenic elements (SiO2, Fe, P) and 7 million tons of organic matter. The amount of dissolved solids resulting from discharge of groundwater directly into the sea is estimated at 2 million metric tons/yr. In all, 58.6 million metric tons of dissolved material are delivered annually to the sea. The amount of suspended solids is 5.2 million metric tons/yr, of which about 3.5 million metric tons/yr or 67% enters the deep part of the sea. The ratio of alluvial bedload to suspended and dissolved material gives a solids-discharge formula of 1.26 286. This ratio is substantially different from the sediment-discharge formula for the humid zone (1:3·25). The total amount of material obtained by erosion of shores and submarine slopes is presently 24.9-28.2 million metric tons/yr. The total amount of terrigenous material transported to the sea is 90.4 million metric tons/yr. The 58.6 million metric tons of dissolved material delivered annually to the sea reflects the predominance of chemical weathering over mechanical erosion. (Josefson-USGS)
W74-07501

ROLE OF TURBIDITY CURRENTS IN SEDIMENTARY PROCESSES (O ROLI MUT'YEVYKH POTOKOV V PROTSESSAKH OSADKONAKOPLENIYA),
Vsesoyuznyi Geologicheskii Institut, Leningrad (USSR).
S. I. Romanovskiy.
Litologiya i Poleznyye Iskopayemyye, No 3, p 29-37, May-June 1973. 47 ref.

Descriptors: *Turbidity currents, *Sedimentation, Stratification, Geologic time.
Identifiers: USSR, Turbidites, Flysch.

The present status of knowledge of turbidity currents as a physicogeological phenomenon is reviewed, and the role of these currents in sedimentation of past geological epochs is analyzed. Characteristics of the sedimentation mechanism of turbidity currents are described to explain conditions of formation of a number of textural features of turbidites. The problem of recognizing turbidites is discussed, and the possibility of a new approach to the solution of the problem of stratification is investigated in the light of the concept of turbidity currents. (Josefson-USGS)
W74-07502

MECHANISM OF ELEMENT DISTRIBUTION IN THE PACIFIC OCEAN (JAPANESE PROFILE) (K POZNANIYU MEKHANIZMA RASPREDELENIYA ELEMENTOV V TIKHOM OKEANE (YAPONSKIY PROFIL')),
Akademiya Nauk SSSR, Moscow. Geologicheskii Institut.
N. M. Strakhov, I. I. Volkov, and N. A. Lisitsyna.
Litologiya i Poleznyye Iskopayemyye, No 3, p 3-28, May-June 1973. 11 fig, 10 tab, 13 ref.

Descriptors: *Geochemistry, *Trace elements, *Distribution patterns, *Sediments, *Pacific Ocean, Marine biology, Oxidation, Reduction(Chemical), Profiles.
Identifiers: *USSR, Pelagic(Oceanography).

To study the mechanism of element distribution in sediments of the northwestern Pacific, a profile was measured in 1969 during the 46th voyage of the Soviet research vessel 'Vityaz' from Tatar Strait to Wake Island atoll. The total length of the profile was about 4,000 km. Two sharply different mechanisms are evident in the distribution of sedimentary materials on the floor of the ocean basin: the biological mechanism acts in the near-shore zone and governs the distribution of organic C, SiO2, Se, I, and Br; and the mechanical fractionation of allochthonous and autochthonous suspensions governs the distribution and accumulation of Cr, Fe, Ge, V, Al, Ti, Ga, Zr, Nb, Ta, Pb, Zn, As, Cu, Mn, Ni, Co, Mo, P, the rare earths, and probably others, throughout the entire length of the profile. Percentages of the elements increase from the shore to the pelagic zone, while the absolute masses decrease. Percentages of the elements depend on sediment grain size: fine fractions (0.01-0.001 and < 0.001 mm) are the principal carriers of trace elements. The presence of biogenic and mechanical fractionation in the Pacific and other oceans is a function of the enormous size of the ocean basins. (Josefson-USGS)
W74-07503

SUSPENDED-SEDIMENT YIELD IN RIVERS OF GOR'KIY OBLAST AS AN INDICATION OF RECENT EROSION PROCESSES (STOK VZVESHENNYKH NANOSOV V REKAKH GOR'KOVSKOY OBL. KAK POKAZATEL RAZVITIYA SOVREMENNYKH EROZIONNYKH PROTSESSOV),
Gorkovskii Gosudarstvennyi Pedagogicheskii Institut (USSR).
F. M. Bakanina.
Pochvovedeniye, No 4, p 131-133, April 1973. 1 tab.

Descriptors: *Suspended solids, *Sediment yield, *Sediment discharge, *Streams, *Erosion, Erosion rates, Erosion control, Turbidity.
Identifiers: *USSR(Gor'kiy Oblast).

The largest areas of eroded soils in Gor'kiy Oblast (20%-50%) are concentrated in the Central and Oka-Volga regions on the Volga right bank. Soils in the Sura and Oka-Tesha regions are somewhat less eroded. Soils of the Oblast are eroded mainly by spring melt waters. Turbidity of water in the Alatyr' River increases in spring by a factor of 300. Suspended-sediment yield is greatest in the Alatyr' River (73 metric ton/sq km/yr), considerably less in the P'yana and Sura Rivers (12 and 13 metric tons/sq km/yr) and less than 10 metric tons/sq km/yr in rivers of the northern part of the Oblast. Annual sediment yield is smallest in the Kerzhenets River (2.7 metric tons/sq km/yr) and in the Serezha River (0.56 metric tons/sq km/yr). Over 80% of suspended solids in rivers of the Oblast during floods and low flow is composed of coarse silt, ranging in size from 0.05 to 0.01 mm. Recent erosion processes are most intense in the Alatyr' River basin. Erosion control measures should take into account the rate of development of recent erosion rather than the actual degree of erosion of the area. The erosion rate can be determined from data on suspended sediments discharged by rivers and expressed in metric tons/sq km/yr, and from turbidity indices of river water. (Josefson-USGS)
W74-07507

SOLVENT EXTRACTION OF SULFUR FROM MARINE SEDIMENT AND ITS DETERMINATION BY GAS CHROMATOGRAPHY.
University of Southern California, Los Angeles, Environmental Engineering Program.
For primary bibliographic entry see Field 5A.
W74-07565

2K. Chemical Processes

CHEMICAL AND BIOLOGICAL PROBLEMS IN THE GRAND CANYON,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 5B.
W74-07093

MINERALOGICAL COMPOSITION OF CLAYS IN SOIL PROFILES OF ISRAEL: I. THE SOILS OF THE MEDITERRANEAN ZONE,
Hebrew Univ., Rehovot (Israel). Dept. of Soil and Water Science.
For primary bibliographic entry see Field 2G.
W74-07099

MINERALOGICAL COMPOSITION OF CLAYS IN SOIL PROFILES OF ISRAEL: II. THE SOILS OF THE DESERT ZONE,
Hebrew Univ., Rehovot (Israel). Dept. of Soil and Water Science.
For primary bibliographic entry see Field 2G.
W74-07100

QUALITY OF WELL WATERS OF JAIPUR DISTRICT,
Udaipur Univ. (India).
For primary bibliographic entry see Field 4B.

W74-07106

MANGANESE AND IRON SOLUBILITY CHANGES AS A FACTOR IN TILE DRAIN CLOGGING: I. OBSERVATIONS DURING FLOODING AND DRYING,
Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
For primary bibliographic entry see Field 2G.
W74-07151

MANGANESE AND IRON SOLUBILITY CHANGES AS A FACTOR IN TILE DRAIN CLOGGING: II. OBSERVATIONS DURING THE GROWTH OF COTTON,
Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
For primary bibliographic entry see Field 2G.
W74-07152

APPLICATION OF GEOCHEMISTRY TO THE SEARCH FOR CRUDE OIL AND NATURAL GAS,
Research Council of Alberta, Edmonton.
For primary bibliographic entry see Field 4B.
W74-07161

DISSOLVED-SOLIDS DISCHARGE TO THE OCEANS FROM THE CONTERMINOUS UNITED STATES,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 5B.
W74-07162

SOURCE AND BUDGET OF SULFATE IN PRECIPITATION FROM CENTRAL ALBERTA, CANADA,
Research Council of Alberta, Edmonton.
For primary bibliographic entry see Field 5B.
W74-07164

MINERAL SPRINGS IN THE SUEZ RIFT VALLEY--COMPARISON WITH WATERS IN THE JORDAN RIFT VALLEY AND POSTULATION OF A MARINE ORIGIN,
Israel Atomic Energy Commission, Yavne. Soreq Nuclear Research Centre.
E. Mazor, A. Nadler, and M. Molcho.
Journal of Hydrology, Vol 20, No 4, p 289-309, December 1973. 8 fig, 4 tab, 12 ref.

Descriptors: *Water chemistry, *Mineral water, Springs, Sea water, Chlorides, Sodium, Bromine, Magnesium, Radium radioisotopes, Stable isotopes, Hydrogen sulfide, Carbon radioisotopes, Radioactive dating.
Identifiers: *Israel(Jordon Valley).

Fresh and mineral waters from the eastern margin of the Suez Rift Valley include sources that resemble the mineral waters in the Jordan Rift Valley. They are characterized compositionally by Cl>Na, the presence of NaCl and MgCl2, a Cl/Br ratio around 150, elevated radium and H2S content, elevated temperature, a light stable-isotope composition, and high carbon-14 age. The waters originated from entrapped seawater that gradually changed in composition by interaction with aquifer rocks. Such changes were demonstrated by laboratory experiments. (Knapp-USGS)
W74-07167

VARIABLES AFFECTING WELL SUCCESS IN A KENTUCKY LIMESTONE AQUIFER,
Kentucky Univ., Lexington. Dept. of Geology.
For primary bibliographic entry see Field 4B.
W74-07176

AQUIFERS IN THE SOKOTO BASIN, NORTHWESTERN NIGERIA, WITH A DESCRIPTION OF THE GENERAL HYDROGEOLOGY OF THE REGION,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 2F.
W74-07184

INFLUENCE OF MINERAL-WATER REACTIONS IN ESTUARIES ON BORON BUDGET IN THE OCEANS,
Florida State Univ., Tallahassee. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W74-07227

COMPARISON OF CONDITIONAL STABILITY CONSTANTS OF NORTH CAROLINA HUMIC AND FULVIC ACIDS WITH CO(II) AND FE(III),
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5B.
W74-07228

REGIONAL CLAY MINERAL FACIES IN ESTUARIES AND CONTINENTAL MARGIN OF THE UNITED STATES EAST COAST,
Geological Survey, Woods Hole, Mass.
For primary bibliographic entry see Field 2L.
W74-07237

SOURCE OF RECENT NEARSHORE MARINE CLAYS, SOUTHEASTERN UNITED STATES,
Western Washington State Coll., Bellingham. Dept. of Geology.
For primary bibliographic entry see Field 2L.
W74-07238

TECHNIQUES FOR USE OF ORGANIC AND AMORPHOUS MATERIALS IN SOURCE INVESTIGATIONS OF ESTUARY SEDIMENTS,
For primary bibliographic entry see Field 2L.
W74-07241

PROCESSES AFFECTING GAS DISTRIBUTIONS IN ESTUARINE SEDIMENTS,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 2L.
W74-07242

TEXTURE AND ORGANIC CARBON CONTENT OF BOTTOM SEDIMENTS IN SOME ESTUARIES OF THE UNITED STATES,
Middlebury Coll., Vt.
For primary bibliographic entry see Field 2L.
W74-07243

BIOGEOCHEMICAL VARIABLES IN BOTTOM SEDIMENTS OF THE RAPPHANNOCK RIVER ESTUARY,
South Carolina Univ., Columbia. Coll. of Arts and Sciences.
For primary bibliographic entry see Field 2L.
W74-07244

EFFECT OF INCREASING DEPTH ON SALINITY IN THE JAMES RIVER ESTUARY,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 2L.
W74-07250

GROUND-WATER RESOURCES OF MCLEAN COUNTY, NORTH DAKOTA,
Geological Survey, Bismarck, N. Dak.
For primary bibliographic entry see Field 2F.
W74-07313

PHOTOMETRIC DETERMINATION OF MANGANESE IN WATER BY USING O-TOLIDINE,
Water Management Board, Brno (Czechoslovakia).
J. Maly, and H. Fadrus.
Analyst, Vol 99, No 1175, p 128-136, February 1974. 3 fig, 5 tab, 18 ref.

Descriptors: *Chemical analysis, *Manganese, *Colorimetry, Aqueous solutions, Analytical techniques, Pollutant identification, Oxidation.
Identifiers: Tolidine.

Oxidation products of manganese react with o-tolidine to produce a yellow color, which can be used for the photometric determination of manganese. Prior to the determination, divalent manganese is converted into the higher valency forms by oxidation with atmospheric oxygen in alkaline solution in the presence of magnesium and iron(III) salts. (Knapp-USGS)
W74-07315

TH-234/U-238 ACTIVITY RATIOS IN PACIFIC OCEAN BOTTOM WATERS,
Tata Inst. of Fundamental Research, Bombay (India).
B. S. Amin, S. Krishnaswami, and B. L. K. Somayajulu.
Earth and Planetary Science Letters, Vol 21, No 4, p 342-344, March 1974. 1 tab, 11 ref.

Descriptors: *Water chemistry, *Pacific Ocean, *Uranium radioisotopes, *Sea water, Sampling, Radioisotopes, Heavy metals, Chemical precipitation.
Identifiers: *Thorium.

Th-234/U-238 activity ratios in the near-bottom waters at a station in the South Pacific are close to the secular equilibrium value, ranging between 0.9 and 1.13 (plus or minus 8%). This suggests that the rate of removal of Th-234 by bottom-water scavenging processes is slow compared to its rate of radioactive decay. The mean activity ratio in these waters is 1.14 plus or minus 0.02, the same as the reported values for the world oceans. (Knapp-USGS)
W74-07322

STUDIES OF THE INGREDIENTS VARIATION OF THE SAKE-GAWA RIVER, A TRIBUTARY OF THE MOGAMI RIVER (IN JAPANESE),
Yamagata Prefectural School for the Blind, Kaminoyama (Japan).
N. Aita.
Jap J Limnol. Vol 33, No 2, p 11-15. 1972. Illus. (English summary).
Identifiers: Alkalinity, *Calcium, *Chlorides, Flow, Ingredients, *Japan(Mogami river basin), Rivers, Tributaries, Thaw.

As is usual in the snowy districts, the melting snow in spring causes the rise of river water. In the Sake-gawa River (Japan) a thaw usually begins early in March and continues for about 3 mo. Judging from the variations of its flow rate, the snow-thawing season is divided into 3 stages. Throughout the thawing season, the concentrations of Cl and Ca ions are kept rather high in spite of the large flow rate. Different from the ions, the alkalinity is negatively correlated with the logarithm of the flow rate at the same period. The observations of the concentration of dissolved mineral show that the amount of transportation (Qd) is proportional to the 'n'th power of the flow rate (Q), i.e., Qd = aQn, where 'n' are the constants dependent on the ions and the stage of snow thawing. In the case of chloride ion, the value of 'n' is in the following order: the beginning > the middle stage = the end. At the beginning stage, the atmospheric salt in the fallen snow conveyed by the monsoon in winter is transported rapidly in the river water. As for the Ca ion, the value of 'n' is in the order: the beginning > the end > the middle stage. The total amount of transported Cl ion during the snow-thawing season is about a half of the yearly amount. The same is true of the Ca ion.--Copyright 1973, Biological Abstracts, Inc.
W74-07360

STRONTIUM AND OTHER NOTABLE CHEMICAL CONSTITUENTS OF WELL-WATER OF ALLEN COUNTY, INDIANA,
Geological Survey, Bloomington, Ind.
C. F. Foley, N. K. Bleuer, R. K. Leininger, and W. C. Herring.
Proceedings of the Indiana Academy of Science, Vol 82, p 274-280, 1972. 3 fig, 1 tab, 10 ref.

Descriptors: Aquifer characteristics, Glacial aquifers, Soil water, Bedrock, *Indiana, Hydrologic data, Geomorphology, Stratigraphy, *Water chemistry, *Groundwater, *Strontium, *Iron, *Sulfates, Solutes, Metals, Cations, Anions, Dolomite, Glacial sediments, Pyrite, Shales, Alkalinity, Bicarbonates, Magnesium, Hardness(Water), Calcium, Glaciohydrology.
Identifiers: Allen County(Ind).

Fourteen waters from aquifers in glacial deposits and 31 samples from aquifers in bedrock were obtained for a water quality study of Allen County, Indiana. Glacial waters contained relatively high concentrations of Fe, Sr, and sulfate. The Fe probably derived from pyrite in Antrim Shale particles. The Ca/Mg ratio decreased generally from north to south and may reflect southward increasing dolomite contents of glacial deposits. Bedrock waters contained much less Fe, but generally more Sr and sulfate. Total solids, sulfate, Sr, bicarbonate alkalinity, water hardness, and the ratio of Sr atoms/1000 Ca atoms increased from NW to SE. Areal distributions of these constituents reflect relationships with bedrock stratigraphy and groundwater flow. (Brown-IPC)
W74-07400

QUANTITATIVE CHEMICAL ANALYSIS OF SPECIFIC COMPONENTS OF THE WATERS OF LOST CREEK AND THE WABASH RIVER, VIGO COUNTY, INDIANA,
Indiana State Univ., Terre Haute. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W74-07405

ULTRA-VIOLET ABSORPTION CHARACTERISTICS OF NATURAL WATERS,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
P. Foster, and A. W. Morris.
Water Research, Vol 8, No 3, p 137-142, March 1974. 7 fig, 1 tab, 5 ref.

Descriptors: *Salinity, *Ultraviolet radiation, *Tracking techniques, Sea water, Runoff, *Organic matter, Tracers, Path of pollutants, Remote sensing, *Absorption.

Concurrent measurements of salinity and u.v. absorbance at selected wavelengths were made on waters collected from an inshore sea area subject to the influence of a number of sources of land drainage. An inverse relationship was found between salinity and absorbance in the spectral region 250-350 nm. As a result of the difference in the absorbance and variations in the relative absorbance in different spectral regions of the fresh water sources, various water masses could be distinguished in the sea. (Knapp-USGS)
W74-07419

THE CHEMISTRY OF CADMIUM IN NATURAL WATER--II. THE ADSORPTION OF CADMIUM ON RIVER MUDS AND NATURALLY OCCURRING SOLIDS,
Stevenage (England). Water Pollution Research Lab.
J. Gardiner.
Water Research, Vol 8, No 3, p 157-164, March 1974. 3 fig, 7 tab, 17 ref.

Descriptors: *Cadmium, *Mud, *Adsorption, Path of pollutants, Rivers, Chelation, Sorption, Humic acids, *Organic matter, Water chemistry, Water quality.

The adsorption of cadmium on mud solids and particles of clay, silica, humic material and other naturally occurring solids was studied using radiochemical methods. Cadmium concentrations in the range of micrograms per liter could be used. The variation of the extent of adsorption with many of the large number of factors involved was investigated and concentration factors (distribution coefficients) were determined. Rates of adsorption and desorption were rapid. Concentration factors for river muds varied between 5000 and 50,000 and depended mainly on the type of solid, its state of subdivision, the concentration of metal ion present, the time of contact and the concentration of complexing ligands. Humic material appeared to be the main component of river mud responsible for adsorption. Adsorption and desorption processes are major factors in controlling the concentration of cadmium in natural waters and tend to counteract changes in the concentration of the metal ion in solution. (See also W74-03775) (Knapp-USGS)
W74-07420

PUBLIC GROUNDWATER SUPPLIES IN BOND COUNTY,
Illinois State Water Survey, Urbana. Hydrology Section.
For primary bibliographic entry see Field 4B.
W74-07429

MICRO-DETERMINATION OF CATION-EXCHANGE CAPACITY BY NEUTRON ACTIVATION ANALYSIS,
Oregon Agricultural Experiment Station, Corvallis.
For primary bibliographic entry see Field 2G.
W74-07439

DETERMINATION OF NITRATES IN SOIL EXTRACTS,
British Columbia Univ., Vancouver. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W74-07443

MINERAL SPRINGS IN THE SUEZ RIFT VALLEY - COMPARISON WITH WATERS IN THE JORDAN RIFT VALLEY AND POSTULATION OF A MARINE ORIGIN,
Israel Atomic Energy Commission, Yavne. Soreq. Nuclear Research Center.
E. Mazor, A. Nadler, and M. Molcho.
Journal of Hydrology, Vol 20, No 4, p 289-309, December, 1973. 8 fig, 4 tab, 15 ref.

Descriptors: *Water quality, *Water types, Water analysis, Water chemistry, Water pollution sources.
Identifiers: *Red Sea Rift.

Fresh and mineral waters from the eastern margin of the Suez Rift Valley are described. They include a fair number of sources that resemble the mineral waters in the Jordan Rift Valley. The term Tiberias-Farun water is thus suggested to describe them. They are characterized compositionally by Cl>Na, the presence of NaCl and MgCl2, a Cl/Br ratio around 150, elevated radium and H2S content, elevated temperature, a light stable-isotope composition and high carbon-14 age. The Tiberias-Farun waters are suggested to have originated from entrapped seawater that gradually changed in composition by interaction with aquifer rocks. Such changes were demonstrated to take place in the laboratory experiments. (Skogerboe-Colorado State)
W74-07444

MECHANISM OF ELEMENT DISTRIBUTION IN THE PACIFIC OCEAN (JAPANESE PROFILE) (K POZNANIYU MEKHANIZMA RASPREDELENIYA ELEMENTOV V TIKHOM OKEANE (YAPONSKIY PROFIL')),
Akademiya Nauk SSSR, Moscow. Geologicheskiy Institut.
For primary bibliographic entry see Field 2J
W74-07503

BROMINE IN GROUNDWATER OF UZBEKISTAN (BROM V PODZEMNYKH VODAKH UZBEKISTANA),
Institute of Hydrogeology and Engineering Geology, Tashkent (USSR).
L. A. Kalabugin
Uzbekskiy Geologicheskiy Zhurnal, No 6, p 30-32, 1972

Descriptors: *Geochemistry, *Water chemistry, *Bromine, *Groundwater basins, Geologic time, Brines, Salinity
Identifiers: *USSR(Uzbek SSR), Mineralization.

Groundwater with a high bromine content was discovered in Uzbekistan on the Ustyurt Plateau, in lower reaches of the Amudar'ya River, and in the Bukhara-Karshi, Surkhandar'inskiy and Fergana artesian basins. Stratigraphically, these waters are confined to Permian-Triassic, Jurassic, Cretaceous, and Paleocene deposits. The chemical composition of the waters is of the sodium- and calcium-chloride types, being weak to strong brines. The pH of the waters ranges from mildly acidic to neutral. The waters are metamorphosed and belong principally to waters derived from residual brine of marine lakes in the absence of water exchange with the ground surface. The bromine content in water increases down valley and with increasing mineralization. Bromine may originate from the destruction of bromine-organic compounds at high temperatures and pressure. (Josefson-USGS)
W74-07505

THE INFLUENCE OF GEOLOGICAL MEMBRANES ON THE GEOCHEMISTRY OF SUBSURFACE WATERS FROM MIOCENE SEDIMENTS AT KETTLEMAN NORTH DOME IN CALIFORNIA,
California Univ., Berkeley. Dept. of Geology and Geophysics.
Y. K. Kharaka, and F. A. F. Berry.
Water Resources Research, Vol 10, No 2, p 313-327, April 1974. 11 fig, 3 tab, 40 ref. NSF Grant GS 1371.

Descriptors: *Water chemistry, *Oil fields, *Membrane processes, Geochemistry, *California, Water temperature, Sodium, Ammonia, Magnesium, Calcium, Strontium, Chlorides, Sulfates, Iodine, Bromine, Silica, Ion exchange, Clays, Zeolites, Shales.
Identifiers: Kettleman Hills(Calif), Lithium, Rubidium, Barium.

In the Kettleman North Dome oilfield in California, the waters from the Temblor formation (Miocene) are principally meteoric in origin, related to recharge areas located to the west. Their chemistry relative to meteoric water is attributed to hyperfiltration through geological membranes as well as to water-rock interactions. The chemistry of the waters in each subzone of the Temblor formation is characteristic of that subzone and shows membrane effluent characteristics to a given subzone with respect to the one stratigraphically below it. The chemical relations are attributed to increased efficiency of shale membranes with increased depth of burial. Membrane behavior of shales controls completely or in part the distribution of the following ratios: Li/Na, Rb/Na, NH3/Na, Mg/Ca, Sr/Ca, Ca/Na, alkalinity/Cl, SO4/Cl, I/Br, and B/Cl. Some of these ratios are modified by temperature-controlled water-rock interactions. The K/Na ratios and the SiO2 and Ba concentrations are completely dependent on water-rock interactions. (Knapp-USGS)
W74-07513

AN EXPERIMENTAL STUDY OF IMMISCIBLE DISPLACEMENT WITH AN UNFAVORABLE MOBILITY RATIO IN POROUS MEDIA,
Purdue Univ., Lafayette, Ind. School of Chemical Engineering.
For primary bibliographic entry see Field 2F.
W74-07524

DISTRIBUTION AND CHEMISTRY OF PHOSPHORUS IN AN ALBAQUALF SOIL AFTER 82 YEARS OF PHOSPHATE FERTILIZATION,
Missouri Agricultural Experiment Station, Columbia.
For primary bibliographic entry see Field 5B.
W74-07532

ROTATING RING-DISK ELECTRODE STUDY OF THE ADSORPTION OF LEAD ON GOLD IN 0.5M POTASSIUM CHLORIDE,
State Univ. of New York, Buffalo. Dept. of Chemistry.
V. A. Vicente, and S. Bruckenstein.
Analytical Chemistry, Vol 45, No 12, p 2036-2043, October 1973. 10 fig, 4 tab, 27 ref.

Descriptors: *Adsorption, *Lead, *Electrochemistry, Zeta potential, Heavy metals, Ions, Oxidation, Chlorides, *Electrodes.
Identifiers: Rotating ring-disk electrodes, *Gold electrodes, Cyclic voltammetry, Anodic stripping voltammetry, Chemical concentration, Chemical interference, Ion selective electrodes, Desorption, Potassium chloride.

The underpotential deposition of Pb(0) on gold occurred at OV greater than E sub D greater than minus 0.6V (SCE) using cyclic voltammetry at a rotating gold ring-disk electrode. A complete monolayer of Pb atoms on gold is equivalent at 420 microC/geometric sq cm or about 247 microC/real sq cm. Bulk Pb(0) deposition does not occur until this amount of charge has been consumed. The monolayer of underpotential Pb(0) yields three peaks upon anodic stripping. Further, adsorption of Pb(II) on gold occurs during the cathodic disk potential scan and begins at about plus 0.6V. From ring collection data, about 20 percent of a monolayer equivalent remains absorbed at the disk as a lead(II) species during the anodic disk potential scan. Complete desorption occurs just before the potential for the dissolution of gold (E sub D equivalent or equal to plus 0.7V) in the chloride medium. (Holoman-Battelle)
W74-07555

MASS AND CHARGE TRANSFER KINETICS AND COULOMETRIC CURRENT EFFICIENCIES. PART VII. CONDITIONAL POTENTIALS, AND SINGLE-SCAN VOLTAMMETRY OF PURE VANADIUM(V) - VANADIUM(IV) SYSTEMS IN VARIOUS MEDIA AT PLATINUM ELEC TRODES PRE-TREATED BY FIVE METHODS,
Exeter Univ. (England). Dept. of Chemistry.
E. Bishop, and P. H. Hitchcock.
Analyst, Vol 98, No 1169, p 553-562, August 1973. 6 fig, 26 ref.

Descriptors: *Kinetics, Chemical reactions, Hydrogen ion concentration, Electrochemistry, Electrolytes, Heavy metals, Aqueous solutions, Oxidation, Electric currents, Efficiencies, Zeta potential.
Identifiers: *Vanadium, *Mass transfer, *Charge transfer, *Single scan voltammetry, *Platinum electrodes, Coulometric currents, Pretreatment methods, Electrochemical reactions, Voltammetry, Isopolymerization reactions, Ion selective electrodes.

The limited previous work on vanadium is reviewed. Five methods of electrode pre-treatment have been selected and are described. The variation of the conditional potential of the vanadium(V) - vanadium(IV) system with hydrogen-ion concentration is reported. The experimental work is complicated by isopolymerization reactions, of which at least one is kinetically slow. The voltammetric reduction of vanadium(V) in saturated potassium sulphate - acetate buffer at pH 4.0 is examined: the benefit of shifting solvent reaction potentials to more negative potentials is nullified by the direct reduction of un-ionized acetic acid. A similar examination is made in a medium of 0.00001 M sulphuric acid and in one of 2.0 M sulphuric acid. Possible adsorption effects are canvassed. The comples behavior at intermediate hydrogen-ion concentrations is discussed, with illustrations drawn from a sulphuric acid medium of pH 2.0. The anodic oxidation of vanadium(IV) is briefly examined. It is concluded that the electrochemical behavior of the vanadium system is strongly dependent on hydrogen-ion concentration and on the electrode pre-treatment. The electrode can be chemically oxidized in vanadium(V) solutions. The mechanism is a one-step one-electron process. No evidence could be found for reduction below the plus 4 oxidation state at platinum. Vanadium(IV) cannot be oxidized without severe loss of current efficiency, nor reduced to vanadium(III) at platinum electrodes. (See also W74-07558) (Holoman-Battelle)
W74-07557

A NEW COLORIMETRIC PROCEDURE FOR THE DETERMINATION OF BENOMYL,
Norges Landbrukshoegskole, Vollebekk. Chemical Research Lab.
For primary bibliographic entry see Field 5A.
W74-07559

KAEMPFEROL (3,5,7,4'-TETRAHYDROXYFLAVONE) AS A CHROMOGENIC REAGENT FOR TIN(IV),
Delhi Univ. (India). Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W74-07579

ELEMENTAL VARIABILITY WITHIN A SAMPLING UNIT,
Ohio Agricultural Research and Development Center, Wooster.
L. R. Drees, and L. P. Wilding.
Soil Sci Soc Am Proc. Vol 37, No 1, p 82-87, 1973. Illus.
Identifiers: *Sampling, *Spectroscopy(X-ray), Variability, *Trace elements.

To determine the magnitude of lateral variability within an area of 1-2 m2, 6 profiles were sampled at 0.6 m-intervals at each of 3 different sites representing loess, till and outwash deposits. Elemental Ti, Zr, Fe, Ca, and K were determined by X-ray spectroscopy for 50-20 micron and 2-5 micron fractions of selected horizons within each profile. Coefficients of variation within these deposits ranged from 1-13% for Ti, 4-20% for Zr, 3-20% for Fe, 5-13% for Ca, and 2-9% for K. The order of variability was loess less than or equal to till < outwash. No consistent differences in elemental variability were observed between size fractions or horizons (i.e., A, B, or C). Elemental data from a single horizon within a vertical profile will seldom permit mean estimates closer than plus or minus 10-20% (95% confidence interval) for loess and till deposits, and plus or minus 20-45% for the more variable outwash deposits. Three lateral subsamples within a given horizon would permit mean estimates of above elements within plus or minus in loess and till but 20 subsamples would be required to achieve similar accuracies in some outwash deposits. Such data emphasize the need to multiply subsample horizons in a lateral dimension if mean estimates are to be accurate within 10-20% over an area approximating a pedon or sampling pit. The number of subsamples for a given horizon is a function of the element under consideration, nature of deposit, and precision of mean estimate desired.--Copyright 1973, Biological Abstracts, Inc.
W74-07598

2L. Estuaries

TECHNOLOGY TRANSFER IN THE MARINE ENVIRONMENT OF LONG ISLAND,
Center for the Environment and Man, Inc., Hartford, Conn.
For primary bibliographic entry see Field 6B.
W74-07059

PROGRAM DEVELOPMENT PLAN FOR THE MESA-NEW YORK BIGHT REGIONAL PROJECT.
Westinghouse Oceanic Div., Annapolis, Md.
For primary bibliographic entry see Field 6B.
W74-07078

SEDIMENTATION BY NON-TIDAL CURRENTS AROUND NORTHERN DENMARK,
Institute of Oceanographic Sciences, Wormley (England).
A. H. Stride, and W. D. Chesterman.
Marine Geology, Vol 15, No 5, p M53-M58, December 1973. 2 fig, 8 ref.

Descriptors: *Sedimentation, *Bottom sediments, *Continental shelf, Sounding, Sand waves, Currents(Water), Littoral drift, Ocean currents, Europe.
Identifiers: *Denmark.

On the shallow sea floor off northern Denmark, a number of bedforms of mobile sand can be associated with nearby sand deposits. Both appear to have been formed largely by the strong, wind-induced, intermittent, coastal current, which converges from between west and south, and flows eastward past the north Danish coast. (Knapp-USGS)
W74-07160

DISSOLVED-SOLIDS DISCHARGE TO THE OCEANS FROM THE CONTERMINOUS UNITED STATES,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 5B.
W74-07162

REMANENT MAGNETIZATION OF MODERN TIDAL FLAT SEDIMENTS FROM SAN FRANCISCO BAY, CALIFORNIA,
Stanford Univ., Calif. Dept. of Geology.
S. Graham.
Geology, Vol 2, No 5, p 223-226, May 1974. 7 fig, 1 tab, 15 ref.

Descriptors: *Bottom sediments, *Mud flats, *California, *Magnetic studies, Sedimentology, Sedimentation, Deposition(Sediments), Sampling, Bottom sampling.
Identifiers: *Tidal flats, *San Francisco Bay, Bioturbation.

Sediments from mud flats of the upper bare zone of San Francisco Bay, California, tidal flats possess remanent magnetization uniform in intensity and direction. The uniformity of magnetization and considerations of the stability of iron species in low Eh, low pS environments (reducing marine conditions) indicate that the remanent magnetization is not chemical remanent magnetization. The pervasiveness of bioturbation in the tidal flat setting, a lack of inclination errors, and the consistent north-directed magnetization acquired by experimentally slurried bay sediment (simulating bioturbation) suggest that the remanent magnetization is postdetrital remanent magnetization related to bioturbation of wet tidal flat sediments. (Knapp-USGS)
W74-07173

ENVIRONMENTAL FRAMEWORK OF COASTAL PLAIN ESTUARIES.
Proceedings of Symposium on Estuaries, 18th Annual Meeting of the Southeastern Section of Geological Society of America, April 10-11, 1969, Columbia, S C: Geological Society of America, Inc, Memoir 133, B. W. Nelson, editor, 1972. 619 p.

Descriptors: *Estuaries, *Sedimentation, *Water pollution effects, Deposition(Sediments), Erosion, Sediment transport, Water chemistry, Water circulation, Coastal plains.

Estuarine water circulation, sedimentation, and water pollution are discussed in this collection of symposium papers. Water circulation patterns are the principal control of sedimentation and are the factor most commonly modified by man's activity. Pollution is common in estuaries because they are the sites of many of the world's major cities. (See W74-07226 thru W74-07250) (Knapp-USGS)
W74-07225

RECENT INVESTIGATIONS IN STRATIFIED FLOWS RELATED TO ESTUARIAL HYDRAULICS,
Florida Univ., Gainesville. Dept. of Coastal and Oceanographic Engineering.
E. Partheniades.
In: Environmental Framework of Coastal Plain Estuaries; 18th Annual Meeting of Southeastern Section of the Geological Society of America, April 10-11, 1969, Columbia, S C: Geological Society of America, Inc, Memoir 133, p 29-70, 1972. 24 fig, 1 tab, 23 ref.

Descriptors: *Mixing, *Stratified flow, *Estuaries, *Saline water intrusion, Hydraulics, Streamflow, Tides, Turbulence, Diffusion, Dispersion, Equations, Reviews.

Equations are available for flow in fully stratified, partially and well-mixed estuaries. The analytical solutions, mostly one-dimensional to date, are very useful in predicting the effects of changes in the estuary regime on salinity intrusion and shoaling patterns. Stratified estuaries have a discontinuous interface between saltwater and freshwater across which very little mixing occurs. In channels, unbalanced downstream pressure forces near the freshwater end overcome the frictional resistance at the interface and contribute to an increase of the velocity head; at the saltwater end an unbalanced pressure force drives saltwater upstream near the bottom. Analytical expressions exist for interfacial stability, mixing, and interfacial and bed shear stresses. The hydraulic equations predict increase in the saltwater intrusion length with increase of channel depth or decrease of freshwater flow. In real estuaries, tides generate shearing stresses that break the interface and mix saltwater and freshwater. Mixing increases with increasing tidal amplitude and decreasing freshwater flow. Continuous entrainment, mixing, upstream and downstream saltwater movement induce a net upstream flow of saltwater near the bottom, just as in the fully stratified case, when the average transport over a tidal period is considered. Mixing is a complex combination of turbulent eddy diffusion, longitudinal dispersion, and gravitational convection. The diffusion coefficient depends on the rate of dissipation of energy due to tidal forces and the degree of vertical mixing. Vertical mixing usually is downward in the first half of the intrusion length but upward in the second half and depends on the degree of stratification. (See also W74-07225) (Knapp-USGS)
W74-07226

INFLUENCE OF MINERAL-WATER REACTIONS IN ESTUARIES ON BORON BUDGET IN THE OCEANS,
Florida State Univ., Tallahassee. Dept. of Oceanography.
R. C. Harriss.
In: Environmental Framework of Coastal Plain Estuaries; 18th Annual Meeting of Southeastern Section of the Geological Society of America, April 10-11, 1969, Columbia, S C: Geological Society of America, Inc, Memoir 133, p 71-77, 1972. 1 tab, 39 ref.

Descriptors: *Water chemistry, *Estuaries, *Boron, Salinity, Sea water, Water balance, Mineralogy, Sedimentation, Adsorption, Chemical precipitation.

A quantitative mass balance calculation indicates that mineral-water reactions in estuaries are the primary control on the boron content of seawater. The total annual removal of boron from the oceanic reservoir by mineral-water reactions and biogenic sedimentation is approximately equal to the total annual influx of boron in continental drainage, indicating that under present conditions the boron content of seawater is about constant with time. Because the buffer system controlling the boron content of seawater is independent of buffer systems controlling most other elemental concentrations in seawater, a constant boron-salinity relation over long periods of geologic time cannot be expected. (See also W74-07225) (Knapp-USGS)
W74-07227

COMPARISON OF CONDITIONAL STABILITY CONSTANTS OF NORTH CAROLINA HUMIC AND FULVIC ACIDS WITH CO(II) AND FE(III),
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5B.
W74-07228

AMAZON RIVER ESTUARINE SYSTEM,
Northwestern Univ., Evanston, Ill. Dept. of Geology.
R. J. Gibbs.
In: Environmental Framework of Coastal Plain Estuaries, 18th Annual Meeting of Southeastern Section of the Geological Society of America, April 10-11, 1969, Columbia, S C: Geological Society of America, Inc, Memoir 133, p 85-88, 1972. 2 fig, 1 tab, 2 ref.

Descriptors: *Estuaries, *Mixing, *Stratified flow, Saline water intrusion, Water circulation, Density stratification.
Identifiers: *Amazon River.

Results of preliminary survey of the water circulation in the Amazon estuary during high river and low river discharge indicate that, due to the river's large discharge, no saltwater wedge enters the Amazon estuary. Rather, an area of turbulent mixing near the river mouth is indicated by a zone a nearly vertical isohalines. As the vertical mixing decreases seaward, vertical stratification develops offshore, persisting seaward across the continental shelf. (See also W74-07225) (Knapp-USGS)
W74-07229

BIODEPOSITION AS A FACTOR IN SEDIMENTATION OF FINE SUSPENDED SOLIDS IN ESTUARIES,
Virginia Inst. of Marine Science, Gloucester Point.
D. S. Haven, and R. Morales-Alamo.
In: Environmental Framework of Coastal Plain Estuaries; 18th Annual Meeting of Southeastern Section of the Geological Society of America, April 10-11, 1969, Columbia, SC: Geological Society of America, Inc., Memoir 133, p 121-130, 1972. 6 fig, 1 tab, 16 ref. AEC Grant AT-(40-1)-2789.

Descriptors: *Deposition(Sediments), *Sedimentation, *Estuaries, Sedimentology, Benthos, Settling velocity, Suspended load.
Identifiers: Biodeposition(Sediments).

Filter feeders, such as mollusks, tunicates, and barnacles, ingest particles as small as 1 micron during their feeding process and void them in fecal pellets which range from 500 to 3,000 microns in length, these pellets settle at a much faster rate than their component particles. Oyster biodeposits contain 77% to 91% inorganic matter, 4% to 12% organic carbon, and about 1.0 gram per kilogram of phosphorus. Fecal pellets are alternately deposited and resuspended by tidal currents. They settle and accumulate in areas of estuaries where the fine particles themselves would not. A portion of the biodeposits settling on sediment surfaces is mixed into subsurface deposits and may alter the textural and chemical properties of the original sediments. (See also W74-07225) (Knapp-USGS)
W74-07231

SPATIAL AND TEMPORAL DISTRIBUTION OF SUSPENDED SEDIMENT IN NARRAGANSETT BAY AND RHODE ISLAND SOUND,
Naval Underwater Systems Center, Newport, R.I.
R. W. Morton.
In: Environmental Framework of Coastal Plain Estuaries; 18th Annual Meeting of Southeastern Section of the Geological Society of America, April 10-11, 1969, Columbia, SC: Geological Society of America, Inc, Memoir 133, p 131-141, 1972. 7 fig, 5 ref.

Descriptors: *Sediment load, *Suspended load, *Sedimentation, *Estuaries, Rhode Island, Distribution patterns, Sedimentation rates.
Identifiers: *Narragansett Bay(R.I.), Rhode Island Sound.

The suspended sediment concentrations in Narragansett Bay and Rhode Island Sound were measured using a continuous-flow centrifuge. Average concentrations were 3.17 milligrams of sediment per liter in the Bay and 1.83 milligrams per liter in the Sound. Most of the sediment entering the estuary from the tributaries is deposited near the head of the Bay, but there is a secondary depositional area near the center of the Bay in zones of weak and variable currents. The average rate of deposition for the entire bay during the fall months was 0.092 grams per square centimeter per year, and the net transport through the estuary was 10% of the tributary sediment load, or 910 grams per second. (See also W74-07225) (Knapp-USGS)
W74-07232

SUSPENDED SEDIMENT TRANSPORT IN DELAWARE BAY,
Millersville State Coll., Pa.
B. L. Oostdam, and R. R. Jordan.
In: Environmental Framework of Coastal Plain Estuaries; 18th Annual Meeting of Southeastern Section of the Geological Society of America, April 10-11, 1969, Columbia, SC; Geological Society of America, Inc, Memoir 133, p 143-149, 1972. 4 fig, 17 ref.

Descriptors: *Sediment transport, *Suspended load, *Estuaries, Currents(water), Advection, Sampling, Tides, Water circulation.
Identifiers: *Delaware Bay.

Sverdrup's simple advective model of estuarine circulation is extended to include suspended sediment transport. Substitution of average flow and turbidity figures suggests a net landward suspended sediment transport into Delaware Bay near the bottom. The resulting projected sedimentation rate of 15 cm per century corresponds reasonably well with figures for the regional relative sea-level rise. In the Delaware Bay mouth, two stations located in fingerlike channels near both shores show net landward sediment transport over a tidal cycle at almost all depths, whereas a station near the center of the bay mouth displays net seaward transport at all levels. (See also W74-07225) (Knapp-USGS)
W74-07233

TRIBUTION AND TRANSPORTATION OF SPENDED SEDIMENT IN UPPER EASAPEAKE BAY,
ns Hopkins Univ. Baltimore, Md. Chesapeake y Inst.
. Schubel.
Environmental Framework of Coastal Plain uaries; 18th Annual Meeting of Southeastern tion of the Geological Society of America, ril 10-11, 1969, Columbia, SC: Geological iety of America, Inc, Memoir 133, p 151-167, 2. 12 fig, 17 ref.

scriptors: *Sedimentation, *Sediment trans-t, *Estuaries, *Chesapeake Bay, Suspended d, Water circulation, Streamflow, Floods, Peak charge, Distribution patterns.
ntifiers: *Susquehanna River.

he upper reaches of the Chesapeake Bay there ur two distinctive distributions of suspended iment and associated patterns of sediment nsport. During the spring freshet the squehanna River overpowers the characteristic tidal estuarine circulation in the upper 20 to 30 meters of the estuary, and the net flow and iment transport are seaward at all depths. The rked decrease seaward of the concentration of pended sediment in the upper bay reveals the se link, during the freshet, between the pended sediment and the principal ultimate rce of sediment--the Susquehanna River. With siding river flow the net nontidal estuarine cir-ation is reestablished in the upper bay, and a bidity maximum is formed. The high concentra-ns of suspended sediment, greater than those ier farther upstream in the source river or ther seaward in the estuary, are produced and intained primarily by the periodic resuspension ottom sediment by tidal scour and by the sedi-nt trap created in the upper reaches of the uarine circulation regime. (See also W74-07225) napp-USGS)
4-07234

O DE LA PLATA ESTUARY ENVIRON-NTS,
mont-Doherty Geological Observatory, isades, N. Y.
M. Urien.
Environmental Framework of Coastal Plain uaries; 18th Annual Meeting of Southeastern tion of the Geological Society of America, ril 10-11, 1969, Columbia, S C: Geological iety of America, Inc, Memoir 133, p 213-234, 2. 10 fig, 4 tab, 12 ref.

scriptors: *Estuaries, *Sedimentation, Cur-nts(Water), Water circulation, Sediment trans-t, Beaches, Sands, Silts.
ntifiers: *Argentina(Rio de la Plata).

e Rio de la Plata is an estuary 220 km long and to 230 km wide in Argentina. The upper river a freshwater invironment where the Uruguay Parana River systems converge. The Parana er is building a delta in the upper Rio de la ta. The hydraulic system has an average yearly charge of 25,000 cu m per sec. The mouth of estuary is open to the sea. Because the tide, l currents, wind, and waves affect the fluvial charge, the river flow is not continuous. Ap-ently the saltwater influence on sedimentation ess than that of dynamic action. Over the estua-bottom lie silty sand and silty clay. The river iment supply consists mainly of silt and clay. In upper estuary the sand is scarce and localized anks, bars, and beaches. In the outer estuary a d carpet extends from the inner continental lf into the estuary. These are relict sands of the Holocene transgression which invaded the uary between 7,000 and 3,000 years B.P. After locene time fluvial mud facies covered, in part, transgressive sands. The south coastal en-nment is estuarine, with its maximum develop-nt in Samborombon Bay. The north coast is ky and sandy with pocket beaches. The regional estuarine environment is mostly fluvial, but the mixing of ocean waters creates a gradual change from fluvial in the upper river to fluvio-marine and marine in the outer river. (See also W74-07225) (Knapp-USGS)
W74-07236

REGIONAL CLAY MINERAL FACIES IN ESTUARIES AND CONTINENTAL MARGIN OF THE UNITED STATES EAST COAST,
Geological Survey, Woods Hole, Mass.
J. C. Hathaway.
In: Environmental Framework of Coastal Plain Esutaries; 18th Annual Meeting of Southeastern Section of the Geological Society of America, April 10-11, 1969, Columbia, S C: Geological Society of America, Inc, Memoir 133, p 293-316, 1972. 14 fig, 31 ref.

Descriptors: *Sedimentation, *Estuaries, *Provenance, *Atlantic Coastal Plain, *Clay minerals, Clays, Kaolinite, Illite, Mineralogy, Sediment transport, Facies(Sedimentation), Southeast U.S., Northeast U.S.

The clay minerals in many estuaries of the eastern United States differ from these in the sediments of the rivers that feed these estuaries. Illite and chlorite are characteristic minerals of the estuaries as far south as Chesapeake Bay, yet chlorite is minor and illite is reduced in concentration in the rivers south of the Hudson. Dioctahedral vermiculite is common in river sediments along the entire coast, yet it is important in estuarine sediments only in Pamlico Sound and the Neuse River estuary, North Carolina. Two major clay mineral facies are observed in the estuaries and on the continental margin: a northern facies characterized by illite, chlorite, and traces of feldspar and hornblende, and a southern facies characterized by montmorillonite and kaolinite. The similarity in composition between Chesapeake Bay and the estuaries to the north may be the result of reworking and redeposition of sediments contributed during Pleistocene time, inasmuch as the Chesapeake is the southermost estuary fed by rivers that drained glaciated areas. Shoreline erosion and reworking of still older sediments on the shelf probably also contribute clay to the estuarine sediments. Bottom drift directions suggest that clay material is moved southward along the shelf and into the mouths of the estuaries; there tidal mixing homogenizes the clay mineral composition over large areas. (See also W74-07225) (Knapp-USGS)
W74-07237

SOURCE OF RECENT NEARSHORE MARINE CLAYS, SOUTHEASTERN UNITED STATES,
Western Washington State Coll., Bellingham. Dept. of Geology.
D. R. Pevear.
In: Environmental Framework of Coastal Plain Estuaries; 18th Annual Meeting of Southeastern Section of the Geological Society of America, April 10-11, 1969, Columbia, S C: Geological Society of America, Inc, Memoir 133, p 317-335, 1972. 14 fig, 38 ref.

Descriptors: *Sedimentation, *Estuaries, *Provenance, *Atlantic Coastal Plain, *Clay minerals, Clays, Kaolinite, Illite, Mineralogy, Sediment transport, Facies(Sedimentation), *Southeast U.S.

Clays in the fine fraction of nearshore marine sediments from the southeastern United States are mineralogically different from clays from the rivers which drain into nearshore areas. River clays average 60% kaolinite with vermiculite nest in abundance, and illite, chlorite, and montmorillonite present in minor amounts. The main source of river clay must be the weathered feldspathic metamorphic rocks of the Piedmont. Small rivers which rise in the Coastal Plain carry montmorillonite and kaolinite, but their quantitative contribution to nearshore areas is very small. Nearshore marine clays of Florida, Georgia, and South Carolina average 50% montmorillonite, whereas those of North Carolina contain both illite and montmorillonite in abundance. A significant part of the nearshore clays must, therefore, come from nonriver sources. Shelf clays are montmorillonitic except off North Carolina where they are illitic as well. Hence, some nearshore clays may be derived either from the shelf or perhaps from erosion of coastal Pleistocence outcrops. Some illitic clay may be transported southward to North Carolina from shore and shelf areas to the north, but this mechanism appears not to operate south of North Carolina. River vermiculite may absorb potassium in the marine environment and collapse to illite. (See also W74-07225) (Knapp-USGS)
W74-07238

MASS PHYSICAL AND ENGINEERING PROPERTIES OF SOME YORK RIVER SEDIMENTS,
Lafayette Coll., Easton, Pa. Dept. of Geology.
R. W. Faas.
In: Environmental Framework of Coastal Plain Estuaries; 18th Annual Meeting of Southeastern Section of the Geological Society of America, April 10-11, 1969, Columbia, S C: Geological Society of America, Inc, Memoir 133, p 337-347, 1972. 4 fig, 4 tab, 14 ref. NSF Grant GY-4092.

Descriptors: *Sedimentology, *Soil strength, *Bottom sediments, *Virginia, *Estuaries, Silts, Clay, Sands, Mechanical properties, Shear strength.
Identifiers: *York River(Va).

In two 232-square-meter areas of the bottom sediments of the York River, Yorktown, Virginia, sediments found in 9 meters of water were clayey silts and those at 4 meters were silty and clayey sands. Some representative ranges for mass properties of the clayey silts are: buld (wet) density, 1,41 to 1.23; moisture content, 222% to 144%; porosity, 85% to 79%. For the silty and clayey sands, the same properties are bulk (wet) density, 2.43 to 1.27; moisture content, 97% to 49%; and porosity, 71% to 56%. In situ strength is consistently higher and has lesser variability than laboratory strength. Disturbance of the sedimentary fabric due to coring is believed responsible. (See also W74-07225) (Knapp-USGS)
W74-07239

STRONTIUM ISOTOPE COMPOSITION AND SEDIMENT TRANSPORT IN THE RIO DE LA PLATA ESTUARY,
Lamont-Doherty Geological Observatory, Palisades, N. Y.
P. E. Biscaye.
In: Environmental Framework of Coastal Plain Estuaries; 18th Annual Meeting of Southeastern Section of the Geological Society of America, April 10-11, 1969, Columbia, SC: Geological Society of America, Inc, Memoir 133, p 349-357, 1972. 3 fig, 1 tab, 11 ref. AEC contract AT (30-1) 4055.

Descriptors: *Tracers, *Strontium radiosotopes, *Sedimentology, *Estuaries, Sedimentation, Sediment sorting, Provenance, Sediment transport, Particle size.
Identifiers: Rubidium, *Argentina(Rio del la Plata estuary).

Rubidium, strontium, and strontium isotope composition were analyzed on a suite of whole, surface-sediment, carbonate-free samples from the Plata estuary, its major source rivers and the adjacent continental shelf. Rubidium and strontium analyses were also made on the greater-than-20-micron and less-than-20-micron fractions of the samples to determine the effect of size frequency distribution on one of the parameters. Because the Rb to Sr ratio and the Sr-87 to Sr-86 ratio varies with grain size, some of the large variability in Sr-87 to Sr-86 in the Plata must be due to differential

sedimentation processes within the estuary. Consideration of the data on an isochron diagram reduces some of this ambiguity and is consistent with an interpretation of two major sources of sediment in the estuary. These sources are the rivers Parana and Uruguay at the head of the estuary and Argentine continental shelf sediment at the mouth. A third source, Uruguayan shield material, along the estuary's north shore, is not distinguishable. (See also W74-07225) (Knapp-USGS)
W74-07240

TECHNIQUES FOR USE OF ORGANIC AND AMORPHOUS MATERIALS IN SOURCE INVESTIGATIONS OF ESTUARY SEDIMENTS,
J. Neiheisel.
In: Environmental Framework of Coastal Plain Estuaries; 18th Annual Meeting of Southeastern Section of the Geological Society of America, April 10-11, 1969, Columbia, SC: Geological Society of America, Inc, Memoir 133, p 359-381, 1972. 12 fig, 5 tab, 8 ref.

Descriptors: *Estuaries, *Bottom sediments, *Organic matter, *Analytical techniques, Electron microscopy, X-ray diffraction, Iron, Coak, Pyrite, Provenance, Differential thermal analysis, Water pollution sources, Gravimetric analysis, Mass spectrometry.

The organic materials in fine-grained Delaware estuary bottom sediment were determined by a combination of the electron microscope, mass spectrometer, chemical techniques, and thermal methods. Amorphous diatoms were identified by scanning electron micrographs, and were quantitatively determined by differential caustic leach methods. Amorphous hydrous iron compounds were determined by the sodium dithionite method. An especially effective combination of techniques to evaluate the pyrite, organic matter, and anthracite coal in the sediment was the use of differential thermal analysis, thermogravimetric analysis, and the mass spectrometer. The anthracite coal occurred in negligible amounts north of the confluence of the Schuylkill and Delaware Rivers and displayed progressive dispersal southward in the estuary. The coal had essentially a point source in the Schuykill River watershed that drains the anthracite coal fields of Pennsylvania. The greater amount of organic matter found in the vicinity of larger cities was attributed largely to sewage. Amorphous opaline diatoms were generally best represented in the more organic-rich sediment. Amorphous iron compounds appeared more abundant in the sediment in proximity to acid effluent discharge from industry. (See also W74-07225) (Knapp-USGS)
W74-07241

PROCESSES AFFECTING GAS DISTRIBUTIONS IN ESTUARINE SEDIMENTS,
Alaska Univ., College. Inst. of Marine Science.
W. S. Reeburgh.
In: Environmental Framework of Coastal Plain Estuaries; 18th Annual Meeting of Southeastern Section of the Geological Society of America, April 10-11, 1969, Columbia, S C: Geological Society of America, Inc, Memoir 133, p 383-389, 1972. 6 fig, 6 ref. AEC contract AT(30-1)-3497.

Descriptors: *Water chemistry, *Chesapeake Bay, Carbon dioxide, Nitrogen, Bubbles, Methane, Argon, Hydrogen sulfide, Mixing.
Identifiers: *Dissolved gases.

Summer and winter depth distributions of Ar, N2, CH4, total CO2, and total H2S were obtained at two stations in Chesapeake Bay. The data indicate that CH4 escapes the sediments as bubbles, stripping Ar and N2 from the sediments. Total CO2 increases to concentrations greater than 1,000 milliliters per liter with depth, and pH remains constant at about 7. Low and uniform total H2S concentrations indicate removal of sulfur as iron sulfides. The absence of CH4 in the upper 25 centimeters of these sediments and the presence of Ar and N2 in concentrations similar to the overlying water indicate mixing to at least this depth (See also W74-07225) (Knapp-USGS)
W74-07242

TEXTURE AND ORGANIC CARBON CONTENT OF BOTTOM SEDIMENTS IN SOME ESTUARIES OF THE UNITED STATES,
Middlebury Coll., Vt.
D. W. Folger.
In: Environmental Framework of Coastal Plain Estuaries; 18th Annual Meeting of Southeastern Section of the Geological Society of America, April 10-11, 1969, Columbia, S C: Geological Society of America, Inc, Memoir 133, p 391-408, 1972. 13 fig, 48 ref. USGS contracts 14-08-0001-11498 and 14-08-0001-11987.

Descriptors: *Sedimentation, *Estuaries, Provenance, Distribution patterns, Clays, Silts, Sands, Mineralogy, Sediment transport, Facies(Sedimentary), *Bottom sediments, Sediment sorting, United States, Sediment distribution, *Organic matter.
Identifiers: *Organic carbon.

Most estuaries, lagoons, and bays of the United States can be divided into four groups based on the distribution of sediment texture at the bottom. Differences between groups reflect the geologic, hydrologic, and bathymetric conditions under which the sediments were deposited. Areas representative of each group include Penobscot Bay, Maine, where widespread clay near the head grades seaward into silt and sand near the mouth; San Francisco Bay, California, where sand accumulated mostly in channels and silt and clay are widespread on tidal flats and shallow areas around the bay margin; Mississippi Sound, Mississippi and Alabama, where silt and clay cover most of the bottom and sand is abundant around the margins; and Pamlico Sound, North Carolina, where sand covers most of the bottom and silt and clay are limited to the deepest areas and channel bottoms. Organic carbon concentrations in bottom sediments are most relatively unpolluted estuaries (Penobscot Bay, Maine; Apalachicola Bay, Florida) are less than 5%; only where vegetal matter is abundant (Whitewater Bay, Florida) or where bottom waters are anaerobic (Deep Inlet, Alaska) are values of natural organic carbon commonly higher. Abundant organic pollutants in estuarine waters (Boston Harbor, Massachusetts; Charleston Harbor, South Carolina) are often relected by organic carbon concentrations in bottom sediments of 10% to 20%. (See also W74-07225) (Knapp-USGS)
W74-07243

BIOGEOCHEMICAL VARIABLES IN BOTTOM SEDIMENTS OF THE RAPPHANNOCK RIVER ESTUARY,
South Carolina Univ., Columbia. Coll. of Arts and Sciences.
B. W. Nelson.
In: Environmental Framework of Coastal Plain Estuaries; 18th Annual Meeting of Southeastern Section of the Geological Society of America, April 10-11, 1969, Columbia, S C: Geological Society of America, Inc, Memoir 133, p 417-451, 1972. 14 fig, 1 tab, 21 ref.

Descriptors: *Bottom sediments, *Estuaries, *Virginia, *Biochemistry, Stratigraphy, Biodegradation, Organic matter, Oxidation-reduction potential, Salinity.
Identifiers: Biogeochemistry, *Rappahannock estuary.

A transition from undifferentiated mud to estuarine sediment occurs in the bottom of the Rappahannock River estuary, Virginia, between the sediment-water interface and 100 centimeters in depth. The sediment profiles and their chemical properties respond to a dynamic equilibri between sedimentation rate depositional rate organic detritus, and microbiological activity T equilibrium is influenced by the gene bathymetry and intensity of physical proces near the bottom, the salinity and ventilation of bottom water, the composition of organic detrit and sediment compaction processes such as watering and gas ebullition Below 50 centimet in depth, Eh typically becomes positive In lower estuary, less intense physical process greater water depths and higher salinities ca higher rates of microbial activity. The chemi properties of estuarine sediment respond to t biological, chemical, and physical forces in th environment, and the particular expression profile development at any location tends reflect a dynamic equilibrium between the forces. (See also W74-07225) (Knapp-USGS)
W74-07244

RECENT ESTUARINE SEDIMENT HISTOR OF THE ROANOKE ISLAND AREA, NORT CAROLINA,
East Carolina Univ., Greenville. Dept. of Geolog
M P O'Connor, S R Riggs, and D Winston
In Environmental Framework of Coastal Pla Estuaries; 18th Annual Meeting of Southeaste Section of the Geological Society of Americ April 10-11, 1969, Columbia, SC: Geologic Society of America, Inc, Memoir 133, p 453-46 1972 6 fig, 1 tab, 6 ref.

Descriptors: *Sedimentation, *Erosio *Estuaries, *North Carolina, Water circulatio Barrier islands, Beaches, Sediment load, Strea flow, Atlantic Coastal Plain, Currents(Wate Sediment transport.
Identifiers: *Roanoke Island(NC).

Estuarine sediments from Croatan, Roanoke, a northernmost Pamlico Sounds in The Roanok Island area of North Carolina demonstrate com plex patterns of deposition and erosion. The sed ments reflect the dynamic interplay between t freshwater and saltwater systems, as controlled b the shifting barrier island inlets from the Atlant Ocean and the freshwater discharge from th mainland. During recorded history, and prior t 1817, inlets adjacent to or north of Roanoke Islan were continuously open. During this time most o the Roanoke Island area was characterize predominantly by sediment deposition within clear, saline, and productive estuarine system ha ing a diverse benthic marine fauna. With the clo ing of the last of the northern inlets in 1817, th discharge from the Albemarle drainage syste was diverted around Roanoke Island, widenin and deepening Croatan Sound, and producing highly variable, turbid, brackish water enviro ment characterized by a restricted benthic faun Today, Croatan Sound is characterized in the cen tral portions by active scour that exposes pr Holocene peats and fossiliferous fine sands, ero sion of the Recent salt marshes and peat bed along the shorelines, and slow deposition of ver fine and fine-grained sediments over much of th rest of the area. Northermost Pamlico Sound i characterized by a shifting erosional-deposition regime to which fine-grained sand is supplied b the tidal currents of Oregon Inlet. Roanoke Soun is characterized primarily by a depositional regim in which fine sand, derived from the Atlanti system by wind action and storm washover, is ac tively filling the shallow sound. (See also W74 07225) (Knapp-USGS)
W74-07245

EROSIONAL AND DEPOSITIONAL ESTUARINE 'TERRACES,' SOUTHEASTERN UNITED STATES,
Georgia Univ., Sapelo Island. Marine Inst.
J. H. Hoyt.
In: Environmental Framework of Coastal Plain Estuaries; 18th Annual Meeting of Southeastern Section of the Geological Society of America

ril 10-11, 1969, Columbia, S C: Geological ciety of America, Inc, Memoir 133, p 465-473, 2. 5 fig, 32 ref.

scriptors: *Erosion, *Sedimentation, stuaries, *Terraces(Geologic), Sea level, position(Sediments), Scour, Surf, omorphology, Surfaces, Water levels, outheast U.S.

er the formation of barrier islands, sediment umulation in lagoons produces to major sur- es which form concurrently at the base and top estuarine deposits. These surfaces range from s than one-half to more than 30 km wide, and separated by as much as 30 m of estuarine sedi- nt. The basal surface is erosional and is shaped the shifting estuarine channels. Relief may be nuch as several meters; the surface is undulato- and slopes gently seaward. Basal estuarine osits are clayey sands and gravels. Gravels nmonly are angular, and cut and fill structures cross-stratification are abundant. The upper t of the estuarine deposits, the salt marsh sedi- nts, are mainly clayey sands and silts, com- nly cut by channels. The surface at the top of estuarine sequence is depositional, the result agoonal filling which converts this area to a salt rsh. The upper limit of deposition is spring high e. Relief may be several tens of meters as a ilt of channels. Only the depositional surrface ld be considered a morphological terrace; how- r, during late stages of barrier island-estuarine velopment, when sediment supply may be insuf- ent to maintain the barriers, marine erosion y produce a wave cut and fill terrace. This type terrace is rare in Quaternary deposits of theastern United States because of modifica- n and burial during the subsequent formation of two major estuarine surfaces. (See also W74-25) (Knapp-USGS)
4-07246

NTEE SUBMERGENCE, EXAMPLE OF CLIC SUBMERGED AND EMERGED QUENCES,
ith Carolina Univ., Columbia. Dept. of Geolo-

J. Colquhoun, T. A. Bond, and D. Chappel.
Environmental Framework of Coastal Plain uaries; 18th Annual Meeting of Southeastern tion of the Geological Society of America, ril 10-11, 1969, Columbia, SC: Geological iety of America, Inc, Memoir 133, p 475-496, 2. 17 fig, 2 tab, 9 ref. NSF Grant GB-7375.

scriptors: *Erosion, *Sedimentation, tuaries, *Terraces(Geologic), Sea level, position(Sediments), Scour, Surf, omorphology, Surfaces, Water levels, *South olina.
ntifiers: *Santee River(So. Car.).

surface geologic maps obtained through auger ling investigation in east-central South Carolina strate cyclic development of terrace formations ing continental submergence and emergence. ient estuarine deposits form part of these ter- e formations. The history of filling of two val- systems, the Piedmont draining Santee River the Coastal Plain draining Cooper River, are mined through three-dimensional stratigraphic uences in the Illinoian-Sangamon and in the locene. Initial erosional disconformities are ceeded by alluvial aggraded bed load and over- k sediments, estuarine clay and marsh clay , shoestring channel fill sands, and deltaic sedi- nts that prograde seaward. The Holocene estua- are in a very early stage of the continental and ine submerged cycles, compared to the full le sediments of the ancient units. (See also 4-07225) (Knapp-USGS)
4-07247

MARINE GEOLOGY AND ESTUARINE HISTORY OF MOBILE BAY, ALABAMA: PART 1. CONTEMPORARY SEDIMENTS,
Florida State Univ., Tallahassee. Dept. of Oceanography.
J. J. Ryan, and H. G. Goodell.
In: Environmental Framework of Coastal Plain Estuaries; 18th Annual Meeting of Southeastern Section of the Geological Society of America, April 10-11, 1969, Columbia, S C: Geological Society of America, Inc, Memoir 133, p 517-554, 1972. 17 fig, 8 tab, 51 ref.

Descriptors: *Sedimentation, *Estuaries, *Alabama, Gulf coastal plain, Sedimentation rates, Sediment distribution, Bottom sediments, Water circulation, Suspended load, Sediment sorting, Mineralogy, Clays, Sands, Silts.
Identifiers: *Mobile Bay(Ala).

An annual average of 4.3 million metric tons of suspended sediment are being transported into the Mobile Bay estuary. The dominant terrigenous clastics are quartz, kaolinite, and montmorillonite. Circulation patterns within the estuary are controlled primarily by river discharge, tides, and geometry of the bay. Comparisons of the bathymetry of 1847 ti 1851 and 1960 to 1962 indicate an average shoaling of 56 cm per century. Aporoximately 1.3 million metric tons of suspended sediment is currently bypassing the estuary of being deposited to the south and west of the tidal inlet. Clean quartz sands occur around the periphery of the bay generally in water depths less than 2 m. Most of the bay bottom sediments consist of silty clays and clays. Grain size decreases and sorting increases downbay and to the southeast. Higher montmorillonite content near the bay-head delta and increasing kaolinite content toward the southeast in Bon Secour Bay are attributed to sediment dispersal patterns, differences in sedimentation rates, and to increase in kaolinite content in the suspended river sediments over the historic period, the result of the development of agriculture within the drainage basin. The distribution and ages of buried oyster reefs indicate a progressive downbay migration in response to progradation of the bay-head delta. (See also W74-07225) (Knapp-USGS)
W74-07248

EFFECTS OF MAN-MADE WORKS ON THE HYDRAULIC, SALINITY, AND SHOALING REGIMENS OF ESTUARIES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Div.
For primary bibliographic entry see Field 5C.
W74-07249

EFFECT OF INCREASING DEPTH ON SALINITY IN THE JAMES RIVER ESTUARY,
Virginia Inst. of Marine Science, Gloucester Point.
M. M. Nichols.
In: Environmental Framework of Coastal Plain Estuaries; 18th Annual Meeting of Southeastern Section of the Geological Society of America, April 10-11, 1969, Columbia, S C: Geological Society of America, Inc, Memoir 133, p 571-589, 1972. 11 fig, 2 tab, 15 ref.

Descriptors: *Estuaries, *Water circulation, *Sedimentation, *Water control, *Environmental effects, Dams, Dredging, River training, Flood control, Levees, Reservoir operation, *Salinity, Streamflow, Hydraulic models.
Identifiers: *James River Estuary(Va).

The effects of channel deepening on the salinity and density flow in the James River estuary, Virginia, were studied to predict changes that might affect oyster production. A hydraulic model with 1:1,000 horizontal and 1:100 vertical scales was employed to integrate three-dimensional changes in salinity and velocity through reaches of variable bottom geometry. After natural characteristics of the tide, current, and salinity were reproduced in the model, tests were run at three levels of steady river inflow, before and after a 3-meter channel deepening. Deepening produced the greatest salinity change in the middle estuary, where the major cut was performed. The lower water layer located mainly in the channel became saltier by about 0.5 part per thousand, whereas the upper layer over the oyster shoals became fresher by about 0.2 part per thousand. Changes in bottom water salinity were greatest at intermediate inflow and least at very low inflow. High freshwater inflow created the greatest change in vertical salinity gradient. With greater stratification, tidal velocities were less effective in promoting vertical mixing between lower and upper estuarine water layers, and the net volume transport in each layer was reduced. Since the changes in salinity and flow pattern due to channel deepening were small, no effects inimical to the oyster fishery were predicted. Similarly the prospective changes in sedimentary regime will not offset the beneficial effects of the proposed deepening project. (See also W74-07225) (Knapp-USGS)
W74-07250

HYDROLOGY OF THE DUNES AREA NORTH OF COOS BAY, OREGON,
Geological Survey, Portland, Oreg.
J. H. Robison.
Open-file report, 1973. 62 p, 30 fig, 2 plate, 15 tab, 23 ref, append.

Descriptors: *Hydrogeology, *Surface-groundwater relationships, *Oregon, Water levels, Anisotropy, *Dunes, Coasts, Analog models, Withdrawal, Water yield, Safe yield, Water resources development.
Identifiers: *Coos Bay(Oreg).

Hydrology of a 20-sq-mi area of dunes along the central Oregon coast was studied. The area is underlain by 80 to 150 feet of Quaternary dune and marine sand which overlies Tertiary marine clay and shale. Groundwater for industrial and municipal use is being withdrawn at a rate of 4 million gallons per day. Plans to withdraw as much as 30 million gallons per day are limited by the prospect of excessive lowering of levels in shallow lakes near the wells, and possibly seawater intrusion, if water-level gradients are reversed. At the present stage of development there are 18 production wells, each capable of producing 200-300 gallons per minute from the lower part of the sand deposits. Except for thin layers of silt, clay, and organic matter, the deposits of sand are clean and uniform; horizontal permeability is 100 times the vertical permeability. Because of the low vertical permeability, drawdown cones are not evident in the upper part of the aquifer adjacent to the wells. However, present pumping lowers general water levels in the lakes and the shallow groundwater zone by several feet. A two-layer electric analog model was built to analyze effects of present and projected development as well as any alternate plans. Model results were used to develop curves for short-term prediction of water levels. (Knapp-USGS)
W74-07325

SIZE AND SHAPE SORTING IN A DUTCH TIDAL INLET,
Groningen Rijksuniversiteit (Netherlands). Geological Inst.
A. M. Winkelmolen, and H. J. Veenstra.
Sedimentology, Vol 21, No 1, p 107-126, February 1974. 8 fig, 1 tab, 25 ref.

Descriptors: *Sediment sorting, *Particle size, *Particle shape, *Tidal waters, Deltas, Bottom sediments, Sediment transport, Littoral drift, Currents(Water).
Identifiers: Tidal flats, *Netherlands.

A tidal inlet system with an outer tidal delta, situated between two barrier islands along the north coast of Holland was studied for size and shape

sorting. Sand types can be distinguished using size data and distinct grain populations can be recognized. Graphs of shape values, plotted against the size intervals of samples also reveal the presence of different grain populations, together with their genetical significance. There is no sand transport directly from island to island. Sand of sizes up to 400 micrometers enters the tidal inlet, is sorted out in the tidal flat area and partly re-enters the sea via the outer tidal delta. On the delta, the sediment is split up again in different populations. A lag deposit is left behind on the frontal part of the delta. The rest of the sand either re-enters the tidal inlet cycle or contributes to the beach building of the next island. In the offshore environment, sand movement by wave-induced currents is restricted to the shallow zone. In deeper water, part of the sediment is relatively immobile and has preserved inherited characteristics from the early Holocene transgressive phase. In front of Ameland, fossil barrier-face deposits are present, off Schiermonnikoog the sea floor contains old tidal channel deposits. (Knapp-USGS)
W74-07329

FUNCTION OF MARSHES IN REDUCING EUTROPHICATION OF ESTUARIES OF THE MIDDLE ATLANTIC REGION,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 5C.
W74-07336

SEASONAL ABUNDANCE AND DISTRIBUTION OF JUVENILE BLUE CRABS IN CORE SOUND, N.C. 1965-1966,
National Marine Fisheries Service, Beaufort, N. C. Atlantic Estuarine Fisheries Center.
H. Judy.
Chesapeake Sci. Vol 14, No 1, p 51-55, 1973. Illus.
Identifiers: Callinectes-Sapidus, *Commercial fishery, *Crabs(Blue), Distribution, Juvenile, Migration, *North Carolina(Cove Sound), *Seasonal.

Studies were made in Core Sound, North Carolina to determine the abundance and distribution of juvenile blue crabs, Callinectes sapidus, and their subsequent relation to the commercial fishery. Estimates of juvenile abundance were based on catches of small crabs in the marsh creeks bordering Core Sound. Young-of-the-year blue crabs (2.5-5.0 mm) begin to enter Core Sound estuary in early Oct. These small crabs move through the open waters of the sound and bays into the small marsh creeks and remain there until the following spring. At this time (April-May) the juvenile crabs move into the bays and sound proper where they remain to maturity. Catch and effort statistics from Core Sound commercial crab fishery were collected from Nov. 1964 through June 1968. Landings of approximately 680,000 kg annually constitue the fishery. --Copyright 1973, Biological Abstracts, Inc.
W74-07350

MARINE FUNGI ISOLATED FROM A KRAFT PULP MILL OUTFALL AREA,
Simon Fraser Univ., Burnaby (British Columbia). Dept. of Biological Sciences.
For primary bibliographic entry see Field 5B.
W74-07396

ULTRA-VIOLET ABSORPTION CHARACTERISTICS OF NATURAL WATERS,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 2K.
W74-07419

SOME ASPECTS OF THE TEMPERATURE, OXYGEN AND NUTRIENT DISTRIBUTIONS IN MONTEREY BAY, CALIFORNIA. ANNUAL REPORT, PART 1, 1973,
Moss Landing Marine Labs., Calif.
For primary bibliographic entry see Field 5C.
W74-07469

FIELD AND EXPERIMENTAL STUDIES ON THE SYSTEMATICS AND ECOLOGY OF ULVA CURVATA AND ULVA ROTUNDATA,
North Carolina Univ., Chapel Hill. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W74-07473

BIOLOGICAL INVESTIGATIONS OF NOXIOUS COELENTERATES AND CTENOPHORES IN COASTAL NORTH CAROLINA,
North Carolina Univ., Morehead City. Inst. of Marine Sciences.
R. J. Schwartz, and A. F. Chestnut.
Available from the National Technical Information Service as COM73-11128, $7.00 in paper copy, $1.45 in microfiche. National Marine Fisheries Service, Washington, D.C., Report NOAA-73052109, April 1973. 96 p, 32 fig, 28 tab, 65 ref, append. JF-2-9. PL 88-309.

Descriptors: *Jelly fish, *Distribution, *North Carolina, *Coasts, Water temperature, Salinity, Systematics, Fish, Economic impact, Bibliographies.
Identifiers: *Coelenterates, *Ctenophores, Albermarle Sound(N.C.), Pamlico Sound(N.C.).

Preliminary to attempting to control or eliminate jellyfish and other such pests, in late 1971 a project was devised to determine what species of jelly-fishes and ctenophores inhabit North Carolinian waters, at what seasons, at what depths, and in what abundance. The study encompassed their life histories and needs, what associations of species and environment triggered or permitted their presence, and the effect upon man and his utilization of the area. The coastal estuarine and marine waters of North Carolina were divided into five sampling areas where the past geologic history, the physical and chemical features, temperature and salinity profiles, circulation and current patterns, and invertebrate fauna were studied. Extensive graphs, maps, and tabulations of their occurrences are included. Seven species of jelly-fishes and two ctenophores were encountered, each with a seasonal preference as to occurrence, water temperature, salinity, and depth distribution. A bibliography of coelenterates that occur in North Carolina and adjacent waters containing 94 references is appended. (Jones-Wisconsin)
W74-07479

INVESTIGATION OF THE BIOLOGY AND CONTROL OF NOXIOUS COELENTERATES OCCURRING IN THE COASTAL WATERS OF PUERTO RICO,
Puerto Rico Univ., Mayaguez. Dept. of Marine Sciences.
C. E. Cutress.
Available from the National Technical Information Service as COM73-11095, $4.25 in paper copy, $1.45 in microfiche. National Marine Fisheries Service, Washington, D.C. Report No. NOAA 73052118, July 1972. 40 p, 6 fig, 8 tab, 4 plates, 2 ref. JF-2-6. PL 88-309.

Descriptors: *Jelly fish, *Coasts, *Puerto Rico, Safety, Life history studies, Distribution, Beaches, Public health, Systematics, Mangrove swamps.
Identifiers: *Coelenterata, Cubomedusae.

Coelenterates long have been troublesome to fishermen and swimmers off the Puerto Rican coasts. Stingings occur regularly but seasonally, and occasionally in epidemic proportions at swimming beaches. Eight jellyfish species are at one time or another responsible for injuries to swimmers but three species are the major offenders. Extensive barrier coral reefs and mangrove lagoons off coastal Puerto Rico are the habitats of sessile stages of nearshore jellyfish species, some of which are bothersome to bathers. The pattern of occurrence and distribution of the principal stinging species seems to be correlated with nearshore hydrographic conditions and proximity of the beaches to mangrove lagoons suggesting that the problem in such instances might be alleviated by slight alterations of a physical feature of the shore. Investigation was begun with preliminary surveys of swimming beaches, marinas, and fishing ports allowing an insight into the nature and extent of the problem. Jellyfish collected during 1969 to 1971 are listed and some illustrated. Life histories of several are described. Of the 32 known jellyfish fauna off Puerto Rico, some are weak stingers while others, while rare, are capable of causing injury. (Jones-Wisconsin)
W74-07480

A STUDY OF THE MOVEMENT OF PHOSPHOROUS IN THE LITTLE RIVER ESTUARY, N.S.W.,
Australian Atomic Energy Commission Research Establishment, Lucas Heights.
For primary bibliographic entry see Field 5B.
W74-07483

AN INVESTIGATION OF PROPAGATION AND THE MINERAL NUTRITION OF SPARTINA ALTERNIFLORA,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 5C.
W74-07486

KELP HABITAT IMPROVEMENT PROJECT, ANNUAL REPORT JULY 1, 1970 - JUNE 30, 1971.
California Institute of Tech., Pasadena. W. M. Keck Lab. of Environmental Health Engineering.
For primary bibliographic entry see Field 5C.
W74-07489

KELP HABITAT IMPROVEMENT PROJECT, ANNUAL REPORT JULY 1, 1971 - JUNE 30, 1972.
California Institute of Tech., Pasadena. W. M. Keck Lab. of Environmental Health Engineering.
For primary bibliographic entry see Field 5C.
W74-07490

PROCEEDINGS 2ND ANNUAL TECHNICAL CONFERENCE ON ESTUARIES OF THE PACIFIC NORTHWEST.
Available from the National Technical Information Service as COM-73-11310; $4.25 in paper copy, $1.45 in microfiche. March 16-17, 1972. Oregon State Univ., Corvallis. Engineering Experiment Station Circular No 44, (1972). 111 p, 45 fig, 12 tab, 71 ref.

Descriptors: *Estuaries, *Conferences, *Pacific Northwest U.S., Migration, Oregon, Anadromous fish, Mathematical models, Primary productivity, Fjords, Ecosystems, Alaska, Tidal waters, Flow, Retention, Winds, Shore protection, Breakwaters, Economics, Water pollution control, Navigation, Protection, Zoning, Management.

Sensitivity of estuaries signals need for better understanding of estuarine processes but their complexity makes simplistic solutions unrealistic and detailed solutions difficult. Papers presented at this conference enhance the knowledge of estuarine ecosystems and of their physical properties--a prerequisite to intelligent management of estuarine and coastal areas. The following subjects are covered by contributors: Some estuarine factors influencing ascent of anadromous cutthroat trout in Oregon, A strategy for modeling primary production in stratified fjords, An ecosystem study in the inside passage of southeastern Alaska, Difficulties ahead for Oregon regarding estuary

regulations, control and protection, The National Shoreline Study, Physical modeling of residence times in tidal basins, The influence of wind on the surface waters of Alberni Inlet, State of the art of floating breakwaters, Laws and regulations of pollution and navigation in Pacific Northwest estuaries, Technical and economic issues in water quality management in Yaquina Bay, and Pacific Northwest coastal zone management as it relates to estuary protection. The development of policies and standards based on the carrying capacities of the natural resources should insure their protection. (See W74-07492 thru W74-07500) (Jones-Wisconsin)
W74-07491

NEW CONCEPTS IN ENVIRONMENTAL PLANNING,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6B.
W74-07492

SOME ESTUARINE FACTORS INFLUENCING ASCENT OF ANADROMOUS CUTTHROAT TROUT IN OREGON,
Oregon State Game Commission, Corvallis.
R. D. Giger.
In: Proceedings 2nd Annual Technical Conference on Estuaries of the Pacific Northwest, March 16-17, 1972. Oregon State Univ., Corvallis (Engineering Experiment Station Circular No 44), p 18-29 (1972). 9 fig, 13 ref.

Descriptors: *Estuaries, *Migration, *Anadromous fish, *Oregon, Geomorphology, Salinity, Water temperature, Distribution, Salmonids, Sport fishing, Dredging, Salmon, Depth, Cutthroat trout.
Identifiers: Alsea River(Ore), Siuslaw River(Ore), Nestucca River(Ore).

Study of coastal cutthroat trout, Salmo clarki clarki, on the north-central Oregon coast was directed primarily toward improvement of angler catches of hatchery-reared cutthroat through the manipulation of liberation times. To determine the timing and location of the estuary catch, information on fish distribution and movement was gathered and related to gross measurements of estuary geometry, salinity, and temperature. Results of estuary studies centering on the Alsea River are reported. Approximately 2000 sea-run cutthroat were captured and marked. More than 300 tags from these fish were subsequently returned providing information on timing of migration, estuary movements, length of estuary residence, and distribution and intensity of sport catch. Angler catch sampling gave additional information on food habits and fish movements. High temperatures in upper estuary areas of some coastal rivers prevent passage of fish that might otherwise migrate further upstream; as a result, ascending fish congregate in estuary areas of suitable temperature and depth immediately downstream until water temperatures moderate in the fall, thus the extended period of summer residence is advantageous to the estuary sport fisheries. Alteration of temperature regimes, depths, or perhaps other features could change fish distributional patterns and ultimately affect the success of fisheries. (See also W74-07491) (Jones-Wisconsin)
W74-07493

A STRATEGY FOR MODELING PRIMARY PRODUCTION IN STRATIFIED FJORDS,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W74-07494

AN ECOSYSTEM STUDY IN THE INSIDE PASSAGE OF SOUTHEASTERN ALASKA,
Oregon State Univ., Corvallis. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W74-07495

PHYSICAL MODELING OF RESIDENCE TIMES IN TIDAL BASINS,
Alaska Univ., College. Dept. of Ocean Engineering.
T. Carstens.
In: Proceedings 2nd Annual Technical Conference on Estuaries of the Pacific Northwest, March 16-17, 1972. Oregon State Univ., Corvallis (Engineering Experiment Station Circular No 44), p 59-65 (1972).

Descriptors: *Model studies, *Tidal effects, *Basins, *Retention, Fjords, Bathymetry, Prototypes, Stratification, Diffusion, Circulation, Estuaries.
Identifiers: *Residence time.

The memory of a water body depends on its topography and on the energy input. The memory is most conveniently described by a single parameter--residence time. The average residence time, defined as the ratio of total basin volume to the average throughflow, has only a limited value if the actual flux of renewal water does not flush the entire basin. Examples are given to demonstrate the need for a more detailed answer to the question of residence time than its gross average. It appears useful and necessary to break down the basin in sub-basins according to realistic estimates of the local residence time. Of particular interest in the feasibility of small-scale physical models are the possibilities of obtaining residual tidal currents quickly and inexpensively, compared with in situ observations, and simulating residence times in stratified basins. Restrictions on the method are that the tidal range should be appreciable and that some information is available on the vertical eddy diffusion coefficient from in situ tracer experiments. The small-scale physical model is not a high-precision tool, however its chief advantage is that it displays local closed circulations, which are ignored in the present generation of mathematical models. (See also W74-07491) (Jones-Wisconsin)
W74-07496

THE INFLUENCE OF WIND ON THE SURFACE WATERS OF ALBERNI INLET,
British Columbia Univ., Vancouver. Dept. of Physics.
D. M. Farmer.
In: Proceedings 2nd Annual Technical Conference on Estuaries of the Pacific Northwest, March 16-17, 1972. Oregon State Univ., Corvallis (Engineering Experiment Station Circular No 44), p 66-73 (1972). 9 fig, 5 ref.

Descriptors: *Winds, *Surface waters, *Inlets(Waterways), *Stratification, Model studies, Bays, Fjords, Currents(Water), Estuaries, Energy, Conductivity, *Canada.
Identifiers: *Alberni Inlet(Vancouver Island).

Strong winds occur along the steep-sided inlets of the Pacific Northwest with a profound effect on the density structure of their highly stratified surface waters. Alberni Inlet, Vancouver Island was chosen for the experiment, timed to coincide with a Canadian Hydrographic Service current and tide survey during the late winter and spring of 1971. Special instruments were built to measure conductivity. Wind was measured using four recording anemometers mounted 2 meters above the ground on exposed points. Observations of wind, current, and surface water layer thickness in Alberni Inlet have helped elucidate some of the ways in which the system responds to a surface stress. Much of the wind energy is diurnal and a close coupling exists at this frequency between wind and current at a depth of 2 meters. On the other hand, most of the energy associated with changes in the surface water layer thickness is of significantly lower frequency. A simple two-layer frictional model is able to explain much of what is observed and can be used to predict the surface layer thickness on the basis of measured wind speeds. (See also W74-07491) (Jones-Wisconsin)
W74-07497

STATE OF THE ART OF FLOATING BREAKWATERS,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8A.
W74-07498

LAWS AND REGULATIONS OF POLLUTION AND NAVIGATION IN PACIFIC NORTHWEST ESTUARIES,
Coast Guard, Portland, Oreg.
For primary bibliographic entry see Field 5G.
W74-07499

ENVIRONMENTAL PLANNING: AN ECONOMIC ANALYSIS. APPLICATIONS FOR THE COASTAL ZONE,
Clemson Univ., South Carolina. Dept. of Agricultural Economics and Rural Sociology.
For primary bibliographic entry see Field 6B.
W74-07534

TAXONOMIC POSITION OF TWO LUMBRINERIS SPP.,
Canterbury Univ., Christchurch (New Zealand). Dept. of Zoology.
G. A. Knox, and K. M. Green.
New Zealand Journal of Marine and Freshwater Research, Vol 7, No 3, p 247-252, September 1973. 2 fig, 8 ref.

Descriptors: *Worms, *Systematics, *Annelids, Speciation, *Australia.
Identifiers: *Lumbrineris, Polychaetes, Animal morphology, *New Zealand.

Two species with unusual features not typically seen in the Lumbrineridae have recently been found: one, identified as Lumbrineris mucronata, is from the north-east coast of Australia, and the other, identified as L. sulcaticeps, is from the south-east coast of New Zealand. Both species are unusual in that maxilla IV is multidentate. In addition, the entire surface of the plate is covered by small, hard projections, thus forming what appears to be a rasping plate; these projections give the pale-colored plate a speckled appearance. The posterior hooks of both species are simple, and basically bidentate. The hoods of these hooks are almost circular. (Mortland-Battelle)
W74-07568

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

SELF CLEANING, TUBULAR SOLAR STILL,
ESB, Inc., Philadelphia, Pa. (assignee).
J. P. Coffey, and J. C. Duddy.
U.S. Patent No 3,785,931, 3 p, 4 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 918, No 3, p 1163, January 15, 1974.

Descriptors: *Patents, *Distillation, *Desalination, *Solar stills, Water treatment, Solar radiation, *Evaporation, *Condensation, Separation techniques, Water quality control.

A microporous evaporator having a dark exterior surface is located within but not touching a concentric tube of clear material serving as a condensing surface. Raw water is fed to the top of the porous evaporator and slowly percolates down to the bottom of the member to a waste water drain.

Sunlight hitting the dark evaporator surface causes water to evaporate giving off pure water vapor. The water vapor is condensed on the inside of the clear tube. As condensed water collects on the clear tube, it runs down to be collected as purified water. The evaporator and condenser tube are normally located in a vertical or near vertical position. For tropic installation, simple reflectors direct the sun's rays on one or more tubes. For operation at higher latitudes, the tubes can be positioned so as to be more or less perpendicular to an average sun ray taking account of latitude declination and times of sunlight, or reflectors can be so directed. (Sinha - OEIS)
W74-07207

PLANNING AND OPERATIONAL STUDIES IN THE INTEGRATED USE OF DESALINATION. CASE STUDIES FOR CYPRUS AND JERSEY,
Water Research Association, Marlow (England).
P. A. Mawer, and T. Wyatt.
Desalination, Vol 13, No 3, p 333-342, December 1973. 7 fig, 1 tab, 2 ref.

Descriptors: *Water supply development, *Desalination, Desalination plants, *Long-term planning, Operation and maintenance, *Simulation analysis, Water quality control, Evaluation, Reliability, Optimization, Irrigation, Water demand, Surface waters, Systems analysis, Mathematical models.
Identifiers: *Cyprus, *Great Britain(Jersey-Channel Islands), Least cost, Control rules.

Two case studies are described relating to the integrated use of desalination with conventional water resources. The studies contrast the different requirements of a long-term planning study with those of an assessment of existing system operation. The first study is concerned with an examination of the potential role of desalination in the long-range development of Cyprus' water resources. Special features of this research are the strong influence of irrigation demands and the need to derive plans which are flexible against an only partially-defined future. The importance of extended periods of planning and preparatory plant operation is emphasized. The second study deals with the 1.5 mgd MSF plant operated by the Jersey New Water Works Company (Jersey, Channel Islands), where the objective is to maintain overall supply reliability at minimum cost. Greater attention is given to recognition of the detailed system constraints. The plant is operated in conjunction with an unusually complex system of surface water resources which present special difficulties in the optimization of control rules for the desalination plant. Discussed is a detailed model for simulating the system. Results, provided in the form of control rules, are also discussed. In both study cases, the most important need is to recognize the desalination plant as a component of the total water supply system. (Bell-Cornell)
W74-07308

3B. Water Yield Improvement

EFFECT OF CONTOUR FURROWS AND CONTOUR BUNDS ON WATER CONSERVATION IN GRASSLANDS OF WESTERN RAJASTHAN,
Central Arid Zone Research Inst., Jodhpur (India).
For primary bibliographic entry see Field 3F.
W74-07090

THE SAGUARO GIANT CACTUS, A BIBLIOGRAPHY,
National Park Service, San Francisco, Calif.
For primary bibliographic entry see Field 2I.
W74-07098

MODEL TESTS WITH THIN SHEETS TO REDUCE EVAPORATION,
Research Inst. for Water Resources Development, Budapest (Hungary).
A. F. Thoma.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 99, No IR2, Proc. Paper 9779, p 117-131, June 1973. 8 fig, 7 tab, 9 ref, 2 append.

Descriptors: *Evaporation control, *Monomolecular films, *Water conservation, *Air temperature, Lakes, Reservoirs, Irrigation, Evaporation, Evaporation pans, Evaporimeters, On-site investigations, Plastics, Surface waters.

The efficiency of a thin suspended sheet in reducing evaporation was tested to determine the relationship between evaporation reduction and the height of the sheet above the water. Sheet (S1) consisted of a 0.3 mm thick plastic sheet, while sheet (S2) was prepared from one 2 mm thick plywood covered on both sides with oil. All tests were carried out under controlled laboratory conditions. Results showed that evaporation reduction may be achieved by using a thin sheet placed above the water surface, but not necessarily in contact with it; and the higher the air temperature, the greater the amount of evaporation reduction. The evaporation reduction effect was 37.3 percent in the open air model test. Future tests should include a greater number of independent variables to more closely approximate naturally occurring processes. (Mastic-Arizona)
W74-07103

STUDY ON THE PASTURE ESTABLISHMENT TECHNIQUE VI. EFFECT OF DIFFERENT SPACINGS AND WEEDINGS ON ESTABLISHMENT AND FORAGE PRODUCTION OF CENCHRUS CILIARIS LINN., LASIURUS SINDICUS HENR. AND PANICUM ANTIDOTALE RETZ UNDER ARID CONDITIONS,
Central Arid Zone Research Inst., Jodhpur (India).
For primary bibliographic entry see Field 3F.
W74-07107

PRODUCTIVITY AND WATER STRESS IN CACTI,
Arizona State Univ., Tempe.
For primary bibliographic entry see Field 2I.
W74-07109

DISTILLATION-CONDENSATION OF WATER AND NUTRIENT MOVEMENT IN A DESERT ECOSYSTEM,
Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 2I.
W74-07110

3C. Use Of Water Of Impaired Quality

EFFECT OF GYPSUM IN REDUCING BORON HAZARD OF SALINE WATERS AND SOILS,
Central Soil Salinity Research Inst., Karnal (India).
I. C. Gupta, and H. Chandra.
Annals of Arid Zone, Vol 11, Nos 3 and 4, p 228-230, Sept. and Dec. 1972. 2 tab, 1 ref.

Descriptors: *Gypsum, *Boron, *Soil treatment, *Saline soils, *Saline water, Sodium, Soil water, Arid lands, Soil amendments, Land management.

Saline water, a common problem in arid zones, is unsatisfactory for agriculture because of high osmotic pressure, high sodium hazard, or high boron hazard. While gypsum has been known as a treatment for sodium hazard, this study has found it also reduces the boron hazard of saline water and saline sodic soil. Eighty percent dose of gypsum reduced the toxicity of sodic soil while one percent was sufficient to have the same effect on water. The gypsum used must be boron-free. (Muller-Arizona)
W74-07095

AN ECONOMIC ANALYSIS OF SELECTE AGRICULTURAL USES OF WARM WATER I THE PACIFIC NORTHWEST RESULTIN FROM ELECTRIC POWER GENERATION,
Washington State Univ., Pullman. Dept. Agricultural Economics.
R. W. Johns, R. J. Folwell, R. T. Dailey, and M. E Wirth.
Journal of Environmental Quality, Vol 2, No 2, 224-228, 1973. 1 fig, 4 tab, 16 ref.

Descriptors: *Water reuse, *Economic feasibility *Heated water, Pacific Northwest U.S., Coolin water, Agriculture, Aquiculture, Greenhouse Thermal pollution.

Between 1970-1990 85% of all electricity generate will require cooling water. Three uses of this coo ing water are examined for the Pacific Northwes to determine whether the warm water could b used to aid fish growth, under the limit established by the reduced water quality caused b the heating, and the economics of raising carp an catfish. It is estimated that carp, used in variou animal meals, would require a price of $59.52 me ric ton compared to the existing price of $55-60 t encourage investment. The 1970-71 price of ca fish--26 cents lb--exceeds the required investmen price of 20 cents lb to raise catfish in a 1500 acr cooling pond. The market price for catfish, how ever, has declined over the past five years an declines are expected to continue. The second use heating greenhouses was also found to be a mar ginal investment. Use of the cooling water for soi warming systems is limited by high initial invest ment cost, yield responses, and prices. A soi warming technique found to be profitable for 20 o 29 crops examined at installation costs o $2000/acre was found profitable only for 1 out o 29 vegetable crops when installation costs in creased to $5000/acre. (Schroeder-Wisconsin)
W74-07125

INTERDISCIPLINARY MODELING IN THE ANALYSIS OF THE SALINITY PROBLEMS OF THE SAFFORD VALLEY,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 5B.
W74-07297

EFFECT OF IRRIGATION WITH THERMAL WATER ON TRACE-ELEMENT CONTENT IN SOME SOILS OF GEORGIA (VLIYANIYE OROSHENIYA TERMAL'NYMI VODAMI NA SODERZHANIYE MIKROELEMENTOV V NEKOTORYKH POCHVAKH GRUZII),
For primary bibliographic entry see Field 3F.
W74-07508

3D. Conservation In Domestic and Municipal Use

TECHNOLOGY TRANSFER IN THE MARINE ENVIRONMENT OF LONG ISLAND,
Center for the Environment and Man, Inc., Hartford, Conn.
For primary bibliographic entry see Field 6B.
W74-07059

SANITARY SERVICES IN TENNESSEE, 1972.
Tennessee State Planning Office, Nashville.
For primary bibliographic entry see Field 5D.
W74-07060

PRELIMINARY WATER AND SEWER PLAN FOR ALCORN, BENTON, MARSHALL, PRENTISS, TIPPAH, TISHOMINGO COUNTIES.
Northeast Mississippi Planning and Development District, Booneville.
For primary bibliographic entry see Field 5D.
W74-07062

ATER AND WASTEWATER SYSTEMS IN-
ENTORY - REGION H, NORTH CAROLINA,
e Dee Council of Governments, Troy, N.C.
r primary bibliographic entry see Field 5D.
74-07063

ACKGROUND SURVEY. SURFACE
RAINAGE PROGRAM, MADISON, SAINT
LAIR, MONROE AND RANDOLPH COUN-
ES, ILLINOIS.
uthwestern Illinois Metropolitan Area Planning
mmission, Collinsville.
r primary bibliographic entry see Field 4A.
74-07066

IE RELATIONSHIP OF LAND USE TO
ATER USE IN SAN ANTONIO, TEXAS,
xas Univ., Austin. Center for Research in Water
sources.
r primary bibliographic entry see Field 4A.
74-07067

RBAN IMPACTS OF RURAL RESOURCE
EVELOPMENT EXPENDITURES IN THE IN-
ERLAKE AREA OF MANITOBA,
anitoba Univ., Winnepeg. Agassiz Centre for
ater Studies.
r primary bibliographic entry see Field 6B.
74-07068

ILITIES AND FACILITIES FOR NEW RE-
DENTIAL DEVELOPMENT: A SURVEY OF
UNICIPAL POLICY,
ban Land Inst., Washington, D.C.
r primary bibliographic entry see Field 5D.
74-07071

ANNING AND DEVELOPING WATER-
ONT PROPERTY,
ck Engineering Co., San Diego, Calif.
r primary bibliographic entry see Field 6B.
74-07072

ATER QUALITY MANAGEMENT ELEMENT
OR THE KENTUCKY RIVER AREA
EVELOPMENT DISTRICT COMPREHENSIVE
ATER AND SEWER PROGRAM.
ayes, Sudderth and Etheredge, Inc., Lexington,
.
r primary bibliographic entry see Field 5D.
74-07077

EASURES TO REDUCE WATER CONSUMP-
ON IN SOUTHEASTERN NEW YORK.
w York State Temporary Commission on the
ater Supply Needs of Southeastern New York,
pany.
r primary bibliographic entry see Field 6D.
74-07079

OPOSED WATER SUPPLY PROJECTS FOR
UTHEASTERN NEW YORK.
w York State Temporary Commission on the
ater Supply Needs of Southeastern New York,
pany.
r primary bibliographic entry see Field 6D.
74-07080

TERIM STORM DRAINAGE PLAN REPORT-
TTLE ROCK-NORTH LITTLE ROCK
ETROPOLITAN AREA.
troplan, Little Rock, Ark.
r primary bibliographic entry see Field 5D.
74-07082

STUDY DESIGN. SURFACE DRAINAGE PROGRAM, MADISON, ST. CLAIR, MONROE AND RANDOLPH COUNTIES, ILLINOIS.
Southwestern Illinois Metropolitan Area Planning Commission, Collinsville.
For primary bibliographic entry see Field 4A.
W74-07083

PUBLIC GROUNDWATER SUPPLIES IN ADAMS COUNTY,
Illinois State Water Survey, Urbana. Hydrology Section.
For primary bibliographic entry see Field 4B.
W74-07172

PLANNING AND OPERATION OF URBAN WATER QUALITY MANAGEMENT SYSTEMS,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 5D.
W74-07334

USER CHARGES AND INDUSTRIAL COST RECOVERY, DENVER SMSA,
Wilbur Smith and Associates, Denver, Colo.
For primary bibliographic entry see Field 5D.
W74-07370

THE GEOLOGY OF WATER: THE LIMITING FACTOR IN URBAN DEVELOPMENT,
Indiana Purdue Univ., Indianapolis. Dept. of Geology.
A. Mirsky.
Proceedings of the Indiana Academy of Science, Vol 82, p 310-317, 1972. 3 fig, 1 tab, 5 ref.

Descriptors: *Water resources, *Water requirements, *Urban hydrology, *Human population, Surface waters, Subsurface waters, Aquifer characteristics, Water quality control, Geomorphology, Hydrogeology, Urbanization.

Of the several factors which bear on the initial establishment and later development of an urban center, the availability of adequate local water supplies is most important. The amount of available water includes that which is already obtained from surface sources plus underground aquifers, as well as local water reserves which can readily be estimated from the geological setting. If any expanding urban area, such as Indianapolis, is to avoid major water crises and the attendant deterioration in the quality of metropolitan life, consideration must be given to setting a population limit within the capacity of the local water resource, and directing excess population elsewhere. (Brown-IPC)
W74-07402

3E. Conservation In Industry

ECONOMIC STUDY OF THE EFFECT OF MUNICIPAL SEWER SURCHARGES ON INDUSTRIAL WASTES AND WATER USAGE,
Clemson Univ., S.C. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W74-07057

POLLUTION, PRODUCTION, AND COMPENSATION,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5G.
W74-07064

REGENERATION OF CHROMATED ALUMINUM DEOXIDIZERS, PHASE I REPORT,
Boeing Commercial Airplane Co., Seattle, Wash.
For primary bibliographic entry see Field 5D.
W74-07254

MODULAR WASTEWATER TREATMENT SYSTEM DEMONSTRATION FOR THE TEXTILE MAINTENANCE INDUSTRY,
Linen Supply Association of America. Miami Beach, Fl. and Institute of Industrial Launderers Washington, D.C.
For primary bibliographic entry see Field 5D.
W74-07343

IN-PLANT, CONTINUOUS HOT-GAS BLANCHING OF SPINACH,
National Canners Association, Berkeley, Calif. Western Research Lab.
J. W. Ralls, H. J. Maagdenberg, N. L. Yacoub, M. Zinnecker, and D. Homnick.
J Food Sci. Vol 38, No 2, p 192-194. 1973.
Identifiers: Ascorbic acid, *Blanching(Hot-gas), Chemical oxygen demand, Continuous, Reduction, *Spinach, Vegetables, Waste water, *Food canneries, Pilot plants.

A new blanching system for vegetables (hot-gas blanching) which showed promise in pilot plant studies was tested in a commercial spinach cannery. The hot-gas blancher was operated at 93-121 degrees C with a spinach residence time of 108 sec. Four tons of washed spinach was hot-gas blanched and returned to the commercial filling line; the volume of wastewater produced was 1% of that from the commercial blancher (per ton blanched). A reduction of 96% in COD (chemical oxygen demand) was achieved by substituting hot-gas blanching for hot-water blanching. Differences were found in the flavor, head-space gas composition and ascorbic acid content of hot-gas blanched spinach compared to commercial canned samples.--Copyright 1973, Biological Abstracts, Inc.
W74-07368

WATER REUSE AND RECYCLE IN THE D(C)EDED BLEACH SEQUENCE,
CIP Research Ltd., Hawkesbury (Ontario).
For primary bibliographic entry see Field 5D.
W74-07377

REDUCTION OF THE VOLUME OF POLLUTANTS DISCHARGED AND OF FRESH WATER CONSUMPTION (SOKRASHCHENIE SBROSA ZAGRYAZNENII I UMEN'SHENIE RASKHODA SVEZHEI VODY),
Vsesoyuznyi-Nauchnyi Planovii Otdel Bumazhnoi Promyshlennost (USSR).
For primary bibliographic entry see Field 5D.
W74-07384

WATER REUSE AND RECYCLE IN KRAFT BLEACHERIES,
CIP Research Ltd., Hawkesbury (Ontario).
For primary bibliographic entry see Field 5D.
W74-07394

A REVIEW OF COLOUR REDUCTION TECHNOLOGY IN PULP AND PAPER MILL EFFLUENTS,
Beak (T. W.) Consultants Ltd., Montreal (Quebec).
For primary bibliographic entry see Field 5D.
W74-07406

POLLUTION CONTROL BY RECYCLING EFFLUENT,
Kimberly-Clark of Canada Ltd., Huntsville (Ontario).
For primary bibliographic entry see Field 5D.
W74-07407

WATER REUSE IN PROTEIN FEED PROCESS UTILIZING LUMBER MILL WASTES,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 5D.
W74-07409

AN OVERVIEW OF WATER REUSE POTENTIAL IN PULP AND PAPER MANUFACTURING,
Wapora, Inc., Washington, D.C.
For primary bibliographic entry see Field 5D.
W74-07410

THE PULP AND PAPER INDUSTRY AND THE ENVIRONMENT,
British Paper and Board Makers' Association, London (England).
For primary bibliographic entry see Field 5D.
W74-07411

3F. Conservation In Agriculture

SUBSURFACE HEATING AND IRRIGATION OF SOILS: ITS EFFECT ON TEMPERATURE AND WATER CONTENT AND ON PLANT GROWTH,
Oregon State Univ., Corvallis. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W74-07054

PUBLIC INVESTMENT CRITERIA: APPLICATION TO A PROJECT IN THE SOURIS RIVER BASIN,
Manitoba Univ., Winnepeg. Agassiz Centre for Water Studies.
For primary bibliographic entry see Field 6B.
W74-07070

EVAPOTRANSPIRATION ON A PALOUSE WATERSHED,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2D.
W74-07087

EFFECT OF CONTOUR FURROWS AND CONTOUR BUNDS ON WATER CONSERVATION IN GRASSLANDS OF WESTERN RAJASTHAN,
Central Arid Zone Research Inst., Jodhpur (India).
W. Ullah, A. K. Chakravarty, C. P. Mathur, and N. S. Vangani.
Annals of Arid Zone, Vol 11, Nos 3 and 4, p 169-182, Sept and Dec 1972. 1 fig, 5 tab, 17 ref.

Descriptors: *Contour furrows, *Soil treatments, *Grasslands, *Soil moisture, Soil management, Percolation, Infiltration, Moisture availability, Precipitation(Atmospheric), Induced infiltration, Retention, Soil water, Storage capacity, Water storage, Cultivation, Range grasses, Range management, Forage grasses, Soil-water-plant relationships.
Identifiers: *India(Rajasthan).

Four study areas were established in Rajasthan, India, to examine the effect of contour furrows and contour bunds on soil moisture conservation and forage yield from rangelands. These treatments increased forage production from 14 to 180 percent in 1966 and from 4 to 37 percent in 1967. The treatment indicated comparatively higher moisture percentages in different areas. Key forages and perenial grasses are identified and the effects of the treatment on their yield are discussed. The contour furrowing essentially retards the drainage from precipitation until it has a chance to infiltrate into the soil horizon. In this way water which would otherwise be lost in runoff will be stored in the soil for the use of the forage grasses. The treatment is recommended for yield augmentation in dry rangeland regions such as the study areas. (Muller-Arizona)
W74-07090

EFFECT OF SEEDING RATES AND ROW SPACINGS ON FODDER PRODUCTION OF MOTH BEAN (PHASEOLUS ACONITIFOLIUS),
Central Sheep and Wool Research Inst., Jaipur (India).
A. S. Faroda.
Annals of Arid Zone, Vol 11, Nos 3 and 4, p 183-186, Sept. and Dec. 1972. 1 tab, 2 ref.

Descriptors: *Forage legumes, *Planting management, *Soil-water-plant relationships, *Rates of application, Forages, Cultivation, Seeds, Plant growth, Application methods, Competition, Moisture availability, Soil water.
Identifiers: *Row spacing, *India(Rajasthan).

The seeding rates of 20 and 25 kg seed per hectare produced more green and dry vegetative material in moth beans than 15 kg seed per hectare, although the difference between the first two rates is negligible. Line sowing at a row spacing of 25 cm was better than broadcasting and line sowing at 50 cm row spacing. Since plant-to-plant distances were maintained uniformly, the yield in the wide row spacing case was probably lower because the distance between the plants in a row was less than the distance between rows and the competition of the plants within the row was intensified. The seeding and planting methods discussed above are believed to reduce excessive plant competition for water. (Muller-Arizona)
W74-07091

EVAPORATION FROM AN IRRIGATED RICE CROP IN A SEMI-ARID REGION,
Commonwealth Scientific and Industrial Research Organization, Griffith (Australia). Div. of Irrigation Research.
For primary bibliographic entry see Field 2D.
W74-07096

AGROCLIMATIC REGIONS OF RAJASTHAN,
Central Arid Zone Research Inst., Jodhpur (India).
A. K. Sen.
Annals of Arid Zone, Vol 11, Nos 1 and 2, p 31-40, March and June 1972. 2 maps, 1 tab, 14 ref.

Descriptors: *Climatic zones, *Regional analysis, *Agroclimatology, *Arid climates, Geographical regions, Semiarid climates, Meteorological data, Microclimatology, Agriculture, Micrometeorology, Weather, Crops, Available water.
Identifiers: *India(Rajasthan).

Various climatic elements, water availability factors and agricultural variables were employed in the classification and mapping of agroclimatic conditions in the Rajasthan dryland region of India. The six climatic variables were average and variational temperature, peak rainfall, rainfall to temperature relationship, climatic homogeneity and humidity. The indices used in defining the agricultural or crop component of the classification were geographic crop distribution, land use, crop yield and intensity, and the location and area of a specific crop. The availability of irrigation water and rainfall were also considerations. The region was found to be suitably divided into 5 larger macroclimatic zones and 10 smaller micro agro-climates. A table is presented in which each of the areas is described in detail with respect to climatic, irrigation, and land use conditions. This classification appears to be a useful tool in the regional agricultural planning for Rajasthan. (Muller-Arizona)
W74-07102

POPULATION, LAND USE AND LIVESTOCK COMPOSITION IN INDIA AND ITS ARID ZONE,
Central Arid Zone Research Inst., Jodhpur (India).
S. P. Malhotra, J. S. Rao, D. Goyal, and F. C. Patwa.
Annals of Arid Zone, Vol 11, Nos 1 and 2, p 116-127, March and June 1972. 4 tab, 5 ref.

Descriptors: *Regional analysis, *Water resources, *Land use, *Livestock, Arid lands, Regional development, Regional economics, Arid climates, Water resources development, Population, Human populations, Economics, Rural area, Land development, Land resources, Agriculture, Cereal crops, Cotton
Identifiers: *India(Rajasthan).

Ten percent of the land surface of India is classified as arid. Most of this is in the Rajasthan region which has a population of approximately 19 million. Mean annual rainfall is inversely correlated with population growth in the area but positively correlated to total population. Twenty-five percent or more of the arable wastelands of India are in the region. The crops are principally rainfed, but the incidence of irrigation is increasing. Wheat, barley, maize and cotton are the principal crops cultivated, with the region producing only a minor portion of the cereals crop of India but a significant part of the cotton. Approximately seven percent of the total livestock in India is raised in Rajasthan. Permanent pastures and grazing lands are available in the area. The development of available water resources and the identification of new ones is the key to the further development of the region. (Muller-Arizona)
W74-07105

QUALITY OF WELL WATERS OF JAIPUR DISTRICT,
Udaipur Univ. (India).
For primary bibliographic entry see Field 4B.
W74-07106

STUDY ON THE PASTURE ESTABLISHMENT TECHNIQUE VI. EFFECT OF DIFFERENT SPACINGS AND WEEDINGS ON ESTABLISHMENT AND FORAGE PRODUCTION OF CENCHRUS CILIARIS LINN., LASIURUS SINDICUS HENR. AND PANICUM ANTIDOTALE RETZ UNDER ARID CONDITIONS,
Central Arid Zone Research Inst., Jodhpur (India).
A. K. Chakravarty, and C. M. Verma.
Annals of Arid Zone, Vol 11, Nos 1 and 2, p 60-66, March and June 1972. 2 fig, 1 tab, 5 ref.

Descriptors: *Water yield improvement, *Pasture management, *Plant growth, *Forage grasses, *Weeds, Arid lands, Weed control, Vegetation effects, Planting management, Seeds, Agronomic crops.
Identifiers: *India(Rajasthan).

Three species of forage producing perennial grasses are examined under various conditions of plant spacing and weeding. The grasses are Cenchrus ciliaris Linn., Lasiurus sindicus Henr. and Panicum antidotale Retz. Weeding once in the first year after establishment caused an increase in forage yield by 86, 120 and 284 percent respectively. The annual and perennial weeds causing the most problems are identified. The increase in forage production in attributed to the fact that the water formerly taken up by the weed is now available to the grass. Plant spacing did not significantly alter forage yield. Weeding seemed to be the predominant management variable, with two annual weedings offering the highest forage production. (See also W70-02554) (Muller-Arizona)
W74-07107

PROBLEMS IN DISTRIBUTION OF WATER RESOURCES IN THE ARID ZONE OF THE AMUDAR'YA RIVER BASIN (VOPROSY RASPREDELENIYA VODNYKH RESURSOV V ARISNOY ZONE (NA PRIMERE AMUDAR'I)),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 4A.
W74-07192

SOLAR EVAPORATION CONTROLLED IRRIGATION SYSTEM,
For primary bibliographic entry see Field 2D.
W74-07211

IRRIGATION AND SPRINKLER SYSTEM,
Clemar Mfg. Corp., Azusa, Calif. Assignee.
D. R. Bayer, L. M. Ritchie, and J. A. Rivens.
U.S. Patent No 3,787,728, 7 p, 6 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 918, No 4, p 1620, January 22, 1974.

Descriptors: *Patents, *Irrigation system, *Evaporation pans, *Sprinkler irrigation, *Environmental control, Rainfall, Frost, Winds, Heat, Equipment, Control systems, *Automation. Identifiers: Sensors.

In an automatic water system water solenoid valves at a plurality of stations or locations may be sequentially and selectively energerized in accordance with two selectable programs: an irrigation program or mode and an environmental program or mode. Push button switches permit transition from one mode to the other. Use is made of evaporation pans, heat, frost, wind or rain sensors which are remotely controlled to activate the selected modes. The stations selected for watering in the irrigation mode may be different from those selected in the environmental mode. Automatic changeover from the irrigation to the environmental mode occurs in accordance with wind, heat or frost. For wind protection, crop cooling and frost protection and when the environmental program is completed the system automatically reverts back to the irrigation mode (except when the first switch is operated, in which case a manual reset operation is required). The irrigation mode has memory in that the irrigation unit resumes watering under the same conditions which existed at the time of transition from the irrigation to the environmental mode. In case of rain, both systems are rendered inoperative and require manual resetting. The irrigation mode incorporates means whereby compensation may be effected in accordance with evaporation conditions. (Sinha-OEIS)
W74-07212

LAND APPLICATION OF SEWAGE SLUDGE,
Guelph Univ. (Ontario). Dept. of Land Resource Science.
For primary bibliographic entry see Field 5D.
W74-07266

EFFECT OF IRRIGATION ON DYNAMICS OF MICROORGANISM QUANTITY IN DARK-BROWN SOILS IN SOUTHERN UKRAINE, (IN UKRAINIAN),
Akademiya Nauk URSR, Kiev. Inst. of Microbiology and Virology.
For primary bibliographic entry see Field 2G.
W74-07279

THE BITTERSWEET WATERS OF THE LOWER COLORADO,
R. Findley.
National Geographic, Vol 144, p 540-568, October 1973. 1 map, 9 photo.

Descriptors: *Dams, *Irrigation, *Salinity, *Flood control, *Water demand, Dam sites, Floods, Water supply, Drainage, Flow, Legal aspects, Rivers, *Colorado River, Deltas, Water utilization, Water, Water control, Irrigated land, Water sources, Colorado, California, Mexico.

Since the construction of Hoover Dam, the Colorado River is the most utilized and controlled river in the world, serving fifteen million people and generating a billion dollars worth of wealth. Legal conflicts have involved California, Arizona, Mexico and Indians as each attempts to obtain a larger allotment of the river's water. At the river's mouth is a wall of water, or tidal bore; the dams on the Colorado are causing the demise of this tidal bore. The delta channels are no longer purged of silt by periodic floods. But the water trapped by the dams irrigates thousands of acres of land. Technically, however, the water users along the river have overdrawn its supply, saved only by the slowness of the upper basin states to use their full allotment. Irrigation farmers flush its water through their soil, returning salty drainage back to the river. As one descends the lower Colorado, the water volume shrinks, and the salt content rises. The Colorado salinity question has become the largest issue between Mexico and the United States. Proposals to increase the flow of water in the Colorado include mining water from under California's Imperial Valley, and combing moisture from winter snow clouds over the Rockies. (Ritchie-Florida)
W74-07292

INFILTRATION AND WATER TABLE EFFECTS OF SOIL AIR PRESSURE UNDER BORDER IRRIGATION,
Agricultural Research Service, Reno, Nev. Soil and Water Conservation Research Div.
D. R. Linden, and R. M. Dixon.
Soil Sci Soc Am Proc. Vol 37, No 1, p 94-98, 1973. Illus.
Identifiers: *Infiltration, *Irrigation(Border), *Soil air pressure, *Water table.

Field studies investigated infiltration and water table responses to soil air pressure under border irrigation. The water table was depressed in the center and elevated near the edge of a border strip in response to differences in soil air pressure during an irrigation. Water table elevations also indicated that infiltration and subsequent groundwater recharge rates were greater in the vicinity of a border dike than at the center of the border. An infiltration response was measured by: venting soil air during an actual irrigation and pumping air into the soil during simulated irrigations. An actual border irrigation experiment indicated that displaced soil air pressure ha (expressed as equivalent heads of water) rising to values of 13-24 cm of water reduced infiltration over a 70-min period 14.3-10.3 cm. Simulated border irrigation experiments indicated that displaced soil air pressure ha must exceed surface head hs to have significant influence on infiltration and that the first few minutes of infiltration may determine the ha-to-hs relationship and subsequent infiltration effects. In the simulated irrigations with hs=6.3 cm, total infiltration in 1 hr was 6.0 and 1.5 cm when ha was 0 and 10 cm of water, respectively. Infiltration was only slightly reduced during the first 5 min when ha was 5 cm of water.--Copyright 1973, Biological Abstracts, Inc.
W74-07301

A MODEL OF IRRIGATED AGRICULTURE AND REGIONAL DEVELOPMENT IN SOUTHERN ARGENTINA: THE RIO NEGRO BASIN,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 6A.
W74-07306

LAND DISPOSAL OF WASTEWATER--LITERATURE REVIEW FOR 1973,
New York State Dept. of Environmental Conservation, Albany.
For primary bibliographic entry see Field 5D.
W74-07327

PHOSPHORUS SUPPLY CHARACTERISTICS OF ACID ORGANIC SOILS AS MEASURED BY DESORPTION AND MINERALIZATION,
North Carolina State Univ., Raleigh.
For primary bibliographic entry see Field 2G.
W74-07345

STRUCTURAL CHANGES IN TROPICAL SOILS DUE TO ANIONS IN IRRIGATION WATER,
Hawaii Univ., Honolulu.
For primary bibliographic entry see Field 2G.
W74-07348

EFFECTS OF MOISTURE STRESS AT EARLY HEADING AND OF NITROGEN FERTILIZER ON THREE SPRING WHEAT CULTIVARS,
Department of Agriculture, Lethbridge (Alberta). Research Station.
S. Dubetz, and J. B. Bole.
Can J Plant Sci. Vol 53, No 1, p 1-5. 1973. Illus.
Identifiers: Cultivars, *Fertilizers, *Moisture stress, *Nitrogen, Spring, Tillering, Triticum-aestivum, *Wheat, Crop production.

Three cultivars of spring wheat (Triticum aestivum L.) were grown at 4 levels of N fertilizer in metal lysimeters protected from rain by an automatic rain shelter. A soil water stress of 8 bars was developed in 1/2 of the lysimeters at the early boot stage. Water stress reduced yield by severely decreasing the number of kernels per spike. Tillering was not affected and kernel weight was increased. 'Pitic 62' withstood the high stress better than 'Manitou' or 'Kenhi.' N enhanced yield by increasing tillering. Kernel weight was unaffected by N, and the number of kernels per spike was decreased. 'Pitic,' which had a higher number of kernels per spike, outyielded 'Manitou' and 'Kenhi.' The protein content of 'Manitou' was higher than that of the other 2 cultivars. The cultivars differed in their reaction to soil water stress and N.--Copyright 1973, Biological Abstracts, Inc.
W74-07351

EFFECTS OF WATER STRESS ON GROWTH AND NITROGEN-FIXING ACTIVITY OF TRIFOLIUM REPENS,
Dundee Univ. (Scotland). Dept. of Biological Sciences.
M. Engin, and J. I. Sprent.
New Phytol. Vol 72, No 1, p 117-126. 1973. Illus.
Identifiers: Age, Growth, *Meristematic activity, *Nitrogen fixation, *Soybean, Trifolium-repens, *Water stress.

The growth and N fixation of T. repens were investigated during the imposition of, and recovery from, different levels of water stress. Growth (measured as fresh and dry weight of roots and shoots, shoot length and N content) and N fixation (per plant and per unit weight of nodule) were depressed by application of water stress. The ability of plants to recover and the time taken for recovery were both related to the duration of the stress period. Meristematic activity in nodules was resumed after watering, making clover nodules more resistant to stress than plants, such as soybean, with spherical nodules. N fixation, estimated by the acetylene reduction technique, was compared with the total N content of plants. Differences between the estimated and actual N content varied with age and degree of water stress.--Copyright 1973, Biological Abstracts, Inc.
W74-07352

THE MICRO-METEOROLOGY OF AN EXTENDED AREA OF TEA BEFORE AND AFTER RAIN,
University of the West Indies, St. Augustine (Trinidad). Cocoa Research Unit.
R. Fordham.
Agric Meteorol. Vol 11, No 1, p 99-105. 1973. Illus.
Identifiers: Evaporation, Meteorology, Rainfall, Sensible, *Solar radiation, *Tea, *Malawi, *Microclimates, Crop canopy, Heat exchange.

Data are presented on the microclimate above the crop canopy of an extended area of mature tea growing in southern Malawi. Stomatal opening was significantly greater following the onset of the rainy season although the difference did not appear to affect the partitioning of solar radiation

between evaporation and sensible heat exchange as indicated by calculated values of the Bowen ratio.--Copyright 1973, Biological Abstracts, Inc.
W74-07354

THE EFFECT OF WATERLOGGING ON THE MINERAL NUTRIENT CONTENT OF TRIFOLIUM SUBTERRANEUM,
Department of Agriculture, South Perth (Australia).
A. C. Devitt, and C. M. Francis.
Aust J Exp Agric Anim Husb. Vol 12, No 59, p 614-617. 1972.
Identifiers: *Mineral nutrients, Trifolium-subterraneum, Trifolium-subterraneum-ssp-brachycal, Trifolium-subterraneum-ssp-subterran, Trifolium-subterraneum-ssp-yanninicu, *Waterlogging, *Clover.

Waterlogging affected the concentration and total content of nutrients in the leaves of 75 cultivars of the 3 subspecies of subterranean clover (T. subterraneum): yanninicum, subterraneum and brachycalycinum. In the plant tops the concentration of P, Fe, Mn and Cu increased; Zn was unaffected and N, K, Ca, Mg and Na decreased. Total leaf nutrient largely reflected differences in dry matter production. Fe content increased; N, P, K, Mg, Ca, Na and Zn decreased, but P and Mn content was unchanged. The results show a general pattern of subspecies differences in which the chemical composition of subspecies yanninicum was least affected by waterlogging, i.e., a result consistent with the overall better growth of this subspecies in waterlogged conditions.--Copyright 1973, Biological Abstracts, Inc.
W74-07355

OCCURRENCE AND DISTRIBUTION OF THE VINE PHYLLOXERA, PHYLLOXERA VITIFOLIAE (FITCH), IN THE OLIFANTS RIVER IRRIGATION AREA, NORTHWESTERN CAPE PROVINCE,
Plant Protection Research Inst., Pretoria (South Africa).
C. A. DeKlerk.
Phytophylactica. Vol 4, No 1, p 25-26. 1972. Illus.
Identifiers: Age, Distribution, Irrigation, Phylloxera, *Phylloxera-vitifoliae, Rivers, Soil types, *Vineyards, *South Africa(Olifants River).

Of 74 vineyards examined during a survey in South Africa, 18 were infested by the vine phylloxera, P. vitifoliae. Phylloxera were found in alluvial and Karoo soils but not in red sandy soils. Young vines are especially susceptible and the use of resistant rootstocks is recommended at future replantings.--Copyright 1973, Biological Abstracts, Inc.
W74-07356

A CONTRIBUTION TO THE BOTANY OF GANGANAGAR DISTRICT, NORTH RAJASTHAN,
Seth G. N. Khalsa Coll., Sri Ganganagar (India).
K. B. S. Dhillon, and P. S. Bajwa.
Bull Bot Surv India. Vol 11, No 3/4, p 234-244. 1969.
Identifiers: Botany, *Dicots, *India(Rajathan), Irrigation, Migration, *Monocots, *Pteridophytes, Weeds.

A preliminary account is presented of the monocots, dicots, and pteriodophytes of Ganganagar district, North Rajasthan (India). Floristically the district is an integral part of northwest Rajasthan, but with the introduction of canal irrigation, many new species have migrated into the area. There are 15 angiosperm species which are new reports for the state of Rajasthan. Ganganagar is a very important agricultural district and weeds of the local crops are indicated.--Copyright 1973, Biological Abstracts, Inc.
W74-07357

A STUDY OF THE INTAKE OF DRINKING WATER BY DAIRY COWS AT GRASS,
Hannah Dairy Research Inst., Ayr (Scotland)
M. E. Castle.
J Br Grassl Soc. Vol 27, No 4, p 207-210. 1972. Illus.
Identifiers: *Cows(Ayrshire), Dairy industry, Milk yield, *Potable water, *Grazing.

The average daily intake of drinking water of 2 groups of 10 spring-calved Ayrshire cows, 1 group on a paddock and the other on a Wye College system of grazing, was measured on 4 days/wk for 20 wk. Trends in water intake were similar on both systems, the average daily intake being 23.0 plus or minus 8.5 kg (5.1 plus or minus 1.9 gal)/cow. The average DM (dry matter) content of the herbage was 17.8% and the mean air temperature 13.4C (56.1F). The weight of water drunk was positively related to the daily milk yield and the DM percentage of the herbage, and negatively related to daily rainfall and relative humidity. All of these relationships were significant. Possible changes in the provision of water for dairy cows at grass are discussed.--Copyright 1973, Biological Abstracts, Inc.
W74-07358

PERFORMANCE OF LUCERNE (MEDICAGO SATIVA) LINES IN PURE STANDS UNDER IRRIGATED AND RAIN GROWN CONDITIONS IN SUB-COASTAL CENTRAL QUEENSLAND,
Department of Primary Industries, Brisbane (Australia).
D. G. Cameron, and J. D. Mullaly.
Aust J Exp Agric Anim Husb. Vol 12, No 59, p 646-652. 1972. Illus.
Identifiers: *Australia(Queensland), Environment, Irrigation, *Lucerne, Medicago-sativa, Nitrogen, Rain, Subcoastal areas, Subtropical conditions, *Crop production.

Seventeen lucerne lines were grown in 2 irrigated and 2 raingrown trials at Biloela, central Queensland(Australia). The cultivar 'Siro Peruvian' outyielded all the other cultivars during the first 2 yr. Seedling vigor, winter growth and regrowth after cutting were better in 'Siro Peruvian' than in 'Hunter River,' but it had shorter stand life and lower N content. 'African' gave similar annual yields to 'Hunter River' even though in seedling vigor, winter growth and rate of regrowth after cutting it was similar to 'Siro Peruvian.' The other lucerne lines were not adapted to the hot subtropical environment, and especially in the irrigated trials their yields or survival or both were much poorer than those of 'Hunter River.'--Copyright 1973, Biological Abstracts, Inc.
W74-07359

POLLUTION CAUSED BY AGRICULTURE,
Norges Veterinarhoegskole, Oslo. Institutt for Naeringsmiddelhygiene.
For primary bibliographic entry see Field 5B.
W74-07366

SOLUTIONS FOR LATERAL OUTFLOW IN PERFORATED CONDUITS,
Ghent Rijksuniversiteit (Belgium). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W74-07433

EFFECTS OF DRAINAGE ON THE YIELD OF CACAO, (IN PORTUGUESE),
Centro de Pesquisas do Cacau, Salvador (Brazil).
Z. Antonio Cadima, and De Tarso Paulo Alvim.
Rev Theobroma, Vol 2, No 2, p 27-32, 1972. Illus. English summary.
Identifiers: *Cacao, *Drainage, *Crop production.

Production data taken during a 5 yr period showed that the badly-drained areas produced 60% less than the moderately-drained one. The 'temporao' or mid-crop harvest (April-Aug) was higher than the 'safra' or main crop harvest (Sept-Jan) in the moderately-drained area; the opposite occurred in the badly-drained areas.--Copyright 1973, Biological Abstracts, Inc.
W74-07435

EFFECTIVENESS OF TWO NITRIFICATION INHIBITORS FOR ANHYDROUS AMMONIA UNDER IRRIGATED AND DRYLAND CONDITIONS,
Agricultural Research Service, Pullman, Wash. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 5G.
W74-07436

PORTABLE REFLECTANCE METER FOR ESTIMATING CHLOROPHYLL CONCENTRATIONS IN LEAVES,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering
For primary bibliographic entry see Field 7B.
W74-07437

AN IRRIGATION SCHEDULING MODEL WHICH INCORPORATES RAINFALL PREDICTIONS,
Auburn Univ., Ala. Dept. of Agricultural Engineering.
E. W. Rochester, and C. D. Busch.
Water Resources Bulletin, Vol 8, No 3, p 608-613, June, 1972. 5 fig, 5 ref. OWRR A-025-ALA(2).

Descriptors: Irrigation, *Scheduling, *Irrigation practices, Supplemental irrigation, Soil moisture, Evapotranspiration, Consumptive use, Agricultural engineering, Mathematical modeling, Computer models, *Forecasting, *Rainfall.
Identifiers: *Irrigation scheduling.

In humid areas appreciable amounts of rainfall complicate irrigation scheduling. This rainfall tends to give supplemental water application a low priority. Irrigation may be delayed until there is not enough time to cover the crop area before some drought damage occurs. To improve the management of irrigation systems, a scheduling model has been developed. The model's water application decisions incorporate climatological records, soil-plant data, current pan evaporation and rainfall, the number of fields to be irrigated, and 5-day weather forecasts. The model updates the soil moisture conditions, predicts impending water depletion, and if supplemental water is needed both the field priority and amounts to be applied is indicated for each of the next 5 days. Errors introduced through the use of forecasts and long-term pan evaporation records have been slight because of the tri-weekly updating. Also natural rains which restore the root zone to maximum water holding capacity prevent long-term bias. (Skogerboe-Colorado State)
W74-07440

SHALLOW DRAIN PERFORMANCE IN A HEAVY SOIL,
Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
For primary bibliographic entry see Field 4A.
W74-07442

NITRATE CONCENTRATIONS IN THE UNSATURATED ZONE BENEATH IRRIGATED FIELDS IN SOUTHERN CALIFORNIA,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W74-07445

EFFECTS OF SUBSURFACE ASPHALT LAYERS ON CORN AND TOMATO ROOT SYSTEMS,
Florida Univ., Gainesville. Dept. of Soil Science.

G. K. Saxena, L. C. Hammond, and W. K. Robertson.
Agronomy Journal, Vol 65, No 2, p 191-194, March-April, 1973. 3 fig, 2 tab, 13 ref.

Descriptors: *Root systems, *Root zone, *Asphalt, Barriers, Root distribution, *Corn field, *Tomatoes, Crop response.

This study was initiated to determine the nature and reason of any influence of a subsurface asphalt layer on root growth and distribution in the soil profile. Observations of root distributions of sweet corn and tomato were made in freshly dug pits. Root sections in and out of the asphalt layer were photographed and examined microscopically for morphological effects. The 'line-intercept' method was used to obtain quantitative measurements of root concentration of field corn. Tomato roots in the asphalt layer were larger in diameter and showed damage to cells in the cortex. Rooting of all crops was less extensive in soil below the asphalt layer than in soil at the same depth without the asphalt. Concentration of corn roots in the top 60 cm of soil averaged 1.6, 1.7, 2.0, and 2.2 cm/cc for the following respective treatments: control, control with irrigation, asphalt layer, and asphalt layer with irrigation. (Skogerboe-Colorado State)
W74-07447

LEACHING LOSSES OF SULFUR DURING WINTER MONTHS WHEN APPLIED AS GYPSUM, ELEMENTAL S OR PRILLED S,
North Carolina Agricultural Experiment Station, Raleigh.
For primary bibliographic entry see Field 5B.
W74-07449

TRICKLE IRRIGATION IN AUSTRALIA,
J. Milne.
Irrigation Journal, Vol 23, No 6, p 21, November-December, 1973. 1 fig.

Descriptors: *Irrigation practices, *Surface irrigation, Application equipment, Soil moisture, Horticulture, *Australia.
Identifiers: *Trickle irrigation, Irrigation scheduling.

A brief history of trickle irrigation in Australia is given. The use of irrigation scheduling in the operation of the trickle system is also noted. (Skogerboe-Colorado State)
W74-07450

IRRIGATION SURVEY.
Irrigation Journal, Vol 22, No 6, p 9-18, November-December, 1972.

Descriptors: Irrigation, *Irrigation practices, Irrigation systems, *Surveys, *United States, *Sprinkler irrigation, Irrigated land.

A state-by-state summary is presented of irrigated acreage for selected years since irrigation was begun in each state. The following is also given: percent change per year, amount sprinkled, type of power used by percent, method of irrigation, irrigated acreage by crop, and amount irrigated by gravity. (Skogerboe-Colorado State)
W74-07451

PLANT AND IRRIGATION WATER REQUIREMENTS,
K. R. Frost.
Irrigation Journal, Vol 23, No 6, p 10, November-December, 1973.

Descriptors: Soil-water-plant relationships, *Crop response, Evapotranspiration, Soil moisture, Soil water, Soil chemistry, *Water utilization, *Irrigation practices.
Identifiers: *Irrigation scheduling.

A brief, descriptive outline of the factors affecting crop water use is presented. A description of the irrigation scheduling processes is given. (Skogerboe-Colorado State)
W74-07452

LIVEWEIGHT GAINS OF SHORTHORN STEERS ON NATIVE AND IMPROVED PASTURES AT ADELAIDE RIVER NORTHERN TERRITORY,
Northern Territory Administration, Darwin (Australia). Animal Industry and Agriculture Branch.
R. N. Wesley-Smith.
Aust J Exp Agric Anim Husb, Vol 12, No 59, p 566-572, 1972. Illus.
Identifiers: *Australia(Adelaide River), *Pastures, Rivers, *Cattle(Shorthorn steers), Liveweight gain(Cattle).

Data from over 40 grazing trials conducted with Shorthorn steers during 1961-1968 in a tropical monsoonal climate, mean rainfall about 127 cm, at Adelaide River, Northern Territory, Australia, are presented. The average yearly liveweight gain on native pasture at 1 beast to 4-8 ha was 18 kg, due to gains in Nov.-Dec. but weight maintenance or loss occurred during most of the year. The average yearly liveweight gain on Townsville stylo based pastures at 1 beast to 0.4-1.2 ha was 95 kg, with gains of about 0.5 kg/day in the wet season and weight maintenance in the dry. These results are lower than those reported for Katherine, Northern Territory. Other pastures, including phasey bean, were also useful. Some evidence is presented of compensatory gain, and of a comparison of Brahman crossbred steers with the Shorthorns. Possible reasons for the better performance by steers at Katherine compared to Adelaide River are discussed.--Copyright 1973, Biological Abstracts, Inc.
W74-07453

AMMONIUM AND NITRATE UPTAKE BY CORN (ZEA MAYS L.) AS INFLUENCED BY NITROGEN CONCENTRATION AND NH4(+)/NO3(-) RATIO,
Michigan State Univ., Lansing.
D. D. Warncke, and S. A. Barber.
Agronomy Journal, Vol 65, p 950-953, 1973. 1 fig, 5 tab, 16 ref. OWRR B-026-IND(2).

Descriptors: *Farm management, *Absorption, *Nitrates, *Ammonium, *Corn(Field), Soil-water-plant relationships, Nitrogen compounds, *Nitrification, Nutrients.
Identifiers: Shoot/Root ratio, Plant weight, Uptake coefficient, Ammonium/Nitrate ratios.

Corn absorbs both ammonium and nitrate forms of N. The relative proportion of the two can be controlled by affecting nitrification. Little is known about the relative rates of absorption of these ions or their effect on plant growth when both are present. Investigations were made in nutrient solutions with 5 N concentrations at each of 5 ammonium/nitrate ratios. Maximum dry matter accumulated with an N concentration of 67 millimoles. Maximum N uptake occurred for the combination of 303 millimoles N and ammonium/nitrate ratio of 2.46. Shoot/root ratio increased significantly with increased N concentration but was unaffected by the ammonium/nitrate ratio. There was no significant difference between ammonium and nitrate in their relative rates of absorption. Increasing the concentration of ammonium reduced the nitrate rate and increasing the nitrate concentration reduced the ammonium uptake rate.
W74-07459

EFFECT OF IRRIGATION WITH THERMAL WATER ON TRACE-ELEMENT CONTENT IN SOME SOILS OF GEORGIA (VLIYANIYE OROSHENIYA TERMAL'NYMI VODAMI NA SODERZHANIYE MIKROELEMENTOV V NEKOTORYKH POCHVAKH GRUZII),
F. N. Gelashvili.
Pochvovedeniye, No 4, p 80-86, April 1973. 2 tab, 17 ref.

Descriptors: *Land reclamation, *Irrigation practices, *Thermal water, *Trace elements, *Soil types, Nutrients, Corn(Field).
Identifiers: *USSR(Georgian SSR).

The amount of thermal water used for irrigation in eastern Georgia during the growing season was 2,700 cu m/ha in 1967, 3,200 cu m/ha in 1968, 2,800 cu m/ha in 1969, and 3,100 cu m/ha in 1970. In western Georgia, because of wetter climate, irrigation rates were less--1,980 cu m/ha in 1967, 2,750 cu m/ha in 1968, 2,000 cu m/ha in 1969, and 2,580 cu m/ha in 1970. Thermal-water irrigation of Meadow-Alluvial and Red Earth-Podzolic soils of Georgia increases the content of available forms of macro- and microelements, which generally promotes nutrient accumulation in the upper part of the profile. Trace-element availability in soils irrigated with thermal water depends not only on pH and natural oxidation-reduction conditions but also on degree of soil wetting by geothermal waters at a temperature of 25-28 deg C. Trace-element availability depends also on the addition to soil of dissolved trace elements, which tend to intensify biochemical reactions, create readily assimilable forms of nutrients and to improve conditions for plant vital activity. Accumulation and quantitative redistribution of nutrients in soil planted to corn depend on chemical composition of thermal waters, soil physicochemical properties, and on variety, spacing, and stage of development of plants. Phosphorus, potassium, and nitrogen accumulate in soils irrigated with thermal water. Ca and CO3 entering the soil tend to neutralize the acidic reaction of Red Earth-Podzolic soils, creating the conditions necessary for growth, development, and increased yield of corn. Thermal-water irrigation increases corn grain yield from 32% to 80% as compared with the control, depending on soil and climatic conditions, variety of the corn, and chemical composition of the thermal water. The yield doubles on an irrigated plot as compared with the control, and the growing season is shortened, on the average, by 20-25 days. (Josefson-USGS)
W74-07508

SOIL MOISTURE DYNAMICS AND ITS VARIATIONS IN SOILS UNDER FIELD CROPS (DINAMIKA VLAZHNOSTI I STEPEN' YEYE VAR'IROVANIYA V POCHVAKH POD POLEVYMI KUL'TURAMI),
Kostromskoi Selskokhozyaystvennyi Institut (USSR).
For primary bibliographic entry see Field 2G.
W74-07509

INVESTIGATION OF THE RELATION OF GROUNDWATER EVAPORATION TO LITHOLOGICAL STRUCTURE OF THE ZONE OF AERATION (K IZUCHENIYU ZAVISIMOSTI ISPARENIYA GRUNTOVYKH VOD OT LITOLOGICHESKOGO STROYENIYA ZONY AERATSII),
Institute of Hydrogeology and Engineering Geology, Tashkent (USSR).
For primary bibliographic entry see Field 2D.
W74-07529

WATER RELATIONS OF WHEAT AS AFFECTED BY IRRIGATION AND NITROGEN FERTILIZATION,
Lincoln Coll. (New Zealand). Dept. of Plant Science.
C. T. Dougherty.
N Z J Agric Res. Vol 16, No 1, p 12-18, 1973.
Identifiers: Fertilization, *Irrigation, Leaf, *Nitrogen fertilization, Transpiration, *Wheat.

Water potentials of flag leaves and ears on the same tiller of Kopara wheat were measured soon after ear emergence by a pressure-bomb technique. Water potentials of ears were nearly 0.5 bar higher than those of flag leaves. At soil water levels (0-15 cm) of 20%, water potentials of -8 to -9 bars were recorded at 9:00 a.m. on a day of high solar radiation with relatively little advective heat point, and the water potentials of the ears were lower than -20 bars. N fertilizer had no direct effect on ear water potential, but in non-irrigated wheat it depleted soil water, probably by increasing leaf area index and transpiration. As a result soil water levels in non-fertilized, non-irrigated plots were well above the wilting point, and the water potentials of the ear of wheat growing in them were similar to those which were irrigated.--Copyright 1973, Biological Abstracts, Inc.
W74-07596

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

A STUDY OF POTENTIAL INSTITUTIONAL ARRANGEMENTS FOR WATER QUALITY AND WATER RESOURCES (QUANTITY) PLANNING AND MANAGEMENT,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 6B.
W74-07051

LANDSCAPE COMPARTMENTALIZATION: AN ECOLOGICAL APPROACH TO LAND USE PLANNING,
Duke Univ., Durham, N.C. School of Forestry.
For primary bibliographic entry see Field 6G.
W74-07053

WALLOWA LAKE BASIN COMPREHENSIVE PLAN.
Stevens, Thompson and Runyan, Inc., Portland, Oreg.
For primary bibliographic entry see Field 5D.
W74-07065

BACKGROUND SURVEY. SURFACE DRAINAGE PROGRAM, MADISON, SAINT CLAIR, MONROE AND RANDOLPH COUNTIES, ILLINOIS.
Southwestern Illinois Metropolitan Area Planning Commission, Collinsville.
Available from the National Technical Information Service as PB-222 504, $7.25 in paper copy, $1.45 in microfiche. Final report prepared for Department of Housing and Urban Development, April 1973. 90 p, 21 fig, 9 tab, 117 ref. WRC-III. Title III.

Descriptors: *Illinois, *Flood protection, *Flood damage, *Drainage systems, *Drainage water, Management, Hydrologic data, Drainage patterns, Drainage effects, Surface runoff, River basin development, Flood plain zoning, Storm runoff, Storm water.
Identifiers: *Regional planning, Randolph County(Ill), Monroe County(Ill), St. Clair County(Ill), Madison County(Ill).

The purpose of a drainage program for Southwestern Illinois (Madison, Monroe, St. Clair, and Randolph Counties) is to identify and analyze drainage and flooding problems and formulate solutions for future implementation. Information concerning the physical and hydrological character of the region, storm drainage water, and flood control for major hydrological units, and agencies responsible is first collected. Results of the initial information survey are presented. Drainage and flood damage control has been accomplished by structural measures, whereas non-structural measures, such as flood plain zoning, have not been used. Three river systems, the Mississippi, Kaskaskia, and Mary's, make up the surface water resource and natural drainage system, but information is scarce for smaller bodies of water. The magnitude of drainage problems and frequency of urban flooding points to a need for land use management principles. Drainage systems must be designed to accommodate future as well as existing needs, requiring increased knowledge about area-wide development. An immediate need for a comprehensive surface drainage planning program to insure coordination among federal, state, and local projects is evident; its implementation will comprise the remainder of the program. (Grden-North Carolina)
W74-07066

THE RELATIONSHIP OF LAND USE TO WATER USE IN SAN ANTONIO, TEXAS,
Texas Univ., Austin. Center for Research in Water Resources.
D. R. Young, and J. F. Malina, Jr.
Technical Report EHE-72-2, CRWR-84. May 1972. 38 p, 9 fig, 24 ref, 1 append. EPA 5T2-WP-183-03,04.

Descriptors: Water management(Applied), *Land use, *Water utilization, *Water consumption, *Water demand, *Texas, Municipal water, Industrial water, Water distribution, Water delivery, Water supply, Water control, *City planning, Planning.
Identifiers: *San Antonio(Tex), Land use planning, Housing density, Housing valuation, Employee concentrations.

A methodology for estimating the relationship between water use and land use in a metropolitan area is developed, based on data from San Antonio, Texas. Water use for 1963 through 1970 was evaluated in regard to housing density, median housing valuation, and employee concentration. When average water use data were correlated with those land use parameters, results showed water consumption in an urban area is a function of land use. Population is the most important factor affecting water use, with household density serving as an adequate predictor. Employee density showed the effect of commercial and industrial activity upon water use, since water sales by the City Water Board were not categorized by household, commercial, and industrial use. Water use is also a function of the consumers' economic level, and housing value exemplifies this. Water use and total annual rainfall are related, but more information is needed concerning the effects of rainfall upon amount of lawn sprinkling. Planners must predict future housing densities, commercial and industrial centers, and economic level changes to plan water supply resources and distribution systems. Zoning is recommended to enforce and establish land use patterns which insure adequate resources and systems. (Grden-North Carolina)
W74-07067

URBAN IMPACTS OF RURAL RESOURCE DEVELOPMENT EXPENDITURES IN THE INTERLAKE AREA OF MANITOBA,
Manitoba Univ., Winnepeg. Agassiz Centre for Water Studies.
For primary bibliographic entry see Field 6B.
W74-07068

A FRAMEWORK FOR ECONOMIC PLANNING OF WATERSHED DRAINAGE,
Manitoba Univ., Winnepeg. Agassiz Centre for Water Studies.
G. A. Norton, and J. A. MacMillan.
Research Report No. 6, 1972. 63 p, 2 fig, 8 tab, 45 ref.

Descriptors: *Canada, *Watershed management, Drainage, *Drainage areas, *Drainage basin, *Project planning, *Project benefits, Drainage district, Watersheds, Drainage effects, Drainage programs, Drainage engineering, Administration, Feasibility, Project purposes, Water conservation, Water resources development.
Identifiers: Interlake Area(Manitoba), Public investment, Public project expenditures, Manitoba(Canada).

A theoretical framework for drainage planning synthesizing biological, engineering, economic and institutional concepts; the relationships among drainage inputs, resource modification, and economic welfare; and evaluation of impacts of drainage expenditures for the Interlake Area of Manitoba, Canada, are objectives for this study on a farm level economic evaluation of drainage. Efficiency criterion show changes in private income that occur per unit of public project expenditure and distribution criterion identify effects on income groups and their geographic location. Results show farmers believe drainage is beneficial due to the Provincial Government's drainage subsidy program, and some communities are quite dependent on their infrastructure drainage components. Such information aids in watershed management and in the allocation of public funds among resource expenditure categories. When deciding whether to drain a watershed, information concerning future demand for food, desirability of drainage (opportunity cost of providing food in other ways), the land's suitability for drainage, and profitability of drainage is needed. The formulation of a decision process based upon a comprehensive evaluation method is often constrained by existing institutional structures. Institutions with a favorable impact on welfare and the ability to view the watershed as part of an ecosystem constitute a favorable structure. (Grden-North Carolina)
W74-07069

PUBLIC INVESTMENT CRITERIA: APPLICATION TO A PROJECT IN THE SOURIS RIVER BASIN,
Manitoba Univ., Winnepeg. Agassiz Centre for Water Studies.
For primary bibliographic entry see Field 6B.
W74-07070

FLOOD PLAIN INFORMATION-NEUSE AND TRENT RIVERS AND JACK SMITH CREEK, NEW BERN, NORTH CAROLINA.
Army Engineer District, Wilmington, N.C.
May, 1969. 50 p, 10 fig, 11 plates, 2 tab.

Descriptors: Floods, *Flood damage, Tidal effects, *Saline water barriers, *Hurricanes, *Flood control, Flood peak, Flood flow, *North Carolina.
Identifiers: *Tidal floods, Hurricane 'Ione', Standard Project Tide Flood, Intermediate Regional Tide Flood, *New Bern(N.C.), Neuse River(N.C.), Trent River(N.C.), Neuse River Estuary(N.C.).

While New Bern, North Carolina, is subject to both fresh-water flooding and salt-water tide flooding, abnormal rises in tides in the Neuse River estuary are the primary causes of flood damage. Approximately 57% of New Bern is vulnerable to flooding, due to low elevations ranging from 10 to 15 feet above mean sea level. The greatest tide flood was caused by Hurricane 'Ione' in 1955. Flood waters rose to 10.6 feet above mean sea level, accompanied by wind gusts up to 80 miles per hour and a rainfall of 12.23 inches in 24 hours. Analysis indicates that an Intermediate Regional Flood of the tide type would be about 1.4 feet higher than the Hurricane 'Ione' tide flood. A Standard Project Tide Flood would be about 2.4 feet higher than the Intermediate Regional Tide Flood. A flood-tide-barrier project across the Neuse River estuary and located 18 miles below New Bern was authorized for construction by

ongress in 1965 to provide against hurricane-tide ooding in New Bern and vicinity. By 1969 how-ver, no funds were appropriated for the project. he barrier would be a 10,400-foot-long, dredge ill structure, with side slopes of 1 vertical to 30 orizontal, a crest elevation of 16 feet above mean ea level, and a crest width of 50 feet. When con-tructed, it would reduce the elevation of a tide lood equal to the 1955 record tide flood from 10.6 eet mean sea level to about 5.4 feet mean sea evel. Reduction of the Intermediate Regional Tide lood would be 6.2 feet, from 12.0 feet mean sea evel to about 5.8 feet mean sea level. (Hoffman-lorth Carolina)
V74-07073

LOOD PLAIN INFORMATION-NEUSE RIVER ND BUFFALO CREEK, SMITHFIELD, ORTH CAROLINA.
rmy Engineer District, Wilmington, N.C.
ugust, 1971, 58 p, 9 fig, 13 plates, 15 tab.

Descriptors: Floods, *Flood damage, *Dams, River regulation, *Flood control, Flood peak, lood profile, Flood flow, *North Carolina.
dentifiers: Falls Lake(N.C.), Standard Project lood, Intermediate Regional Flood, Neuse iver(N.C.), Buffalo Creek(N.C.), Smithfield(N.C.).

Smithfield, North Carolina lies in the middle of the Neuse River drainage basin. Neuse River and Buf-alo Creek converge on the northern edge of town; ogether they form the western and northern town imits. Approximately 56%, or 1,265 acres, of the own is subject to flooding from major floods on hese streams. This area includes the town's water reatment and sewage treatment plants. Analysis ndicates that Intermediate Regional Floods would ttain depths of about 19 feet above bankfull on he Neuse River and about 10 feet above bankfull n Buffalo Creek. This would result in the flooding f 485 acres and 40 structures within the town imits. Standard Project Floods would generally be 8 to 19 feet higher than Intermediate Regional Floods, resulting in flooding of the entire flood lain and the 830 structures located on it. Maps, rofiles and cross sections detail the extent of past loodings and possible future flooding. With this nformation, minimum floor levels for buildings or control of flood damage can be determined. Falls Lake, to be located 47 miles upstream from Smithfield on the Neuse River, will control 63% of he drainage area above Smithfield. The project will have a maximum regulating effect on flood tages at Smithfield of about 3.5 feet. (Hoffman-North Carolina)
W74-07074

FLOOD PLAIN INFORMATION: BURDENS AND TWO BOTTLE CREEKS AT RESEARCH TRIANGLE AREA, DURHAM COUNTY, NORTH CAROLINA.
Army Engineer District, Wilmington, N.C.
June, 1972. 21 p, 7 fig.

Descriptors: *Floods, *Flood damage, *Flood profiles, Flood peak, Flood flow, *North Carolina.
Identifiers: Intermediate Regional Flood, Standard Project Flood, Burdens Creek(N.C.), Two Bottle Creek(N.C.), Research Triangle Area(N.C.).

Burdens Creek is a main tributary of Northeast Creek. It rises in the south central part of Durham County and flows in a southwesterly direction through the Research Triangle Park, North Carolina. This report covers Burdens Creek from its confluence with Northeast Creek to N.C. Highway 54, a distance of 2.12 miles. Also included is Two Bottle Creek, a tributary of Burdens Creek. Two Bottle Creek enters Burdens Creek 1.34 miles from Northeast Creek. The study covers the .53 mile section south of N.C. Highway 54. No flood discharge or stage records are available for either creek. Determination of flooding potential in the Burdens Creek and Two Bottle Creek area is therefore based on data on streams with similar geographical and physiographical characteristics. Maps, profiles and cross sections delineate the extent of possible flooding. At the present time land-use along the creeks is 20% agricultural and 80% woodland. The only facilities that would be affected by flooding are highway bridge crossings. The Intermediate Regional Flood would flood one highway crossing and the Standard Project Flood would overflow five. (Hoffman-North Carolina)
W74-07075

FLOOD PLAIN INFORMATION - GLADE CREEK, VINTON, VIRGINIA.
Army Engineer District, Wilmington, N.C.
December, 1971. 35 p, 5 fig, 11 plates, 7 tab.

Descriptors: Floods, *Flood profiles, *Flood damage, Flood peak, Flood flow, *Virginia.
Identifiers: *Intermediate Regional Flood, *Standard Project Flood, Glade Creek(Va.), *Vinton(Va.).

Records pertaining to floods and flood damage along Glade Creek in Vinton, Virginia are extremely scarce. Based on an analysis of intense rainfall data, it was estimated that floods have occurred at a rate of nearly 1 every 3 years. Contour maps, profiles and cross sections indicate the extent of past flooding and potential future flooding. A Standard Project Flood would cause flood stages from about 12 to 20 feet higher than bankfull stages, depending on location. This would flood approximately 420 structures within a 585 acre area. An Intermediate Regional Flood would cause flood stages from about 4 to 11 feet higher than bankfull stages, also depending upon location. This would flood approximately 100 structures within a 388 acre area. (Hoffman-North Carolina)
W74-07076

INTERIM STORM DRAINAGE PLAN REPORT-LITTLE ROCK-NORTH LITTLE ROCK METROPOLITAN AREA.
Metroplan, Little Rock, Ark.
For primary bibliographic entry see Field 5D.
W74-07082

STUDY DESIGN. SURFACE DRAINAGE PROGRAM, MADISON, ST. CLAIR, MONROE AND RANDOLPH COUNTIES, ILLINOIS.
Southwestern Illinois Metropolitan Area Planning Commission, Collinsville.
Available from the National Technical Information Service as PB-222 487; $6.25 in paper copy, $1.45 in microfiche. Final report. No SWIL-MAPC 73-11. June, 1973. 74 p, 4 fig. HUD-Ill-P 317-2-275.

Descriptors: *Flood control, Surface drainage, *Surface runoff, *Watershed management, *Comprehensive planning, River basin development, Drainage, Runoff, Urban runoff, *Illinois, Water control, Abatement, Flood damage, Storms, Watersheds, Drainage area, Drainage effects, Water quality, Environmental control, Environmental effects, Regional development.
Identifiers: *Surface drainage program, *Illinois, Madison County(Ill), St. Clair Co.(Ill), Monroe Co.(Ill), Randolph Co.(Ill).

This comprehensive drainage and flood abatement planning program provides techniques and guidelines needed to formulate and implement solutions for drainage problems found in the 2,375 square miles within the political boundaries of Madison, St. Clair, Monroe and Randolph Counties, Illinois, which (except for Randolph) comprise part of the St. Louis Metropolitan Area. Political boundaries are disregarded in order to consider total watershed surface drainage planning. The Planning Area lies within the basins of the Mississippi, the Kaskaskia and Mary's Rivers divided into ten sub-basins. Urbanized centers range in size from small outlying communities with less than 500 to conglomerate urbanized areas with populations exceeding 150,000 in the northwestern quadrant. A detailed description of methodology, a description of work activities and information required, and a detailed model of the plan development process are provided. Various planning and engineering tasks to be carried on during the program are outlined in terms of objectives, scope and content description, input, output, staff skills needed, and time element. Cost estimates, flow charts of work activities and scheduling, and other information are provided. An effort will be made to coordinate this program with related water resources activities and programs of other agencies. (Grden-North Carolina)
W74-07083

STATE FLOOD CONTROL PROGRAM.
Arizona Water Commission, Phoenix.
Report No 3, March 1973, 40 p. 5 fig, 6 tab.

Descriptors: *Building codes, *Zoning, *Project planning, *Flood control, Cost analysis, Floods, Flood plain zoning, Alluvial fans, Arizona, Flood damage, Civil engineering, Check structures, Flood plains, Water management(Applied), Water policy, Hydraulic structures, Dams.

Since much of the land which Arizonans use to live and work is subject to frequent flooding, a comprehensive flood control program is required. Floodplains and alluvial fans are the two principal landforms subject to inundation which support the vast majority of the population. A two-fold program is required to meet the flood control needs of Arizona. The first phase, involving the physical protection of development which has already been established in floodprone areas, identified these areas and proposes flood control measures which will cost in the excess of $400 million. The second phase of the Arizona flood control program must protect areas not yet developed, by proper zoning, building regulations, and planning. The first of these considerations is emphasized. A total of 47 projects are identified and a short description and recommendation for each is given. Legislative recommendations and acts associated with the flood control program proposition are presented in an appendix. The economics, method of payment and costs of the projects are included. (Muller-Arizona)
W74-07111

CALCASIEU RIVER AT COON ISLAND, LOUISIANA, SHIP CHANNEL (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New Orleans, La.
For primary bibliographic entry see Field 8A.
W74-07118

HAWAII'S STATEWIDE LAND CLASSIFICATION PROVES ADAPTABILITY AS LAND USE AND ENVIRONMENTAL CONCERNS CHANGE,
Hawaii State Land Study Bureau, Honolulu.
H. L. Baker.
In: Hawaii Univ., Honolulu, Water Resources Research Center, Water Resources Seminar Series No. 2, December 1972, p 77-81,

Descriptors: *Hawaii, *Land classification, *Land use, *Water quality, Zoning, Decision making, Urbanization, Agriculture, Productivity, Land development, Economics, Planning.
Identifiers: *Land types, *Land categories, Oahu(Hawaii), Maui(Hawaii).

To meet the challenge of growing demands on its limited land resources Hawaii has created a statewide land classification system which inventories the suitability of existing resources for agricultural suitability and productivity. The system groups land into homogeneous units known as land types,

describes their physical conditions and environment, delineates the land type units utilizing areal photos and rates land according to its productivity under alternative uses. While the study appears to have been initially developed to handle problems in agricultural development, such elements as slope, stoniness, depth of soil and drainage are also useful in making urban development decisions. As a result, a classification system of urban land has arisen from data collected under the statewide survey. The existing system has already proved to be a useful tool in the development of statewide zoning, local community development, and in recent re-evaluation of specific urban-use suitability of lands within the urban zone as defined under the State Land Use Law. (See also W74-07133) (Schroeder-Wisconsin)
W74-07138

WATER USES AND WATER DEVELOPMENT IN FALL CREEK--POSSIBLE CONFLICTS,
Cornell Univ., Ithaca, N.Y. Dept. of Conservation.
For primary bibliographic entry see Field 6B.
W74-07149

MANGANESE AND IRON SOLUBILITY CHANGES AS A FACTOR IN TILE DRAIN CLOGGING: I. OBSERVATIONS DURING FLOODING AND DRYING,
Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
For primary bibliographic entry see Field 2G.
W74-07151

MANGANESE AND IRON SOLUBILITY CHANGES AS A FACTOR IN TILE DRAIN CLOGGING: II. OBSERVATIONS DURING THE GROWTH OF COTTON,
Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
For primary bibliographic entry see Field 2G.
W74-07152

DRAINAGE DENSITY AND EFFECTIVE PRECIPITATION,
For primary bibliographic entry see Field 2A.
W74-07155

WATER YIELD, ANNUAL PEAKS AND EXPOSURE IN MOUNTAINOUS TERRAIN,
Forest Service (USDA), Moscow, Idaho. Forestry Sciences Lab.
For primary bibliographic entry see Field 2A.
W74-07165

NUMERICAL STUDIES OF TWO-DIMENSIONAL SATURATED-UNSATURATED DRAINAGE MODELS,
Oslo Univ. (Norway). Inst. of Geophysics.
For primary bibliographic entry see Field 2G.
W74-07168

THE FORECASTING OF STREAMFLOW USING THE METHOD OF CHARACTERISTIC MODES,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
E. D. Soulis, and W. C. Lennox.
Journal of Hydrology, Vol 20, No 4, p 341-350, December 1973. 2 fig, 3 tab, 9 ref. Canada NRC Grant A3726.

Descriptors: *Streamflow forecasting, *Statistical methods, Stochastic processes, Correlation analysis, Time series analysis, Algorithm, Optimization.
Identifiers: *Farmers method(Characteristic modes).

Streamflow forecasting was studied using the method of characteristics modes proposed by Farmer for nonstationary processes. The calculation of the autocorrelation matrix was modified for processes which generate a single record. An algorithm is proposed for the optimum choice of the number of past data and mode vectors. Results for 12 gaging stations in various parts of the world are presented. (Knapp-USGS)
W74-07178

A SYNTHETIC MODEL FOR DAILY STREAMFLOW,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W74-07179

WATER RESOURCES INVESTIGATIONS IN NEW YORK, 1973.
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 7C.
W74-07188

HYDROELECTRIC POWER RESOURCES OF THE UNITED STATES, DEVELOPED AND UNDEVELOPED, JANUARY 1, 1972.
Federal Power Commission, Washington, D.C.
For primary bibliographic entry see Field 8C.
W74-07189

PROBLEMS IN DISTRIBUTION OF WATER RESOURCES IN THE ARID ZONE OF THE AMUDAR'YA RIVER BASIN (VOPROSY RASPREDELENIYA VODNYKH RESURSOV V ARISNOY ZONE (NA PRIMERE AMUDAR'I)),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
A. A. Bostandzhoglo.
Vodnyye Resursy, No 5, p 55-67, 1973. 1 fig, 10 tab, 7 ref.

Descriptors: *Water resources, *Water distribution(Applied), *Arid lands, *Irrigation, Irrigation systems, Irrigated land, Water utilization, Agriculture, Cotton, Mathematical studies, Optimization, Economics.
Identifiers: USSR, *Soviet Central Asia(Amudar'ya River basin).

The major water user in Soviet Central Asia today and in the years ahead is irrigated agriculture, which will soon cover 7 million ha in the Kirgiz, Tadzhik, Uzbek, and Turkmen Republics. Land suitable for irrigation in Soviet Central Asia is about 26 million ha, including 13.5 million ha in the Syrdar'ya basin and 12.5 million ha in the Amudar'ya basin. Land cropped to cotton is about 2.8 million ha, representing more than 95% of all cotton produced in the USSR. Water resources in basins of Soviet Central Asian rivers in an average water year are about 120 cu km, including 80 cu km in the Amudar'ya system and 40 cu km in the Syrdar'ya system. River runoff in the Syrdar'ya basin can be used to irrigate 3 to 3.5 million ha, and river runoff in the Amudar'ya basin, 5 to 5.2 million ha. Based on investigations in the Amudar'ya basin and use of mathematical programming techniques, a working method was proposed and a solution obtained for an optimization problem on water-resource distribution among different water users. Results of optimization computations were compared with data obtained earlier in a general program for complex use of water resources of the Amudar'ya River. Procedures recommended for distribution of limited water resources can be used to solve similar problems for any region where irrigation merits prior attention. (Josefson-USGS)
W74-07192

OPTIMAL LINEAR EXTRAPOLATION OF LEVEL FLUCTUATIONS OF CLOSED WATER BODIES (OPTIMAL'NAYA LINEYNAYA EKSTRAPOLYATSIYA KOLEBANIY UROVNYA ZAMKNUTYKH VODOYEMOV),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
V. Ye. Prival'skiy.
Vodnyye Resursy, No 5, p 17-28, 1973. 2 fig, 23 ref.

Descriptors: *Lakes, *Water level fluctuations, *Statistical methods, Statistical models, Stochastic processes, Forecasting, Inflow, Evaporation, Circulation, Equations
Identifiers: *USSR(Caspian Sea).

A method is presented for optimal linear extrapolation of regular random processes based on their parametric models. A method is described for constructing these models, based on estimates of correlation and partial correlation functions of the process. The problem of forecasting level fluctuations of a closed water body from a water-balance equation is examined within the framework of the theory of random processes, and a long-range forecast is made of level fluctuations of the Caspian Sea to the year 2000, provided the present level of irretrievable water losses in the sea basin is maintained. An approximate stochastic model was constructed of fluctuations of visible evaporation from the sea surface for 1890-1969. Changes in stochastic models of inflow and visible evaporation were found to have little effect on the results of the long-range forecast. The need to construct a physical model that relates level fluctuations of the Caspian to large-scale air and ocean circulation processes and their effects is noted. (Josefson-USGS)
W74-07195

THE BITTERSWEET WATERS OF THE LOWER COLORADO,
For primary bibliographic entry see Field 3F.
W74-07292

AGANA SMALL BOAT HARBOR, AGANA, GUAM (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Honolulu, Hawaii. Pacific Ocean Div.
Available from the National Technical Information Service as EIS-PI-73-0847-F; $4.75 in paper copy, $1.45 in microfiche. February 23, 1973. 39 p, 4 fig.

Descriptors: *Environmental effects, *Harbors, *Aquatic habitats, Construction, Aquatic life, Reefs, Wastes, Oil spills, Water supply, Fish, Wildlife, Navigation, Coastal structures, Shore protection.
Identifiers: *Environmental Impact Statements, *Guam(Agana).

The project under consideration is the construction of a small boat harbor in Agana, Guam. Implementation of the proposed plans will alter the existing shallow reef. The proposed harbor would improve boating conditions and enhance recreational uses. The impact upon marine life will be limited to construction periods. No rare or endangered species nor any areas of historical significance will be affected. Some of the adverse environmental effects are various short-term impacts during construction, use of 40 acres of reef flat habitat, and possible conflicts of use among boaters, surfers, and fishermen. Three alternatives; alternative sites, alternate harbor configuration, or no action at all. The responsibilities for control of harbor pollution from fuel and oil spills and ship wastes rest with the local interests. The following protected uses will come from the harbor: industrial water supply, propagation of fish and other aquatic life, esthetic enjoyment, recreation, and navigation. (Daniels-Florida)
W74-07294

MALL BEACH EROSION CONTROL PROECT, LEWES, DELAWARE (FINAL ENVIRONIENTAL IMPACT STATEMENT).
rmy Engineer District, Philadelphia, Pa.
vailable from the National Technical Informaon Service, Springfield, Va. 22151, as EIS-DE-3-0493-F. March 1972. 11 p, 1 map.

escriptors: *Delaware, *Erosion control, Reclaation, *Recreation facilities, Dredging, *Filling, edimentation, Planning, Land use, Estimating, ederal project policy, Environmental engineerg, Environmental effects, Beach erosion, Fish onservation, Turbidity.
dentifiers: *Environmental impact statement, Lewes(Del).

he feasibility was evaluated of restoring and stailizing a portion of the shoreline of Lewes, elaware, by providing beach erosion control easures resulting in a protective and recreational each adequate to meet the area's present and fuure needs. The proposed plan consists of beach ill, periodic nourishment, sand fence and dune rass. The beach fill will be dredged from oosevelt Inlet. Implementation of the plan would revent storm damage, improve the beach's apearance, and satisfy recreational beach use deand. Disturbance of bottom sediments would ause a temporary increase in turbidity and bacerial counts in overlying waters which would not esult in any significant effect on fishery esources, as the seasonal dredging would not inerfere with shellfish or finish reproduction. Conurrence and approval of the plan by numerous ederal and state agencies affirms the plan as an nvironmentally sufficient method of repairing the resent beach erosion problem. (Silber-Florida)
W74-07295

A COMPUTER SIMULATION MODEL FOR FLOOD PLAIN DEVELOPMENT. PART II: MODEL DESCRIPTION AND APPLICATIONS,
NTASA, Menlo Park, Calif.
For primary bibliographic entry see Field 6A.
W74-07296

NONLINEAR PROGRAMMING IN RIVER BASIN MODELING,
Calgary Univ. (Alberta). Faculty of Business.
For primary bibliographic entry see Field 5B.
W74-07298

FLOOD PROOFING DECISIONS WITH UNCERTAIN EVENTS,
Massachusetts Univ., Amherst. Dept. of Agricultural and Food Economics.
For primary bibliographic entry see Field 6A.
W74-07299

SIMULATION--A TOOL FOR WATER RESOURCE MANAGEMENT,
Hydrocomp, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 6A.
W74-07300

IPSWICH RIVER BASIN MODEL STUDY,
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 6D.
W74-07302

ECONOMIC SIZE SELECTION FOR PVC PIPELINES,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 8A.
W74-07303

A MODEL OF IRRIGATED AGRICULTURE AND REGIONAL DEVELOPMENT IN SOUTHERN ARGENTINA: THE RIO NEGRO BASIN,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 6A.
W74-07306

CAPITAL COST MINIMIZATION OF DRAINAGE NETWORKS,
Duke Univ., Durham, N.C. Dept. of Civil Engineering.
J. S. Dajani, and Y. Hasit.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 100, No. EE2, Proceedings paper No. 10448, p 325-337, April 1974. 3 fig, 2 tab, 18 ref.

Descriptors: *Drainage systems, *Networks, *Sewers, Costs, *Environmental engineering, Computers, Linear programming, Optimization, Model studies, Hydraulics, Sanitary engineering, Economics, Pipes, Flow design, Size, Systems analysis.
Identifiers: Separable-convex programming, Mixed-integer programming, *Cost minimization.

Three mathematical programming models for the optimization of drainage networks are presented and compared. The models suggest a feasible design methodology for selecting pipe size and slope combinations for a given network layout; the methodology produces the minimum cost design under given assumptions. The three models are based on two extensions of linear programming: separable-convex and mixed-integer programming. The former produces a continuous range of diameters while the latter limits the solution to discrete commercially available sizes. It is shown that while the former can be formulated with pipes flowing full, the latter must allow for partial flow. A solution which combines both these techniques is shown to produce a minimum cost system with partially-full flows and commercially available diameters. This solution requires less computer time than those based strictly on mixed-integer programming. An example seven-link drainage network has been designed by the three alternative model formulations and the results are presented. Mixed-integer programming coupled with convex-separable programming presents itself as a feasible design and optimization tool for drainage networks. (Bell-Cornell)
W74-07309

NETWORK APPROACH TO MANAGEMENT OF CONJUNCTIVELY OPERATED GROUND WATER - SURFACE WATER SYSTEMS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
A. S. Hamdan.
Available from the National Technical Information Service as PB-231 769 $13.00 in paper copy, $1.45 in microfiche. Ph.D Thesis, 1974 187p, 26 tab, 36 fig, 125 ref, 2 append. OWRR A-059-ILL(1) 14-31-0001-3813.

Descriptors: *Algorithms, *Illinois, Networks, *Conjunctive use, Water management(applied), Model studies, Costs, Water allocation, Planning, Forecasting, *Optimum development plans.
Identifiers: Management planning, *Network analysis, Optimum design, *Kaskaskia River Basin(Ill).

The approach involves modeling a problem as a network and solving it by network-based solution algorithms. The network model of a water resources system consists of nodes and directed arcs. The nodes represent supplies where water is originated, uses where water is consumed, and intermediate nodes where water is conserved. Linear unit 'costs' (representing actual costs or some function of returns) are imposed on appropriate network arcs. Any other constraints on the amount of water to be allocated from a particular supply to a particular use are also imposed as bounds on appropriate network arcs. A network model and the out-of-kilter Algorithm were used to determine optimal plans to meet the water supply requirements in the Kaskaskia River Basin in South-Central Illinois, over a planning period of 50 years starting in 1970, using local surface and ground water sources and a source of water import.
W74-07335

PLANAR AND AXISYMMETRIC BOTTOM WITHDRAWAL FROM A DENSITY-STRATIFIED RESERVOIR,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
J. C. Ho.
Available from the National Technical Information Service as PB-231 768 $15.50 in paper copy, $1.45 in microfiche. Ph.D. Thesis, 1973. 230 p, 48 fig, 3 tab, 42 ref, 8 append. OWRR B-080-WIS (1) 14-31-0001-3948.

Descriptors: Model studies, Engineering, Equations, *Resevoir releases, *Density currents, *Stratification, *Withdrawal, Flow, *Mathematical models, *Stratified flow.
Identifiers: Viscous flow, Transition flow, Sinks.

This study deals with theoretical and experimental investigations on selective withdrawal of a viscous, non-diffusive linearly stratified fluid from the bottom of a reservoir. Two-dimensional planar and axisymmetric flows are considered in the mathematical treatment. A model is developed to describe planar, bottom withdrawal. A solution to the governing differential equations is attempted using a momentum integral technique. Accordingly, the horizontal momentum equation is integrated across the withdrawal layer. Fourteen laboratory experiments were conducted on a tank 15 cm. wide, 60 cm. high and 600 cm. long to verify the mathematical model. A density-stratified fluid is produced by slowly releasing into the experimental reservoir, successive thin layers of salt solution of decreasing density. Horizontal velocity profiles are measured by photographing the displacement of an initially vertical dye streak. Experimental results confirm the predicted growth of the withdrawal layer and other theoretical findings, such as the maximum horizontal velocity in the withdrawl layer. An axisymmetric bottom withdrawal model is developed. The mathematical treatment is similar to that of the planar model. Twenty laboratory experiments were conducted on a tank in the shape of a quadrant 153 cm. in radius and 57 cm. high. Experimental data confirm the predicted growth of the withdrawal layer and other theoretical findings.
W74-07340

MANAGEMENT OF SOUTH WESTLAND TERRACE PODOCARP FOREST UNDER A SELECTION LOGGING SYSTEM,
New Zealand Forest Service, Harihari.
R. K. Gover.
N.Z.J. For. Vol 17, No 2, p 256-265, 1972. Illus.
Identifiers: Dacrydium-Cupressinum, Degradation, Forests, Logging, *Management, Mineral, *New Zealand(Westland), Nutrients, *Podocarp forests, Scarification, Soils, Terrace, Waterlogged.

Selection management began on the morainic podocarp forests of State tenure in south Westland(New Zealand) in 1963 in an effort to conserve forest structure and to provide a timber source in perpetuity. The area of these forests is 14,500 ha. During the first 7 yr of the initial cutting cycle (prescribed as 30 yr) some 710 ha were worked. Past clearfelling practices on these terraces caused severe soil degradation. The soils are naturally characterized by water logged mineral horizons, hardpan formations, lack of structure, severe leaching, acidity and extreme nutrient deficiency. Under the selection system, however, this degradation is kept to a minimum by retention of forest structure. Machines used, and extraction methods employed, are governed by stand condi-

tions. Mechanical damage to residual trees is kept to a minimum, rarely exceeding 5%, and machine scarification of the ground improves seedbed conditions. The effect heavy machinery is having on increment, through compaction of shallow feeding roots of rimu (Dacrydium cupressinum), is not certain at this stage. Ponding in localized areas also causes root damage to rimu, and subsequent mortality is rapid. Selection logging may eventually be extended to replace clearfelling practice in hill country forests. --Copyright 1973, Biological Abstracts, Inc.
W74-07347

INSTRUMENTATION FOR ENGINEERING MANAGEMENT OF A MULTI-PURPOSE RIVER BASIN SYSTEM (TRINITY RIVER BASIN, TEXAS) REAL-TIME ENGINEERING MANAGEMENT OF A MULTI-PURPOSE RIVER BASIN SYSTEM,
Texas Univ., Austin. Center for Research in Water Resources.
Q. W. Martin, E. F. Gloyna, and W. G. Lesso.
Availability from the National Technical Information Service as PB-231 867, $6.00 in paper copy, $1.45 in microfiche. Completion Report CRWR-98, December 1973. 216 p, 31 fig, 22 tab, 75 ref. OWRR B-079-TEX (2). 14-01-0001-3337.

Descriptors: *Instrumentation, Data acquisition, On-site data collection, *Texas, Automatic control, Economic feasibility, Sampling, *Reservoir operation, River basins, Waste discharges, *River systems, Linear programming, Systems analysis, *Multiple purpose reservoirs, Management, Monitoring, Algorithm.
Identifiers: *Trinity River Basin(Tex), Dynamic systems operation, Water quality monitoring network.

The goal was to determine the conceptual requirements of future data acquisition and monitoring instrumentation systems for the efficient operation and management of a highly developed river basin system. The Trinity River Basin in Texas is selected as an example system for specific recommendations. The complexity of the entire Trinity River system is evaluated and the feasibility of using a real-time data acquisition system on the Trinity River and its tributaries is considered. The current state of the art in management instrumentation is evaluated to ascertain the extent of practical feasibility and applicability on both the micro- and macro-scale environments, i.e., the Dallas-Fort Worth area and the entire Trinity River Basin, respectively. An algorithm was developed for finding the optimal management policies for the dynamic operation of a system of multipurpose reservoirs, tertiary wastewater treatment plants, wastewater retention basins, and navigation locks and dams. This management procedure is designed to interface with a real-time water quality monitoring system so that operating policies can be adjusted to reflect changing environmental conditions.
W74-07369

SOLUTIONS FOR LATERAL OUTFLOW IN PERFORATED CONDUITS,
Ghent Rijksuniversiteit (Belgium). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W74-07433

DEVELOPMENT OF AN AGRICULTURAL DRAINAGE GUIDE,
Soil Conservation Service, Berkeley, Calif.
G. L. Dickey, and W. R. Johnston.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 16, No 1, p 97-99, January-February, 1973. 6 fig, 6 ref.

Descriptors: *Drainage, *Subsurface drainage, Tile drainage, Drainage systems, Drainage engineering, Drainage area, Drainage programs, *Design, *California.
Identifiers: *Drainage guide, Fresno County(Calif).

A simplified procedure for field investigation and design of subsurface drainage systems was developed for western Fresno County, California. Data were collected to a depth of 20 feet or more in deep soil in order to analyze the drainage problem. Standard soil surveys to the depth of 5 feet are of little value in determining drain depth requirements in deep soils; however, a correlation was found between 0 to 5-feet soil characteristics and the drainage coefficient. Existing drainage systems are needed for study and evaluation. This allows a drainage guide to be developed on actual drain performance. (Skogerboe-Colorado State)
W74-07438

SHALLOW DRAIN PERFORMANCE IN A HEAVY SOIL,
Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
L. F. Hermsmeier.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 16, No 1, p 92-94, January-February, 1973. 3 fig, 5 tab.

Descriptors: *Drainage, *Subsurface drainage, Tile drainage, Drainage systems, Drainage engineering, Drainage area, Drainage programs.

Shallow drains installed at a 4-foot depth and 200-foot spacing in a clay and loamy clay soil removed only from 12 percent to 7.2 percent of the salt added by the irrigation water during four cropping seasons over a 2-1/2 year period. The small amount of salt removed by the drains, when combined with salt removed from the soil by the natural drainage, was sufficient to maintain a favorable salt balance. However, during the sugarbeet cropping season when only 7.2 percent of the salt added by the irrigation water was removed by the drains there was an unfavorable salt balance in the field. Shallow drains can provide the means for removing sufficient salt from the soil to maintain a favorable salt balance when combined with natural drainage and good irrigation practice. (Skogerboe-Colorado State)
W74-07442

TRICKLE IRRIGATION IN AUSTRALIA,
For primary bibliographic entry see Field 3F.
W74-07450

IRRIGATION SURVEY.
For primary bibliographic entry see Field 3F.
W74-07451

A RAINFALL-RUNOFF MODEL BASED ON THE WATERSHED STREAM NETWORK,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 2A.
W74-07464

HERBIVOROUS FISH FOR AQUATIC PLANT CONTROL,
Waterways Experiment Station., Vicksburg, Miss.
E. O. Gangstad, J. J. Raynes, and R. M. Burress.
Available from the National Technical Information Service as AD-765 437; $4.75 in paper copy, $1.45 in microfiche. Aquatic Plant Control Program, Technical Report 4, June 1973. 150 p, 9 fig, 47 tab, 90 ref.

Descriptors: *Aquatic weed control, *Biocontrol, *Carp, *Herbivores, Aquatic plants, Arkansas, Florida, Georgia, Albama, California, Spawning, Stocking, Algae, Hatching, Fish genetics, Breeding, Fish, Fish reproduction, Fish harvest, Fish diets.
Identifiers: Israeli carp, White amur, Ctenopharyngodon idella, Hypophthalmichthys molitrix, Grass carp, Chinese carp, Indian carp, Catla catla, Labeo rohita, Cirrhina mrigala, Mylopharyngodon piceus, India.

Efficiency of white amur fish (Ctenopharyngodon idella) as a biological control agent of aquatic weed populations in natural habitats is determined and effects of space and plant nutrients resulting from destruction of weeds evaluated. Research was conducted in Arkansas, Florida, Georgia, Alabama, and California, and India. The artificial diploid gynogenesis method undoubtedly will be useful in selection of heterosis combinations. Such heterosis will evidently be possible in crossing of the 'topcross' type. In the preliminary study, spawning was successful during May after water temperatures reached 75F, little success was attained after water temperatures reached 87F. The white amur fish appears promising as an efficient agent for converting troublesome aquatic plant growth into a useful product, i.e., fish protein. Effects at various stocking rates on channel catfish and striped bass, and aquatic plants were determined. Benefits are shown of using white amur where biological methods of weed control are preferable to chemical methods. Apparently white amure do not pose a competitive threat for food organisms eaten by gamefish. Feasibility of successful hybridization of Chinese carp with Indian carp and vice versa indicates that hybrids of selected desirable qualities could probably be produced. The nutritional preferences are described. (Jones-Wisconsin)
W74-07470

RESPONSE OF AQUATIC WEEDS TO LASER RADIATION,
Athens Coll., Ala. Dept. of Biology.
For primary bibliographic entry see Field 5G.
W74-07475

THE PAST AND PRESENT FLORA AND VEGETATION OF THE HACKENSACK MEADOWS,
For primary bibliographic entry see Field 2I.
W74-07476

POSSIBLE EFFECTS OF CONSTRUCTION AND OPERATION OF A SUPERTANKER TERMINAL ON THE MARINE ENVIRONMENT IN NEW YORK BIGHT,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 5C.
W74-07488

SEEPAGE THROUGH A HILLSIDE: THE STEADY WATER TABLE,
Arizona Univ., Tucson. Dept. of Soils, Water, and Engineering.
For primary bibliographic entry see Field 2G.
W74-07517

SALT DISPLACEMENT INTO DRAIN TILES UNDER PONDED LEACHING,
Arizona Univ., Tucson. Dept. of Soils, Water, and Engineering.
For primary bibliographic entry see Field 2G.
W74-07518

SNOW ACCUMULATION AND SNOWMELT AS INFLUENCED BY A SMALL CLEARING IN A LODGEPOLE PINE FOREST,
Forest Service (USOA) Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2C.
W74-07526

POTENTIAL OF WESTLAND'S MORAINIC SOILS FOR FOREST MANAGEMENT,
New Zealand Forest Service, Hokitika.
R. J. Coker.

N Z J For. Vol 17, No 2, p 224-231, 1972. Illus.
Identifiers: Deposits, *Forest management, *Morainic soils, *New Zealand(Westland), *Pleistocene, Podocarps, Soils.

More than 160,000 ha of lowland areas of the West Coast of the South Island of New Zealand consist of soils derived from outwash gravels or deposits of Pleistocene age. Over half this area is State forest land-much of it derelict following colonial-type exploitation of the high volume indigenous forests it once carried. Fires, excess surface water, lack of seed trees, and exposure have contributed to poor regeneration of podocarps, and to a large extent these areas are wastelands with no definite management policy. Management of the remaining well-forested terraces is being mastered by selection logging techniques which allow production without further contributing to management problems. An evaluation of species on the better sites in Mahinapua State Forest, which was planted with exotics during the late 1920s and early 1930s, indicates that these soils have potential for exotic production forest provided that only better sites are utilized and and a silvicultural regime is adopted which maximizes diameter growth.--Copyright 1973, Biological Abstracts, Inc.
W74-07594

THE AGE DYNAMICS AND THE ECONOMIC SELECTION CUTTINGS IN BROAD LEAVED DARK CONIFEROUS FORESTS OF THE WATER PROTECTIVE SHELTERBELT OF THE UFA RIVER WITHIN THE SVERDLOVSK REGION, (IN RUSSIAN),
E. P. Smolonogov.
Tr Inst Ekol Rast Zhivotn Ural Fil Akad Nauk SSSR. 77 p 117-134, 1970.
Identifiers: Age, *Coniferous forests, *Cuttings(Broad-leaf), *Economics, *Forests, Maturity, Mortality, Rivers, Shelterbelt, Stands, *USSR(Ufa River), Volume, Water.

In the shelterbelt of the Ufa River, USSR, there are about 6,500,000 m3 of mature and overmature wood. In 1953, regeneration cuttings were started in these forests. The change in the forest areas and in the mean stand volumes according to age classes for 1956-1966 s shown. Wood losses for that period amounted to 1,480,000 m3. On the basis of age structure dynamics, the standing volume and stand yield tables, a calculation was made of the magnitude of the natural mortality of the stands. Economic-selection cuttings are recommended, the intensity of which is based on the phases of quantitative maturity, natural maturity and renovation maturity of forests.--Copyright 1973, Biological Abstracts, Inc.
W74-07600

4B. Groundwater Management

GROUNDWATER GEOLOGY OF FORT VALLEY, COCONINO COUNTY, ARIZONA,
R. H. DeWitt.
In: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1973 meetings of the Arizona Section-AWRA, and the Hydrology Section-Arizona Academy of Science, May 4-5, 1973, Tucson, Arizona, p 41-43, (1973). 1 fig, 2 ref.

Descriptors: *Perched water, *Clays, *Groundwater, *Geohydrologic units, *Fractures(Geologic), Geology, Sandstones, Sedimentary rocks, Faults, Alluvium, Igneous rocks, Conglomerate rocks, Aquifers, Water table, Infiltration, Runoff, Recharge, Watersheds(Basins), Surface drainage, Limestones, Reservoirs, *Arizona, Impervious soils, Water wells, Water yield.
Identifiers: Interflow.

All groundwater in Fort Valley is presently found in perched aquifers. The regional water table in the area is estimated to lie at a depth of approximately 1750 feet. Groundwater reservoirs are perched on impermeable clay zones located at the base of alluvial units. Groundwater is also found in highly fractured volcanic zones overlaying impermeable clay zones. Perched aquifers also occur in interflow zones above either impermeable clays or unfractured volcanics. Groundwater in Fort Valley is the result of infiltration or runoff and from precipitation. This recharge water infiltrates the alluvium or fractured volcanic rocks until an impermeable zone is reached where it becomes perched groundwater. Greatest well yields come from these recharge aquifers; their reliability is largely dependent on precipitation and runoff. Most wells in the Fort Valley area supply adequate amounts of water for domestic use. (Mastic-Arizona)
W74-07092

QUALITY OF WELL WATERS OF JAIPUR DISTRICT,
Udaipur Univ. (India).
K. V. Paliwal, and A. P. Gandhi.
Annals of Arid Zone, Vol 11, Nos 1 and 2, p 41-49, March and June 1972. 6 tab, 25 ref.

Descriptors: *Irrigation wells, *Dissolved solids, *Water quality, *Groundwater, *Salinity, Hardness(Water), Water analysis, Water chemistry, Water properties, Water resources, Saline water, Saline water systems, Salts, Sodium, Boron, Electrical conductance, Ions, Anions, Cations, Cation adsorption.
Identifiers: *India(Rajasthan).

Chaksu Panchayat Samiti of the Jaipur district of India is a dry region in need of groundwater for irrigation. This study examines this water in terms of water quality in an attempt to determine its suitability to that end. Ninety-two wells were analyzed for the pertinent ions in solution and for electrical conductivity. The waters were classified in terms of total dissolved solids, sodium absorption ratio, boron and bicarbonate content. Boron class and salinity-SAR groups are determined. The waters have a wide concentration rage but are, for the vast majority of the samples, extremely saline with a high SAR. Their indiscriminate use in agriculture is not indicated, although controlled and managed irrigation is possible. Cation/anion ratios should be used as indications of water quality in the evaluation of irrigation water. (Muller-Arizona)
W74-07106

WATER RESOURCES SEMINAR SERIES NO. 2.
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W74-07133

APPLICATION OF GEOCHEMISTRY TO THE SEARCH FOR CRUDE OIL AND NATURAL GAS,
Research Council of Alberta, Edmonton.
B. Hitchon.
In: Introduction to Exploration Geochemistry, Applied Publishing Ltd, Calgary, Alberta, Canada, Chapter 13. p 509-545, 1974. 17 fig, 5 tab, 128 ref.

Descriptors: *Geochemistry, *Exploration, *Oil fields, *Oil, Investigations, Water chemistry, Water circulation, Groundwater movement, Surveys, Organic matter, Chemical analysis, Canada.

Geochemistry may be applied at several stages during the exploration of sedimentary basins for crude oil and natural gas. During the initial stages, when few wells have been drilled and no commercial accumulations discovered, proper application of modern geochemical techniques provides reliable information on the petroleum generating potential of the basin and allows selection of the major source rock groups. Once hydrocarbons have been discovered it is important to classify the crude oils and natural gases into geochemical families having distinctive sources, hydrologic histories and timing of generation, migration and accumulation. In this manner geochemically related hydrocarbons may be sought in unexplored areas and different stratigraphic units. In the final stage of exploratory sophistication computer modeling of all available geolocal, geophysical, geochemical and hydrologic data may be used to seek out commercial accumulations. Practical application of geochemistry to the search for crude oil and natural gas can only be accomplished by extensive multicomponent analysis of fluids and rocks, together with a knowledge of hydrodynamics and a thorough understanding of the basic geology of the sedimentary basin, coupled with computer modeling of the geological, geophysical, geochemical and hydrologic history of the basin. (Knapp-USGS)
W74-07161

PUBLIC GROUNDWATER SUPPLIES IN ADAMS COUNTY,
Illinois State Water Survey, Urbana. Hydrology Section.
D. M. Woller.
Bulletin 60-1, 1973. 21 p.

Descriptors: *Groundwater, *Water wells, *Aquifer characteristics, *Illinois, Data collections, Hydrologic data, Hydrogeology.
Identifiers: *Adams County(Ill).

All available information on production wells used for public groundwater supplies in Adams County, Illinois, is presented. Systems and wells described furnish water for drinking or general domestic use in: (1) incorporated municipalities; (2) unincorporated communities where 10 or more separate lots or properties are being served or are intended to be served; (3) state-owned parks and memorials; and (4) state-owned educational, charitable, or penal institutions. Descriptions are included for groundwater supplies of 8 municipalities, 2 subdivisions, and 1 state park in Adams County. Consolidated bedrock aquifers, principally the Keokuk-Burlington limestone, are tapped as a primary source of both private and municipal supplies throughout much of the entire county. The estimated production of all municipal wells finished in limestone aquifers of the county was 250,000 gpd in 1970. Water from the limestone varies in iron content from 0.0 to 3.6 mg/liter and from 68 to 348 mg/liter in hardness. The towns of Golden and Liberty aerate to remove hydrogen sulfide; none of the towns removes iron or softens the water. (Knapp-USGS)
W74-07172

VARIABLES AFFECTING WELL SUCCESS IN A KENTUCKY LIMESTONE AQUIFER,
Kentucky Univ., Lexington. Dept. of Geology.
J. T. Johnson, and J. Thrailkill.
Journal of Hydrology, Vol 20, No 4, p 327-333, December 1973. 1 fig, 1 tab, 12 ref.

Descriptors: *Water wells, *Water yield, *Water quality, Hydrogeology, Karst hydrology, Statistical methods, Stratigraphy, Surface-groundwater relationships, Limestones, Water levels, *Kentucky, Topography, Structural geology.

Variables significantly affecting groundwater supply in the Centerville Quadrangle, Kentucky were those directly related to lithology (wellhead stratigraphy and well-bottom stratigraphy) and those interpreted as being strongly influenced by lithology (well depth, wellhead elevation, and well-bottom elevation). In addition, wells judged adequate for water supply were closer to surface streams and bottomed closer to stream level than dry holes. Adequate wells were also closer to synclinal axes than dry holes. There was no signifi-

cant difference between holes and adequate wells in their distance from sinkholes or regional structural position. Wells producing water with H2S differed from adequate wells only with regard to variables related to lithology. Saline-water wells were more abundant in areas distant from surface streams as well as in unfavorable lithology. The ten variables studied were examined using nonparametric statistical tests (the Mann-Whitney U and the Chi-square tests). (Knapp-USGS)
W74-07176

VERTICAL MOVEMENTS IN THE NONSATURATED ZONE AND THE SPECIFIC YIELD OF A WATER-TABLE AQUIFER (ETUDE DES TRANSFERTS VERTICAUX DANS LA ZONE NON SATUREE ET DE L'EMMAGASINEMENT D'UNE NAPPE LIBRE, DANS LE CAS D'UN POMPAGE, DANS LES CONDITIONS NATURELLES),
Bordeaux Univ. (France).
For primary bibliographic entry see Field 2F.
W74-07182

AQUIFERS IN THE SOKOTO BASIN, NORTHWESTERN NIGERIA, WITH A DESCRIPTION OF THE GENERAL HYDROGEOLOGY OF THE REGION,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 2F.
W74-07184

RECORDS OF GROUND-WATER LEVELS IN WYOMING, 1940-1971,
Geological Survey, Cheyenne, Wyo.
B. H. Ringen.
Wyoming State Water Planning Program Report No 13, 1973. 479 p, 25 fig, 2 ref.

Descriptors: *Hydrologic data, *Water wells, *Water levels, *Wyoming, *Data collections, Water level fluctuations.

The U.S. Geological Survey, in cooperation with city, state, and other Federal agencies, has measured the depth to water periodically in a large number of wells in Wyoming since 1940. This report publishes, in a single volume, groundwater-level measurements that have been made in Wyoming in the period 1940-71 by the U.S. Geological Survey. Water-level measurements by other agencies in several of the same wells measured by the U.S. Geological Survey have been included, where available, to provide greater detail in a record, or to increase the length of a record. Generally, water-level measurements are for wells with a sufficient number of measurements to show a trend of fluctuations. (Knapp-USGS)
W74-07186

LONG-TERM TRENDS IN GROUNDWATER LEVEL FLUCTUATIONS (MNOGOLETNIYE TENDENTSII V KOLEBANIYAKH UROVNEY POSZEMNYKH VOD),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 2F.
W74-07191

ANNUAL REPORT/FISCAL YEAR 1973.
Delaware Univ., Newark. Water Resources Center.
For primary bibliographic entry see Field 9D.
W74-07252

GROUND-WATER RESOURCES OF MCLEAN COUNTY, NORTH DAKOTA,
Geological Survey, Bismarck, N. Dak.
For primary bibliographic entry see Field 2F.
W74-07313

HYDROLOGIC CONDITIONS IN THE LAKELAND RIDGE AREA OF POLK COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
A. F. Robertson.
Florida Bureau of Geology Report of Investigation No 64, 1973. 54 p, 23 fig, 6 tab, 49 ref.

Descriptors: *Hydrogeology, *Florida, *Water levels, *Withdrawal, Water yield, Karst hydrology, Limestones, Water wells, Water quality, Saline water intrusion, Surface-groundwater relationships.
Identifiers: Lakeland(Fla).

In the Lakeland ridge area of Florida there has been an increase in groundwater pumpage from about 11 billion gallons in 1950 to 27 billion gallons in 1970. Decline in artesian water levels due to this pumpage is most pronounced in the southern part of the area of investigation where water levels have declined 50 feet or more in the last 20 years. The hazard of upward movement of water of poor quality is increased by the declines in freshwater level. Current water analyses reveal no widespread changes in quality of groundwater that can be correlated with water-level decline. The water levels of some lakes in the area were lower in June 1970 than in June 1961. A widespread zone of solution features in the limestone of the Floridan aquifer occurs at about 450 feet below mean sea level in the northeast part of the area of investigation and at about 650 feet below mean sea level in the south part of the area. Most wells open to this zone yield several thousand gpm with relatively small drawdowns. (Knapp-USGS)
W74-07318

DATA FOR MUNICIPAL WELLS IN THE CITY OF MODESTO, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
R. W. Page, L. R. Zeitz, and W. B. Kinsey.
Open-file report, January 3, 1974. 80 p, 2 fig, 5 tab.

Descriptors: *Data collections, *Hydrologic data, *Water wells, *California, Water yield, Drillers logs, Water levels.
Identifiers: Modesto(Calif).

Water for the city of Modesto, California, and the immediate area is supplied from 46 city wells, 49 wells owned by a private water company, and many privately owned domestic and industrial wells. Data are presented for the municipal wells. The city of Modesto incorporates about 12 square miles along and near the Tuolumne River in the northeastern part of the San Joaquin Valley, California. (Knapp-USGS)
W74-07320

HYDROLOGY OF THE DUNES AREA NORTH OF COOS BAY, OREGON,
Geological Survey, Portland, Oreg.
For primary bibliographic entry see Field 2L.
W74-07325

A COMPUTER SYSTEM FOR STORAGE AND RETRIEVAL OF HYDROGEOLOGICAL DATA FROM WELL RECORDS,
Natural Environment Research Council, London (England). Inst. of Geological Sciences.
For primary bibliographic entry see Field 7C.
W74-07328

NETWORK APPROACH TO MANAGEMENT OF CONJUNCTIVELY OPERATED GROUND WATER - SURFACE WATER SYSTEMS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W74-07335

STRONTIUM AND OTHER NOTABLE CHEMICAL CONSTITUENTS OF WELL-WATER C ALLEN COUNTY, INDIANA,
Geological Survey, Bloomington, Ind.
For primary bibliographic entry see Field 2K.
W74-07400

SANDSTONE AQUIFERS IN EASTERN SUL LIVAN COUNTY, INDIANA,
Indiana Univ., Bloomington.
C. E. Wier, C. R. Glore, and A. F. Agnew.
Proceedings of the Indiana Academy of Science Vol 82, p 297-302, 1972. 2 fig, 2 tab, 5 ref.

Descriptors: *Aquifer characteristics, Soil water, *Groundwater availability, Surface water, Watersheds(Basins), *Indiana, Geomorphology, *Wells, *Sandstones, *Subsurface waters, Water types, Water supply, Shales, Groundwater barriers, Bedrock, Groundwater movement, Hydrogeology, Aquifers, Permeability, Porosity, Domestic water.
Identifiers: Sullivan County(Ind), Busseron Creek(Sullivan County-Ind).

In the Busseron Creek watershed (Sullivan County, Indiana), surface waters are poor in both quality and quantity. Shallow wells in unconsolidated deposits and in Pennsylvania sandstones supply most of the rural domestic water needs, but most wells produce less than 10 gal/min. At least 6 potential sandstone aquifers of Pennsylvania age exist at depths ranging from 10 to 600 ft in thicknesses ranging from 1 to 104 ft. Although these sandstone bodies are considered as sheet sands, they are lenticular and mostly confined by shale above and below. Hence recharge of these aquifers is minimal, except where the sandstone body intersects the bedrock surface and is recharged by groundwater moving downward through the unconsolidated deposits. These sandstones are finely grained and well cemented. Their porosity ranges from 11 to 50%, calculated from electrical logs of oil and gas test holes. Their permeability coefficient is very low, ca. 0.04 gal/day/sq ft. Recorded well water production from sandstone averages less than 4 gal/min. Thus, the sandstones are poor aquifers and cannot furnish sufficient water for a small municipality, but may be used successfully by individual households. Deeper sandstones should be investigated. (Brown-IPC)
W74-07401

THE GEOLOGY OF WATER: THE LIMITING FACTOR IN URBAN DEVELOPMENT,
Indiana Purdue Univ., Indianapolis. Dept. of Geology.
For primary bibliographic entry see Field 3D.
W74-07402

PUBLIC GROUNDWATER SUPPLIES IN BOND COUNTY,
Illinois State Water Survey, Urbana. Hydrology Section.
D. M. Woller.
Bulletin 60-3, 1973. 9 p.

Descriptors: *Groundwater, *Water wells, *Aquifer characteristics, *Illinois, Data collections, Hydrologic data, Hydrogeology, *Water supply, Potable water.
Identifiers: Bond County(Ill).

All available information on production wells used for public groundwater supplies in Bond County, Illinois, is presented. Systems and wells described furnish water for drinking or general domestic use in: (1) incorporated municipalities; (2) unincorporated communities where 10 or more separate lots or properties are being served or are intended to be served; (3) state-owned parks and memorials; and (4) state owned educational, charitable, or penal institutions. Descriptions are included for groundwater supplies of 3 municipalities in Bond

County. These are preceded by brief summaries of the groundwater geology of the county and the development of groundwater sources for municipal use. Unconsolidated sand and gravel deposits associated with the valleys of the East Branch of Shoal Creek and Beaver Creek are tapped as the sources for the three municipal supplies in Bond County. At Greenville, Mulberry Grove, and Pocahontas, there are presently 9 municipal wells tapping these aquifers to depths ranging from 31 to 74 ft. Their reported yields range from 12 to 250 gpm depending primarily upon the type of well and the permeability, thickness, and areal extent of the sand and gravel unit tapped by each well. Production from these wells was estimated to be 335,000 gpd in 1972. Analyses of water they produce indicate that the iron content ranges widely (from 0.0 to 36 mg/liter) and the hardness from 80 to 508 mg/liter. Groundwater for all the municipal supplies is chlorinated and fluoridated. In addition, water for Mulberry Grove and Pocahontas is aerated, settled, and filtered for iron removal, and at Pocahontas the pH is adjusted. (Knapp-USGS)
W74-07429

UNDERFLOW IN RIVER VALLEYS OF THE CARPATHO-UKRAINE (PODRUSLOVYY STOK V RECHNYKH DOLINAKH ZAKARPAT'YA),
Akademiya Nauk USSR, Kiev. Instytut Geologichnykh Nauk.
For primary bibliographic entry see Field 2F.
W74-07504

BROMINE IN GROUNDWATER OF UZBEKISTAN (BROM V PODZEMNYKH VODAKH UZBEKISTANA),
Institute of Hydrogeology and Engineering Geology, Tashkent (USSR).
For primary bibliographic entry see Field 2K.
W74-07505

GROUND-WATER FLOW PATTERNS IN CONFINED AQUIFERS AND POLLUTION,
Iowa State Water Resources Research Inst., Ames.
For primary bibliographic entry see Field 5B.
W74-07510

EFFECT OF PARTIAL PENETRATION ON FLOW IN UNCONFINED AQUIFERS CONSIDERING DELAYED GRAVITY RESPONSE,
Agricultural Research Organization, Bet-Dagan (Israel). Inst. of Soils and Water.
For primary bibliographic entry see Field 2F.
W74-07514

STEADY STATE FLOW IN RIGID NETWORKS OF FRACTURES,
Leeds, Hill and Jewett, Inc., San Francisco, Calif.
For primary bibliographic entry see Field 2F.
W74-07521

4C. Effects On Water Of Man'S Non-Water Activities

EFFECTS OF MAN-MADE WORKS ON THE HYDRAULIC, SALINITY, AND SHOALING REGIMENS OF ESTUARIES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Div.
For primary bibliographic entry see Field 5C.
W74-07249

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR URBAN STUDIES IN THE SAN ANTONIO, TEXAS METROPOLITAN AREA, 1971,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 2E.
W74-07323

SEDIMENT DISCHARGE IN THE LAKE TAHOE BASIN, CALIFORNIA, 1972 WATER YEAR,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2J.
W74-07326

WATER POLLUTION ASPECTS OF STREET SURFACE CONTAMINANTS,
URS Research Co., San Mateo, Calif. Environmental Systems Div.
For primary bibliographic entry see Field 5B.
W74-07418

COMPARISON OF RAINFALL-RUNOFF MODELS FOR URBAN AREAS,
India Inst. of Tech., Kanpur.
For primary bibliographic entry see Field 2A.
W74-07463

RELATIONSHIP BETWEEN LOGGING ACTIVITIES AND SALMON PRODUCTION,
Alaska Dept. of Fish and Game, Juneau.
A. P. Kingsbury.
Available from the National Technical Information Service as COM-73-11630; $5.00 in paper copy, $1.45 microfiche. National Marine Fisheries Service Report No. NOAA 73090605, April 1973. 59 p, 13 fig, 1 tab, 33 ref, 10 append. 5-24-R.

Descriptors: *Sedimentation, *Lumbering, *Salmon, *Productivity, Bottom sediments, Pink salmon, Fry, Streams, *Alaska, Spawning, Dissolved oxygen, Seasonal, Gravels, Fish eggs, Road construction, Streamflow.

Effects of logging and road building on stream flow, water temperature and debris on salmon egg and fry production were assessed quantitatively and additional data obtained on sediment content of spawning gravel, intra-gravel, dissolved oxygen and salmon abundance. Studies were conducted at 108 Creek and Kadashan Creek in southeastern Alaska. Spawning bed sediment and dissolved oxygen and pink salmon survival data were assembled and are discussed in relation to logging and road building. Fine sediment in three 108 Creek study areas increased somewhat irregularly over the first six years of the study and did not change appreciably in the following three years. Analysis of the relationship between amount of fine sediment and dissolved oxygen content within the gravel in the streams was inconclusive. Decreases in fine sediments were usually associated with high stream flow and high spawner density. Estimates of overwinter survival of pink salmon were too imprecise and are affected by too many factors for use as a measure of land use effectson pink salmon production. Intra-gravel sediment and dissolved oxygen data were highly variable within and between Kadashan Creek study areas. Effects of logging and roading on the pink salmon production were difficult to demonstrate. (Jones-Wisconsin)
W74-07468

EFFECT OF GRAZING ON RUNOFF FROM TWO SMALL WATERSHEDS IN SOUTHWESTERN WISCONSIN,
Forest Service (USDA), La Crosse, Wis. Watershed Lab.
R. S. Sartz, and D. N. Tolsted.
Water Resources Research, Vol 10, No 2, p 354-356, April 1974. 3 fig, 2 tab, 1 ref.

Descriptors: *Rainfall-runoff relationships, *Grazing, *Water yield, Land use, *Small watersheds, Hydrograph analysis, *Wisconsin.

Storm runoff from two small open pasture watersheds was measured for 11 years; during the first 7 years both were grazed, and during the last 4 years only one was grazed. Their runoff behavior was similar when both were grazed, but by the third year after cessation of grazing, runoff from the ungrazed watershed had dropped sharply. The ungrazed/grazed ratio for mean total flow had dropped from 1.17 to 0.10 and for mean peak flow from 0.82 to 0.03. After 3 years without grazing a heavy mat of bluegrass blanketed the ground, and soil bulk density was significantly lower. (Knapp-USGS)
W74-07525

4D. Watershed Protection

REACTIVATING SOIL RIPPING TREATMENTS FOR RUNOFF AND EROSION CONTROL IN THE SOUTHWESTERN U.S.,
Forest Service (USDA), Albuquerque, N. Mex. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2G.
W74-07089

SAND DUNE RECLAMATION IN IRAQ -- PRESENT STATUS AND FUTURE PROSPECTS,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
For primary bibliographic entry see Field 2J.
W74-07104

CONTROL OF GRADING PRACTICES IN THE CITY AND COUNTY OF HONOLULU,
Honolulu City and County Dept. of Public Works, Hawaii.
R. Chun.
In: Hawaii Univ., Honolulu, Water Resources Research Center, Water Resources Seminar Series No. 2, December 1972, p 85-88,

Descriptors: *Erosion control, *Grading, *Legislation, *Hawaii, Control, Rockslides, Landslides.
Identifiers: *Honolulu(Hawaii).

Early grading operations ordinances in the City and County of Honolulu may have been the result of early subdivision planning which had little or no concern for potential landslides which might result, and which lead to events threatening the safety of human lives and caused severe property damages. The existing ordinance presently controlling grading activities was passed in 1955. Its primary feature was the adding of control over grubbing and stockpiling operations. Most recent changes in regulations are concerned with broader environmental concerns, including drainage and erosion control plans, sediment control, and broader planning requirements which provide for explicit consideration of alternative plans that would minimize grading. (See also W74-07133) (Schroeder-Wisconsin)
W74-07139

QUALITY OF WATER DISCHARGED FROM TWO AGRICULTURAL WATERSHEDS IN SOUTHWESTERN IOWA,
Agricultural Research Service, Council Bluffs, Iowa. North Central Watershed Research Center.
For primary bibliographic entry see Field 5B.
W74-07528

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

VARIABLES AFFECTING WELL SUCCESS IN A KENTUCKY LIMESTONE AQUIFER,
Kentucky Univ., Lexington. Dept. of Geology.
For primary bibliographic entry see Field 4B.
W74-07176

AQUIFERS IN THE SOKOTO BASIN, NORTHWESTERN NIGERIA, WITH A DESCRIPTION OF THE GENERAL HYDROGEOLOGY OF THE REGION,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 2F.
W74-07184

TECHNIQUES FOR USE OF ORGANIC AND AMORPHOUS MATERIALS IN SOURCE INVESTIGATIONS OF ESTUARY SEDIMENTS,
For primary bibliographic entry see Field 2L.
W74-07241

TEXTURE AND ORGANIC CARBON CONTENT OF BOTTOM SEDIMENTS IN SOME ESTUARIES OF THE UNITED STATES,
Middlebury Coll., Vt.
For primary bibliographic entry see Field 2L.
W74-07243

PHOTOMETRIC DETERMINATION OF MANGANESE IN WATER BY USING O-TOLIDINE,
Water Management Board, Brno (Czechoslovakia).
For primary bibliographic entry see Field 2K.
W74-07315

DETERMINATION OF CHLORINATED INSECTICIDES IN SUSPENDED SEDIMENT AND BOTTOM MATERIAL,
Geological Survey, Menlo Park, Calif.
D. F. Goerlitz, and L. M. Law.
Journal of the Association of Official Analytical Chemists, Vol 57, No 1, p 176-181, 1974. 1 fig, 2 tab, 21 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *Bottom sediments, *Suspended load, *Chromatography, *Insecticides, Adsorption, Sorption, Analytical techniques, *Pollutant identification.

Chlorinated hydrocarbon insecticides in suspended sediment and bottom material were extracted with acetone-hexane solvent, with the extractants added separately. Co-extractives, including polychlorinated biphenyls and polychlorinated naphthalenes, were isolated by adsorption chromatography. Sulfur is removed by precipitation. Mean recoveries from 8 spiked samples ranged from 75% to 99% for 9 chlorinated hydrocarbon insecticides. An average recovery of 97.9% was obtained for bottom material samples contaminated with chlorinated hydrocarbons. (Knapp-USGS)
W74-07317

TH-234/U-238 ACTIVITY RATIOS IN PACIFIC OCEAN BOTTOM WATERS,
Tata Inst. of Fundamental Research, Bombay (India).
For primary bibliographic entry see Field 2K.
W74-07322

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR URBAN STUDIES IN THE SAN ANTONIO, TEXAS METROPOLITAN AREA, 1971,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 2E.
W74-07323

AERIAL SPILL PREVENTION SURVEILLANCE DURING SUB-OPTIMIM WEATHER,
Earth Satellite Corp., Washington, D.C.
R. I. Welch, A. D. Marmelstein, and P. M. Maughan.
Copy Available from GPO Sup Doc as EP1.23/2:73-243, $1.40; microfiche from NTIS as PB-231 817 $1.45. Environmental Protection Agency, Technology Series EPA-R2-73-243, September 1973. 55 p, 6 fig, 3 tab, 1 ref. EPA Contract 68-01-0191.

Descriptors: Water pollution sources, *Oil spills, Chemicals, *Remote sensing, *Aerial photography, Cloud cover, *Pollutant identification, Weather data.
Identifiers: *Sub-optimum weather, Hazardous materials.

Multi-band aerial photography was acquired during specified conditions of cloud cover and reduced visibility considered to be representative of a nearly infinite range of sub-optimum weather conditions. (For aerial photography, optimum is defined as clear skies and greater than 15 miles visibility.) Basic techniques were derived from an earlier study designed to yield strategic spill prevention surveillance. (Welch, et al. 1972) Results indicated that only one film tested, a high sensitivity color positive film, provided consistently interpretable results. Rapid access techniques were also evaluated leading to recommendations for a tactical system providing a capability for both real-time and near real-time system update during sub-optimum aerial photographic conditions. (EPA)
W74-07342

INSTRUMENTATION FOR ENGINEERING MANAGEMENT OF A MULTI-PURPOSE RIVER BASIN SYSTEM (TRINITY RIVER BASIN, TEXAS) REAL-TIME ENGINEERING MANAGEMENT OF A MULTI-PURPOSE RIVER BASIN SYSTEM,
Texas Univ., Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 4A.
W74-07369

MICROBIAL INDICATORS FOR THE BIOLOGICAL QUALITY OF TREATED WASTEWATER EFFLUENTS,
Dept. of Civil Engineering. Illinois Univ., Urbana.
For primary bibliographic entry see Field 5D.
W74-07372

USE OF AMBERLITE XAD-4 FOR EXTRACTION AND RECOVERY OF CHLORINATED INSECTICIDES AND POLYCHLORINATED BIPHENYLS FROM WATER,
Bristol Univ. (England). Dept. of Inorganic Chemistry.
For primary bibliographic entry see Field 5D.
W74-07383

DETERMINATION OF PENTACHLOROPHENOL IN NATURAL AND WASTE WATERS,
Canada Centre for Inland Waters, Burlington (Ontario).
A. S. Y. Chau, and J. A. Coburn.
Journal of the Association of Official Analytical Chemists, Vol 57, No 2, p 389-393, March 1974. 5 fig, 3 tab, 11 ref.

Descriptors: *Pulp wastes, *Industrial wastes, Sewage, *Water analysis, *Chlorinated hydrocarbon pesticides, *Phenols, *Pollutant identification, Waste water(Pollution), Chemical analysis, Analytical techniques, Chromatography, Gas chromatography, Water types
Identifiers: Pentachlorophenol, Chlorine compounds.

In a sensitive and reliable procedure for the routine determination of pentachlorophenol (PCP) in waters, the PCP is extracted from the preserved sample with benzene and thence into a potassium carbonate solution. The addition of acetic anhydride to the aqueous solution produces PCP acetate which is extracted with hexane and analyzed by electron capture gas-liquid chromatography. Typical PCP concentrations determined in lake waters, sewage, and a pulp mill effluent are presented, along with the retention times of 17 other phenolic acetates. The new procedure can detect concentrations of PCP as low as 0.01 ppb per liter of water. (Brown-IPC)
W74-07385

STRONTIUM AND OTHER NOTABLE CHEMICAL CONSTITUENTS OF WELL-WATER OF ALLEN COUNTY, INDIANA,
Geological Survey, Bloomington, Ind.
For primary bibliographic entry see Field 2K.
W74-07400

QUANTITATIVE CHEMICAL ANALYSIS OF SPECIFIC COMPONENTS OF THE WATERS OF LOST CREEK AND THE WABASH RIVER, VIGO COUNTY, INDIANA,
Indiana State Univ., Terre Haute. Dept. of Chemistry.
D. G. Lesniak, M. C. Tavenner, and J. R. Siefker.
Proceedings of the Indiana Academy of Science, Vol 82, p 176-179, 1972. 1 tab, 4 ref.

Descriptors: *Water analysis, Rivers, *Indiana, Surface waters, Water temperature, Conductivity, Iron, Lead, Sodium, Zinc, Dissolved oxygen, Chlorides, Fluorides, Hydrogen ion concentration, *Pollutant identification, *Dissolved solids.
Identifiers: *Wabash River(Ind), *Lost Creek(Ind), Vigo County(Ind).

The surface waters of Lost Creek and the Wabash River were sampled February-May 1972 at several sites in Vigo County, Indiana. Dissolved and total concentrations of Fe, Pb, Na, and Zn were measured. The river stage, water temperature, specific conductance, pH, and concentrations of chloride and fluoride ions and dissolved oxygen were also determined. Fluoride, Fe, Pb, and Zn concentrations were higher in the Wabash River than in Lost Creek, whereas the pH and Na concentration were higher in Lost Creek than in the Wabash River. (Brown-IPC)
W74-07405

DETERMINATION OF NITRATES IN SOIL EXTRACTS,
British Columbia Univ., Vancouver. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W74-07443

THE ENVIRONMENTAL IMPACT OF CADMIUM,
Connecticut Univ., Storrs.
L. Bruckman.
Msc Thesis, 1974. 102 p, 12 fig, 22 tab, 116 ref, 3 append.

Descriptors: *Cadmium, *Water quality standards, *Water pollution sources, *Environmental effects, Trace elements, Sewage treatment, Sulfides, Heavy metals, *Connecticut, Potable water, Public health, Monitoring, Toxicity.
Identifiers: Health, Drinking water standards, Cadmium-Organic complexes, Storrs(Conn).

sewage treatment plant and household drink-
water supplies in the Storrs, Connecticut area
e been monitored for the cadmium content.
mium was not present in concentrations above
drinking water standard of 10 mg/l and there-
, does not appear to pose a serious water pol-
on problem at this time in these places. Tenfold
centrations by evaporation were used for
lyses by an Atomic Absorption Spec-
hotometer in order to be well above sensitivity
ts. Controls, cadmium spiked in the waters and
age gave 90% plus recoveries by this
nique. In addition to the possibility that cadmi-
may not be present in water supplies to begin
, the absence of cadmium could be due to the
ence of trace amounts, less than 1 mg/l, of
ides and the formation and precipitation of ex-
ely insoluble complex-breaking sulfide com-
nds. It is recommended that ferrous sulfide be
sidered for addition to conventional sewage
tment so as to make sulfide ions readily availa-
to react with certain heavy metals present, like
mium, thus removing them from waters. A
rature review is presented on the health effects
race amounts of cadmium present in the en-
nment and bases for toxicity criteria on cadmi-
are quantitatively presented. (Helfgott-Con-
ticut)
4-07530

E MARINE DIATOM ETHMODISCUS REX: MORPHOLOGY AND OCCURRENCE IN E PLANKTON OF THE SARGASSO SEA,

ode Island Univ., Kingston. Graduate School of
eanography.
Swift.

rnal of Phycology, Vol 9, No 4, p 456-460,
cember 1973. 12 fig, 1 tab, 13 ref.

scriptors: *Diatoms, *Marine algae, *Plant
rphology, *Cytological studies, Chrysophyta,
toplankton, Electron microscopy, Hydrog-
hy, Speciation.
ntifiers: *Ethmodiscus rex, *Scanning electron
croscopy, *Sargasso Sea, Sample preparation.

ving cells of the diatom Ethmodiscus rex
ttray) Wiseman and Hendey 1953 were found
he plankton of the sourthern Sargasso Sea. Ap-
rently, this is the first report of E. rex from the
nkton of the Atlantic Ocean. Scanning electron
croscopy of peroxide-cleaned frustules revealed
ne new morphological features for this species.
hen viewed from inside the frustule, the puncta
pear as rimmed pits. From outside the frustule,
y appear to be shallow depressions with a small
ening at the bottom. The so-called mucous tu-
les in the center of the valve were seen from the
tside to be elongate slits and from the inside as
liquely directed flattened cylinders which cap
e tubes. (Holoman-Battelle)
74-07547

IE CHEMICAL FORM AND BODILY DISTRIBUTION OF MERCURY IN MARINE FISH,

hoku Univ., Sendai(Japan). Dept. of Public
ealth.
Suzuki, T. Miyama, and C. Toyama.

lletin of Environmental Contamination and
xicology, Vol 10, No 6, p 347-355, December
73. 2 fig, 3 tab, 14 ref.

escriptors: *Mercury, *Marine fish, *Pollutant
ntification, *Distribution patterns, Chemical
alysis, Inorganic compounds, Heavy metals.
entifiers: *Animal tissues, *Cold atomic absorp-
on spectrophotometry, *Bioaccumulation,
uscle, Liver, Brain, Brain, Kidneys, Gastric
ntents, Organic mercury.

ne gram of muscle, liver, brain, kidney, and gas-
ic content of fish, or about half of the organ
eighing less than 2 g was homogenized in a
osphate-buffer solution (pH 8.6, 1/16 M), and
alyzed for inorganic mercury by cold vapor
omic absorption photometry. Weight of fish and the level of total mercury are independent of the inorganic mercury percentage. Comparing the values in the muscle, both inorganic mercury percentages and levels of total mercury are elevated in the liver and kidney. The total mercury content in the liver, excluding the data on fish from the Japan Sea, is also significantly correlated with body weight but this is not seen in the case of the kidney. The data on the brain are difficult to interpret both regarding the level of total mercury and the inorganic mercury percentage. The level of total mercury of the gastric content is markedly higher in greenlings from the Japan Sea than in other fishes from the South China Sea, which means a difference in the mercury level in the habitat, and may contribute to the differing relationships between body weight and the total mercury level in the muscle and liver. The pattern of bodily distribution changes depending on the chemical form of mercury. In the case of inorganic mercury, three significant correlation coefficients are found, that is, 'kidney' vs 'muscle' and 'liver', and 'liver' vs 'brain'. There is a different pattern for organic mercury. The distribution pattern of total mercury is similar to that of organic mercury. (Holoman-Battelle)
W74-07551

THE PHOTOCHEMISTRY OF CARBAMATES. 1. THE PHOTODECOMPOSITION OF ZECTRAN: 4-DIMETHYLAMINO-3,5-XYLYL-N-METHYL CARBAMATE,

New Brunswick Univ., Fredericton. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W74-07552

ROTATING RING-DISK ELECTRODE STUDY OF THE ADSORPTION OF LEAD ON GOLD IN 0.5M POTASSIUM CHLORIDE,

State Univ. of New York, Buffalo. Dept. of Chemistry.
For primary bibliographic entry see Field 2K.
W74-07555

MASS AND CHARGE TRANSFER KINETICS AND COULOMETRIC CURRENT EFFICIENCIES. PART VII. CONDITIONAL POTENTIALS, AND SINGLE-SCAN VOLTAMMETRY OF PURE VANADIUM(V) - VANADIUM(IV) SYSTEMS IN VARIOUS MEDIA AT PLATINUM ELEC TRODES PRE-TREATED BY FIVE METHODS,

Exeter Univ. (England). Dept. of Chemistry.
For primary bibliographic entry see Field 2K.
W74-07557

MASS AND CHARGE TRANSFER KINETICS AND COULOMETRIC CURRENT EFFICIENCIES. PART VIII. SINGLE-SCAN VOLTAMMETRY OF VANADIUM(V) - VANADIUM(IV) IN THE PRESENCE OF CHROMIUM, MANGANESE AND IRON, AND THE KINETIC PARAMETERS OF THE VANADIUM SYSTEM, AT PLATINUM ELECTRODES PRE-TREATED BY FIVE METHODS,

Exeter Univ. (England). Dept. of Chemistry.
E. Bishop, and P. H. Hitchcock.
Analyst, Vol 98, No 1169, p 563-571, August 1973. 6 fig, 1 tab, 7 ref.

Descriptors: *Kinetics, Heavy metals, Cations, Electolytes, Electrochemistry, Chromium, Manganese, Iron, Electric currents, Efficiencies, Zeta potential.
Identifiers: *Platinum electrodes, *Single scan voltammetry, *Charge transfer, *Mass transfer, *Vanadium, Ionic interference, Pretreatment methods, Coulometric currents, Electrochemical reactions.

Continuing the earlier examination of the vanadium system alone, under various conditions and with various electrode pre-treatments, the effect of neighboring steel-forming d-block elements has been investigated. Chromium(VI) at pH 4.0 suppresses the vanadium(V) reduction wave, and the degree of suppression is quantitatively proportional to the chromium(VI) concentration. Activated electrodes are deactivated by dipping them in a chromium(VI) solution, and remain so even when well washed thereafter, so that chromium(VI) as well as chromium(III) is absorbed strongly on platinum. In 2.0 M sulphuric acid, chromium(VI) and vanadium(V) are reduced at the same rate. Manganese(VII) in acetate buffer gives a fast, well separated wave, but the separation is not as good in 2.0 M sulphuric acid; slowing the vanadium(V) reduction by using an oxidized electrode effects no improvement: the manganese wave is similarly affected. Addition of chromium(VI) to the manganese - vanadium mixture at pH 4 suppresses the manganese wave only slightly, even when the vanadium wave is completely suppressed. In 2.0 M sulphuric acid, the manganese wave is undistorted and chromium and vanadium are simultaneously reduced. Iron(III) in 2.0 M sulphuric acid does not interfere, but the separation of the vanadium and iron waves is not good. Iron(II) can, however, act as a potentiostatic intermediate. The kinetic parameters of the vanadium system are reproducible in acetate buffer, but only when the electrode is fouled in 2.0 M sulphuric acid. Pattern theory and diffusion-corrected Lewartowicz methods give results that agree. The charge-transfer kinetic parameters are shown to be potential dependent in acidic media. The results are compared with those in earlier reports. The generation current efficiency for vanadium(IV) in acetate buffer was computed. (See also W74-07557) (Holoman-Battelle)
W74-07558

A NEW COLORIMETRIC PROCEDURE FOR THE DETERMINATION OF BENOMYL,

Norges Landbrukshoegskole, Vollebekk. Chemical Research Lab.
J. Kvalvag.
Bulletin of Environmental Contamination and Toxicology, Vol 10, No 3, p 137-139, September 1973. 1 tab, 4 ref.

Descriptors: *Colorimetry, *Pollutant identification, Fungicides, Aqueous solutions, Hydrolysis, Separation techniques, Fruit crops, Vegetable crops, Pesticide residues.
Identifiers: *Benomyl, Metabolites, 2-Aminobenzimidazole, Cleanup, Sodium hypochlorite, Sample preparation.

A colorimetric procedure for the combined determination of the fungicide benomyl and metabolites hydrolyzable to 2-aminobenzimidazole is described. The prodcedure is based on the intense blue color that appears when hypochlorite or hypobromite is added to an aqueous solution of 2-aminobenzimidazole. An extraction, hydrolysis, and cleanup prodecure described elsewhere is used. The final evaporation is halted when sufficient ethyl acetate has evaporated to leave an essentially aqueous solution. This solution is poured into a 10 ml centrifuge tube, the beaker is washed with 3 ml hot water, and this is added to the solution in the tube. After cooling, the volume is adjusted to 5 ml and part of the contents is transferred to an optical cell. Measurement is made at 560 nm against water, and the sample discarded if absorbance is higher than 0.015. Two drops of sodium hypochlorite are added to an acceptable solution, and the cell is placed quickly in the colorimeter compartment. The absorbance is compared with a standard curve. If the uncertainty span is confined to three times the absorbance mentioned above, the limit of detection is slightly above 2 micrograms/ml 2-aminobenzimidazole which corresponds to 0.5 ppm benomyl in a 50-g sample based on a 5 ml final volume. In order to check precision of the method four different crops were fortified with 2 ppm of benomyl and analyzed. (Mortland-Battelle)
W74-07559

MULTIPLE ORGANOCHLORINE PESTICIDE RESIDUES IN JAPAN,
Kitakyushu Municipal Inst. of Public Health (Japan).
M. Suzuki, Y. Yamato, and T. Watanabe.
Bulletin of Environmental Contamination and Toxicology, Vol 10, No 3, p 145-150, September 1973. 3 fig, 3 tab, 14 ref.

Descriptors: *Pesticide residues, *Soils, *Gas chromatography, Aldrin, Dieldrin, Endrin, DDE, DDT, Vegetable crops, Soil analysis, DDD.
Identifiers: BHC, *Japan(Kyushu district), Sample preservation, Sample preparation, Isomers.

Organochlorine pesticide residues were analyzed in agricultural soil of the Kyushu district in Japan. Soil samples were taken 15 cm deep, stored at -30C, then air dried, pulverized, screened in a 20-mesh sieve, and mixed. For analysis, one hundred grams of dry soil was mixed with a 0.70 volume of water in a high speed mixer and deactivated for 30 min. After this treatment, 200 ml of acetonitrile was added and blended at a high speed for 5 min. An extract was filtered, and the filtrate was poured into a 1 liter separatory funnel, shaken with 100 ml of n-hexane for 5 min., and partitioned with 600 ml distilled water by shaking for 1 min. Then the n-hexane layer was washed twice with 100 ml distilled water. The n-hexane layer was dried. The column was rinsed twice with approximately 5 ml of n-hexane, and washings were mixed into the layer. The dried n-hexane solution was applied to a gas chromatograph equipped with a tritium foil electron capture detector. Gas chromatographic determination was carried out by combining three different columns. The typical multiple organochlorine pesticide residues in soil are given. Alpha-, beta-, gamma-, and delta-BHC were detected in all 99 soil samples. Considerable residual amounts of aldrin, dieldrin and endrin and high residual levels of DDT and its related compounds were detected. (Mortland-Battelle)
W74-07560

INCIDENCE OF RESISTANCE TO TETRACYCLINE, CHLORAMPHENICOL AND AMPICILLIN AMONG SALMONELLA SPECIES ISOLATED IN THE NETHERLANDS IN 1969, 1970 AND 1971,
Rijksinstituut voor de Volksgezondheid, Bilthoven (Netherlands).
For primary bibliographic entry see Field 5C.
W74-07562

PSYCHROPHILIC YEASTS ISOLATED FROM MARINE FISH,
University of Strathclyde, Glasgow (Scotland). Dept. of Applied Microbiology.
J. Bruce, and E. O. Morris.
Antonie van Leeuwenhoek, Vol 39, No 2, p 331-339, 1973. 1 tab, 32 ref.

Descriptors: *Yeasts, *Marine fish, *Pathogenic fungi, *Isolation, Nutrient requirements, Fish, Hosts, Temperature, Vitamins, Speciation, Cultures, Methodology, Herrings.
Identifiers: *Psychrophilic fungi, Culture media, Deuteromycetes, Candida scotti, Debaryomyces hansenii, Candida tropicalis var. lambica, Cryptococcus diffluens, Cryptococcus laurentii, Torulopsis famata, Torulopsis sake, Trichosporon pullulans, Rhodotorula glutinis, Rhodotorula mucilaginosa, Rhodotorula infirmo-miniata, Whiting, Skate, Haddock, Halibut, Flounder, Lemon sole.

Yeasts were isolated from marine fish using low incubation temperatures. The isolates were screened for their ability to grow at 4 C and 30 C. Isolates growing at 4 C but not at 30 C were considered to be psychrophilic and were selected for further study. Approximately 25 percent of the isolates were in this category. The isolates comprised the following genera: Candida, Cryptococcus, Debaryomyces, Rhodotorula, Torulopsis and Trichosporon. Rhodotorula infirmo-miniata accounted for 50 percent of the isolates and Trichosporon pullulans 10 percent. Other species were present in numbers below the 10 percent level. The distribution of the species between the two sample areas is discussed. The vitamin requirements and optimum growth temperatures of the isolates were assessed. (Holoman-Battelle)
W74-07563

SOLVENT EXTRACTION OF SULFUR FROM MARINE SEDIMENT AND ITS DETERMINATION BY GAS CHROMATOGRAPHY.
University of Southern California, Los Angeles, Environmental Engineering Program.
K. Y. Chen, M. Moussavi, and A. Sycip.
Environmental Science and Technology, Vol 7, No 10, p 948-951, October 1973. 4 fig, 2 tab, 14 ref.

Descriptors: *Sulfur, *Solvent extractions, *Separation techniques, *Sediments, *Gas chromatography, Colorimetry, Soil analysis, Pollutant identification,
Identifiers: Comparative techniques, Sample preservation, Sample preparation, Detection limits.

The feasibility of elemental sulfur extraction and analytical determination by gas chromatography (gc) is examined. To get maximum response from the gc, various experiments were performed using different parameter settings. The operating conditions at which optimum responses for sulfur were obtained were: injection port temperature - 220 C, oven column temperature - 190 C, EC detector temperature - 265 C, and gas flow - 84-90 ml/min. At these settings, after injection of standards or extracts, the predominant sulfur species eluted were S4, S6, and S8. The S8 species exhibits the largest area and peak height. The recovery of sulfur from sediment was carried out initially with a sediment sample of unknown sulfur content. The purpose was to evaluate the efficiency of different solvents in recovering sulfur and to evaluate their suitability for subsequent determinations by both colorimetry and chromatography. Only benzene and toluene exhibited high recovery efficiencies and showed consistent results in both methods. The detection limit of the method described was at the picogram level, unmatched by other known methods. Neither the coefficient of variation nor mean values for sulfur were significantly different in comparisons between the gc method and a standard colorimetric method. (Mortland-Battelle)
W74-07565

THE BACTERIAL FLORA OF THE ATLANTIC SALMON (SALMO SALAR L.) IN RELATION TO ITS ENVIRONMENT,
Torry Research Station, Aberdeen (Scotland).
R. W. Horsley.
Journal of Applied Bacteriology, Vol 36, No 3, P 377-386, September 1973. 4 fig, 3 tab, 29 ref.

Descriptors: *Atlantic salmon, *Aerobic bacteria, *Pollutant identification, Methodology, *Bioindicators, *Water quality, Estuarine environment, Fungi, Aquatic environment, Rivers, Coasts, Water analysis, Fishing, Pseudomonas, Enteric bacteria, Yeasts.
Identifiers: Skin, *Heterotrophic bacteria, Gills, Marine environment, Viable count, Swab technique, Sampling technique, Animal tissues, Salmo salar, Culture media, Moraxella, Acinetobacter, Flavobacterium, Cytophaga, Bacillus, Vibrio, Aeromonas, Coryneform bacteria, Micrococcaceae, Enterobacteriaceae, Chromobacterium spp, Actinomycetes.

The aerobic flora of the skin of 56 Atlantic salmon from coastal, estuarine and river waters was analyzed quantitatively; 50 skin and 33 gill samples were analyzed qualitatively. The water at each sampling station was also analyzed. The principal genera on the skin and gills were Moraxella, Flavobacterium, Cytophaga and Pseudomonas; members of Acinetobacter, Bacillus, Aeromonas, Vibrio, the Enterobacteriaceae, Micrococcac and some coryneforms were also present. The flora was similar to that of the skin, w reflected that of the environment. (Holoman-B telle)
W74-07567

TAXONOMIC POSITION OF TWO LU BRINERIS SPP.,
Canterbury Univ., Christchurch (New Zealar Dept. of Zoology.
For primary bibliographic entry see Field 2L.
W74-07568

MOINA SP. (CLADOCERA: MOINIDAE) IN SEWAGE PLANT, WELLINGTON, REFERR TO MOINA TENUICORNIS SARS, 1896 (NOT
Wellington City Corp. (New Zealand). Wo Dept.
I. L. Vidal.
New Zealand Journal of Marine and Freshwa Research, Vol 7, No 3, p 253-259, September 19 1 fig, 1 tab, 6 ref.

Descriptors: *Systematics, *Water quali *Ecology, *Waterfleas, Water temperature, A kalinity, Hydrogen ion concentration, Dissolv solids, Biochemical oxygen demand, Orga matter, Sewage lagoons, Nitrates, Phosphor Speciation, Physiological ecology, Crustacea Scenedesmus, Chlamydomonas, Coliform Habitats.
Identifiers: *Moina, *New Zealand, Microtiniu Cryptomonas.

A species of Moina from sewage ponds at Gle side, Wellington, New Zealand, is identifi ble/with Moina tenuicornis Sars, 1896, and disti guishable from Moina australiensis Sars, 18 sensu stricto, in having rectangular sculpturing the ephippium, ungrouped setae on the hind ma gin of the carapace, and in lacking a permane supra-ocular depression. Because of wide vari tion in some diagnostic characters, possibly bo taxa are conspecific. Some physical and chemic characteristics of the habitat are tabulated, sinc little is known of the ecological requirements these morphologically similar species. Using mea values as a guide, the Glenside population Moina tenuicornis favors a temperature in th vicinity of 20 C, a very slightly alkaline pH, a di solved oxygen content in excess of 6 mg.liter, dissolved solid content of about 270 mg/liter, which about half is organic and exerts a BOD sub of about 60 mg/liter, and suspended organic solid of about 150 mg/liter. (Mortland-Battelle)
W74-07569

PRELIMINARY DIAGNOSIS OF A NEW SPE CIES OF MARINE ISOPOD FROM STEWART ISLAND,
Oceanographic Inst. (New Zealand). Departmen of Scientific and Industrial Research, Wellington.
For primary bibliographic entry see Field 2I.
W74-07570

SUMMARY OF THE STATE OF THE ART IN RADIOCHROMATOGRAPHY,
Oslo Univ. (Norway). Inst. of Physics.
S. Prydz.
Analytical Chemistry, Vol 45, No 14, p 2317-2326, December 1973. 12 fig, 2 tab, 54 ref.

Descriptors: *Reviews, *Carbon radioisotopes, *Tritium, Radiochemical analysis, *Radioactivity techniques, Computers, Prices, Films, Cameras.
Identifiers: *Radiochromatography, Film registration, Fluorography, Detectors, Luminescence, Photon detector, Scintillators, Image intensifiers, Scanners, Beta camera, Spark chamber, Beta particles.

Film registration in radiochromatography is discussed. Low-temperature fluorography gives

e lowest detection limits, 3.0 and 0.06 nCi-day/sq for tritium and radiocarbon, respectively. Vari- s detectors for one- and two-dimensional anning, comprising windowless gas-flow GM de- ctors, solid state detectors, and vacuum- erated channel electron multipliers are treated. e luminescence detection method, applying intillators in the chromatograph and a scanned oton detector, is discussed. For tritium, the ter method is about 30 times more efficient than M detection. Two radio-labels may be counted nultaneously using pulse height discrimination. e beta camera, the spark chamber, and the pos- ility of using image intensifiers are also scussed. The application of a computer to in- ease the signal-to-noise ratio and, hence the sen- ivity, of scanners is mentioned. A comparison the sensitivities of the available detection chniques and an appendix giving prices and chnical details of the commercially available anners are included. (Mortland-Battelle)
74-07571

ECOVERY OF ARSENIC BY DRY ASHING ROM ANIMAL TISSUE FORTIFIED WITH RGANOARSENICALS OR ARSENIC TRIOX- E,
lsbury Labs., Charles City, Iowa, Pharmaceuti- l Development and Analysis Dept.
M. George, L. J. Frahm, and J. P. McDonnell.
urnal of the Association of Official Analytical hemists, Vol 56, No 6, p 1304-1305, November 73. 2 tab, 8 ref.

escriptors: *Chemical analysis, *Poultry, ethodology, Colorimetry, rsenicals(Pesticides).
entifiers: *Arsenic, *Chemical recovery, nimal tissues, Organoarsenicals, Arsenic trioxe, Dry ashing, Liver, Kidneys, Roxarsone, Arnilic acid, Nitarsone, Carbarsone, Arnobenzene.

study was conducted to establish whether or not senic recovery from animal tissue is independent arsenic source. Control chicken liver and kidey tissues were fortified with 1.0 or 2.0 ppm arnic from arsenic trioxide, roxarsone, arsanilic id, nitarsone, or carbarsone. The tissue samples ere dry ashed and total arsenic was determined olorimetrically. Arsenic recovery for the ornoarsenical-fortified tissue samples is essenlly complete for all drugs tested. Mean recovees ranged from 98 to 109 percent of the theoretil amount expected. (Holoman-Battelle)
74-07573

CID AMMONIUM ACETATE EXTRACTION ND ELECTRON CAPTURE GAS CHROMATO- RAPHIC DETERMINATION OF CARBOFU- AN IN SOILS,
gricultural Research Service, Beltsville, Md. gricultural Environmental Quality Inst.
H. Caro, D. E. Glotfelty, H. P. Freeman, and A. . Taylor.
ournal of the Association of Official Analytical hemists, Vol 56, No 6, p 1319-1323, November 73. 2 fig, 5 tab, 9 ref.

escriptors: *Pollutant identification, *Soil analys, Methodology, *Pesticide residues, Carbamate esticides, Solvent extractions, Insecticides, Soil ontamination, Water pollution sources, *Gas hromatography, Soils, Loam, Peat, Chemical nalysis.
dentifiers: *Carbofuran, Electron capture gas hromatography, Chemical recovery, Metabolites, Detection limits, Landrin, Propoxur, Bux, Acid mmonium acetate.

A method is presented for determining carbofuran esidues in soils that gives improved recovery, specially in weathered soils, and allows quantitaion of as little as 0.1 ppm without cleanup. The oil is extracted with 0.5 M acid ammonium cetate and the carbamate in the extract is determined by electron capture gas chromatography as the dinitrophenyl ether. A systematic study was conducted to optimize extraction conditions. In tests of soils fortified with 1 ppm carbofuran, using optimized extraction conditions, recoveries varied with soil type, ranging from 61 percent in a peat to 92 percent in a silt loam. Recoveries of the metabolites 3-hydroxy- and 3-ketocarbofuran from field soils were at least as efficient as by HCl extraction. In addition to carbofuran, other methylcarbamate insecticide residues that may be determined by this method include Landrin, propoxur, and Bux. (Holoman-Battelle)
W74-07574

OBSERVATIONS ON THE GAS CHROMATOGRAPHY OF KELTHANE (DICOFOL),
Food and Drug Administration, Washington, D.C. Div. of Chemistry and Physics.
N. F. Ives.
Journal of the Association of Official Analytical Chemists, Vol 56, No 6, p 1335-1338, November 1973. 4 fig, 12 ref.

Descriptors: *Degradation(Decomposition), *Gas chromatography, Mass spectrometry.
Identifiers: Gas liquid chromatography, *Kelthane, *Sample preparation, Dichlorobenzophenone, Infrared spectrophotometry, Electron capture detector.

Problems associated with the GLC of Kelthane (dicofol) are discussed. The contribution of inlet glass wool to the decomposition of dicofol to p,p'-dichlorobenzophenone is investigated and steps to minimize the problem are suggested. An impurity of the technical material, which eluted immediately after dicofol, was isolated and tentatively identified as 1,1-bis(p-chlorophenyl)-1,2,2,2-tetrachloroethane by infrared and mass spectrometry. (Little-Battelle)
W74-07575

REDUCTION IN MERCURY CONTENT OF FISH PROTEIN CONCENTRATE BY ENZYMATIC DIGESTION,
Massachusetts Inst. of Tech., Cambridge. Dept. of Nutrition and Food Science.
M. C. Archer, B. R. Stillings, S. R. Tannenbaum, and D. I. C. Wang.
Journal of Agricultural and Food Chemistry, Vol 21, No 6, p 1116-1117, November/December 1973. 1 tab, 10 ref.

Descriptors: *Mercury, *Reduction(Chemical), *Digestion, Proteins, Separation techniques, Enzymes, Centrifugation, Fish.
Identifiers: *Fish protein concentrate, *Proteolysis, Sample preparation, Swordfish, Pacific hake.

The effect of proteolytic digestion on the distribution of mercury in fish protein concentrate (FPC) has been investigated. A two- to sevenfold concentration of mercury in the insoluble FPC fraction and a corresponding reduction of mercury level in the soluble FPC fraction was achieved after proteolysis. The following commercial enzyme preparations were used: Pancreatin, B grade (porcine pancreas), Calbiochem; Pronase, B grade (Streptomyces griseus), Calbiochem; and Monzyme PA-I (Bacillus subtilis), Monsanto. FPC samples were prepared from either Pacific hake (Merluccius productus) or swordfish (Xiphias gladius). Ten percent slurries of FPC were digested for periods of 1 and 6 hr at 50 C with Monzyme at pH 8.8 and with Pronase and Pancreatin at pH 8.5. After digestion for 1 or 6 hr, the reaction was stopped by pouring the mixture into two 50-ml centrifuge tubes and spinning down the residue at 4 C for 5 min and 5090 X g. The residue was suspended in distilled water and recentrifuged. The clear supernatants were combined and freeze-dried after most of the water was removed by flash evaporation at a bath temperature of 40 C. The residue was also freeze-dried. The soluble and insoluble fractions were then analyzed for mercury content. (Mortland-Battelle)
W74-07576

A DIRECT COMPARISON OF SATELLITE AND AIRCRAFT INFRARED (10 MICROMETERS-12 MICROMETERS) REMOTE MEASUREMENTS OF SURFACE TEMPERATURE,
Commonwealth Scientific and Industrial Research Organization, Aspendale (Australia). Div. of Atmospheric Physics.
For primary bibliographic entry see Field 7B.
W74-07578

KAEMPFEROL (3,5,7,4'-TETRAHYDROXYFLAVONE) AS A CHROMOGENIC REAGENT FOR TIN(IV),
Delhi Univ. (India). Dept. of Chemistry.
B. S. Garg, and R. P. Singh.
Microchemical Journal, Vol 18, No 5, p 509-519, October 1973. 8 fig, 3 tab, 14 ref.

Descriptors: *Spectrophotometry, *Aqueous solutions, Methodology, *Pollutant identification, Color reactions, Chemical reactions, Chelation, Acidity, Temperature, Time, Cations, Anions, Heavy metals, Organic compounds, Alkaline earth metals, Halides.
Identifiers: *Tin, *Chromogenic reagents, *Kaempferol, Metal chelates, Ionic interference, Sensitivity, Precision, Chemical concentration, Ethanol, Absorption spectra, Rare earth elements.

Tin(IV) forms a deep yellow chelate with the ligand kaempferol in aqueous ethanolic medium. This color reaction has been investigated in terms of using it for the spectrophotometric determination of tin. Those parameters studied were acidity, ethanol, time and temperature, reagent concentration. With the method used, the sensitivity of the color reaction 0.0029 microgram of Sn/sq cm is identical to log I sub o/I equals 0.001, at 430 nm in 0.1 N HCl medium and Beer's law is obeyed up to 3.6 ppm of tin. Several complexing anions do not interfere and they have been used for masking some of the cations which interfere in the determination. (Holoman-Battelle)
W74-07579

MICRODETERMINATION OF RESORCINOL IN PRESENCE OF PHENOL,
Pakistan Council of Scientific and Industrial Research Lahore.
M. Sarwar, and K-U. Butt.
Mikrochimica Acta, No 5, p 679-682, 1973. 2 tab, 12 ref.

Descriptors: *Phenols, *Volumetric analysis, *Aqueous solutions, Water analysis.
Identifiers: *Resorcinol, N-bromosuccinimide, Accuracy.

A displacement titration method using N-bromosuccinimide as the titrant has been devised for estimation of resorcinol in phenol. One ml of the resorcinol test solution is placed in a 50-ml Erlenmeyer flask. One ml of potassium iodide and 0.5-1.0 ml of fresh starch is added. The solution is titrated against 0.01 N solution of N-bromosuccinimide added dropwise from a microburette. The end point is reached when a bluish color appears and persists for 30 seconds. A similar procedure is repeated for the estimation of resorcinol in phenol. The method is very simple, rapid, and accurate. (Mortland-Battelle)
W74-07580

GAS CHROMATOGRAPHIC STUDIES OF MIXED-LIGAND COMPLEXES OF DIVALENT CATIONS,
Hewlett-Packard Co., Avondale, Pa. Avondale Div.
C. A. Burgett.
Journal of Chromatographic Science, Vol 11, No 11, p 611-614, November 1973. 5 fig, 1 tab, 6 ref.

Descriptors: *Cations, *Gas chromatography, *Solvent extractions, Iron, Cobalt, Nickel, Gravimetric analysis, Mass spectrometry, Separation techniques.
Identifiers: *Ligands, Thermogravimetric analysis, Thermal stability, Divalent cations, Chromatograms, Metal complexes, Metal chelates.

Volatile complexes of iron(II), cobalt(II) and nickel(II) are prepared by solvent extraction using the mixed-ligand system 1,1,1,2,2,6,6,7,7,7-decanfluoro-3,5-heptanedione, H(FHD), di-n-butylsulfoxide, (DBSO). The composition of the extracted species is reported to be M(FHD)2. DBSO. Thermogravimetric analysis of the complexes is reported. The complexes were eluted from the gas chromatographic column without decomposition as determined by mass spectrometric detection. Separation of iron(II) and cobalt(II) from nickel(II) was readily achieved; however, iron(II) and cobalt(II) were not separated. (Mortland-Battelle)
W74-07582

NUMERICAL ANALYSIS OF HANSENULA, PICHIA AND RELATED YEAST GENERA,
Heriot-Watt Univ., Edinburgh (Scotland). Dept. of Brewing and Biological Sciences.
I. Campbell.
Journal of General Microbiology, Vol 77, No 2, p 427-441, August 1973. 4 fig, 1 tab, 53 ref.

Descriptors: *Systematics, *Speciation, *Numerical analysis, *Yeasts.
Identifiers: Data interpretation, Debaryomyces, Pichia, Wingea, Endomycopsis, Hansenula, Pachysolen, Schwanniomyces, Lipomyces, Ambrosizyma, Brettanomyces, Citeromyces, Dekkera, Ladderomyces.

Numerical analysis of published standard descriptions of the eight species of Debaryomyces, 48 species of Pichia, and the single species of Wingea failed to distinguish separate genera. It is proposed that they be combined as a single genus Pichia of 41 species, three of which were formerly allocated to the genus Endomycopsis. The genus Hansenula, of 20 species including Pachysolen tannophilus and three former species of Endomycopsis, is closely related to the genus Pichia and is distinguished only by the ability of Hansenula species to assimilate nitrate. In the genus Schwanniomyces the number of species is reduced from four to two, and in Lipomyces, from three to one. (Little-Battelle)
W74-07583

RESIDUES OF ATRAZINE, CYANAZINE, AND THEIR PHYTOTOXIC METABOLITES IN A CLAY LOAM SOIL,
Ontario Ministry of Agriculture and Food, Guelph. Pesticides Residue Lab.
G. J. Sirons, R. Frank, and T. Sawyer.
Journal of Agricultural and Food Chemistry, Vol 21, No 6, p 1016-1020, November/December 1973. 6 fig, 2 tab, 11 ref.

Descriptors: *Clay loam, *Pesticide residues, *Degradation(Decomposition), *Triazine pesticides, Persistence, Phytotoxicity, Soil analysis, Herbicides, Methodology, Solvent extractions, Chemical analysis, Chemical reactions.
Identifiers: *Metabolites, *Coulson conductivity detector, Quantitative analysis, Chemical recovery, Atrazine, Cyanazine, Electrolytic conductivity gas chromatography, Deethylated atrazine, Deisopropylated atrazine, Cyanazine amide, Gas liquid chromatography.

The degradation of 2-chloro-4-ethylamino-6-isopropylamino-s-triazine (atrazine) and 2-chloro-4-(1-cyano-1-methylethylamino)-6-ethylamino-2-triazine (cyanazine) was investigated in Perth clay loam soil. Atrazine and cyanazine were applied at rates of 1, 2, and 3 lb/A of active ingredients as pre- and postemergence treatments. Soil was sampled from plots after 0, 2, 3.5, 5, and 12 months at 0-2.5, 2.5-5, and 5-10 in. depths. Atrazine, cyanazine, and their phytotoxic metabolites were extracted with a 65 percent acetonitrile-water mixture and quantitated on a Coulson conductivity detection system. Presented data indicate that atrazine is converted into deethylated atrazine (2-chloro-4-amino-6-isopropylamino-s-triazine) as a major and deisopropylated atrazine (2-chloro-4-amino-6-ethylamino-s-triazine) as a minor phytotoxic metabolite and that cyanazine is changed to deisopropylated atrazine as a major phytotoxic metabolite. Cyanazine amide (2-chloro-4-(1-carbamoyl-1-methylethylamino)-6-ethylamino-s-triazine) was found. It is proposed that the hydrolysis precedes the microbiological degradation to the deisopropylated atrazine. (Holoman-Battelle)
W74-07585

DETERMINATION OF MEAN CELL SIZE OF TETRAHYMENA IN GROWING CULTURES,
University Coll. of Wales, Aberystwyth.
G. A. Morrison, and A. L. Tomkins.
Journal of General Microbiology, Vol 77, No 2, p 383-392, August 1973. 7 fig, 1 tab, 4 ref.

Descriptors: *Cultures, *Populations, *Particle size, *Volume, Growth rates, Cytological studies, Aqueous solutions.
Identifiers: *Coulter counter, *Counting, Tetrahymena pyriformis, Size.

In this study of the actions of certain inhibitors on the growth of Tetrahymena pyriformis in deep culture it was necessary to make concomitant measurements of the number of mean cell size of the living organisms in a culture at intervals. To accomplish this, a Coulter model A was fitted with a 280 micrometer orifice tube to detect decreases in the conductance of a small volume of an aqueous electrolyte. When the setting correspond to detection of every particle, the total count was obtained. The counts at a number of different threshold settings were used to obtain a distribution of particle volume curve and hence to calculate the mean particle volume (electronic volume). The results show that the diluting solution can have an optimal colligative concentration in which there is initially no change of the measurement; in suboptimal concentrations there is initial increase followed by a decrease to a value somewhat less than that prevailing at the moment of dilution (95 percent), whereas in superoptimal concentrations there is initial decrease followed by an increase. If the initial decrease is severe the subsequent increase restores the value to only 80 percent of the original. The measurements of electronic volume, and of its changes reflect the corresponding mean cell volume, and changes of it, estimated by photographic methods. The changes can be accounted for by changes of balance between the elasticity of the cell walls and the osmotic pressure across the walls. (Little-Battelle)
W74-07586

ELEMENTAL VARIABILITY WITHIN A SAMPLING UNIT,
Ohio Agricultural Research and Development Center, Wooster.
For primary bibliographic entry see Field 2K.
W74-07598

5B. Sources Of Pollution

ECOLOGY AND PRODUCTIVITY OF STRIP-MINE AREAS IN MERCER COUNTY, PENNSYLVANIA,
Grove City Coll., Pa. Dept. of Biology.
F. J. Brenner.
Available from the National Technical Information Service as PB-231 559, $4.00 in paper copy, $1.45 in microfiche. Pennsylvania Institute for Research on Land and Water Resources, University Park, Penn., Completion Report, March 1974. 70 p, 35 fig, 12 tab, 15 ref. OWRR A-029-PA(1), 14-31-0001-4038.

Descriptors: *Strip mines, *Ecology, *Aquatic life, *Fish populations, Water chemistry, Plankton, Reclamation, *Pennsylvania, Productivity, Recreation, *Land reclamation, Wildlife.
Identifiers: *Mercer County(Penn), Recreational development.

Abandoned strip mines were surveyed in Mercer County, Pennsylvania during 1971 and 1972. The general ecology of each strip mine site was determined and the water chemistry of each pool was analyzed. The majority of the strip mine pools within Mercer County are supporting aquatic life. The data on water chemistry, plankton surveys and age and growth of fish populations indicate that these areas offer considerable potential for recreational development. The results of this preliminary study will provide an excellent basis for further research on the fish and wildlife potential of these sites. Furthermore, this research suggests that cooperation between the mine operator, land owner and an ecologist could result in reclamation procedures beneficial for fish and wildlife populations.
W74-07055

CHEMICAL AND BIOLOGICAL PROBLEMS IN THE GRAND CANYON,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
G. C. Slawson, Jr., and L. G. Everett.
In: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1973 meetings of the Arizona Section - AWRA and the Hydrology Section, Arizona Academy of Sciences, May 4-5, 1973, Tucson, Arizona, p 63-72, (1973). 1 fig, 6 tab, 1 ref.

Descriptors: *Water quality, *Biological properties, *Colorado River, Water pollution sources, Chemicals, Bacteria, Pollutants, Tributaries, Public health, Sampling, Salinity, Sediments, Water quality standards.
Identifiers: *Grand Canyon National Park.

Chemical and bacteriological water quality in the Grand Canyon was investigated to determine possible health hazards to river users. Water quality is a function of both time and location and in general, the quality of water in the main river channel is relatively stable and appears to be within acceptable standards. Extreme temporal variability was noted in tributary streams, as a result of summer rains and flooding in the side canyons, and definite health hazards are present during these periods. A more intensive water quality monitoring program is called for to determine the sources of the contamination and to protect and preserve the quality of the Grand Canyon experience. (Mastic-Arizona)
W74-07093

DISSOLVED-SOLIDS DISCHARGE TO THE OCEANS FROM THE CONTERMINOUS UNITED STATES,
Geological Survey, Washington, D.C.
D. K. Leifeste.
Circular 685, 1974. 8 p, 1 fig, 2 tab, 6 ref.

Descriptors: *Dissolved solids, *Rivers, *United States, Data collections, Hydrologic data, Erosion, Water quality, Path of pollutants, Solutes, Oceans.

Dissolved-solids data from 54 river basins for 1966-69 were used to compute the amount of dissolved material contributed to the oceans from the conterminous United States. About 264,000,000 tons are discharged annually. The Gulf of Mexico receives the largest load, about 183,000,000 tons, of which about 157,000,000 tons are contributed by the Mississippi River. The Atlantic Ocean

receives about 37,500,000 tons, and the Pacific Ocean about 43,400,000 tons. Average yearly yields range from 26 to 231 tons per square mile and average about 100 tons per square mile. (Knapp-USGS)
W74-07162

SOURCE AND BUDGET OF SULFATE IN PRECIPITATION FROM CENTRAL ALBERTA, CANADA,
Research Council of Alberta, Edmonton.
P. W. Summers, and B. Hitchon.
Journal of the Air Pollution Control Association, Vol 23, No 3, p 194-199, March 1973. 6 fig, 1 tab, 8 ref.

Descriptors: *Sulfates, *Air pollution, *Path of pollutants, *Chemistry of precipitation, *Precipitation(Atmospheric), Snowfall, Rainfall, *Canada, Meteorology.
Identifiers: Alberta(Canada).

Rain, hail, and snow samples collected in central Alberta were analyzed for sulfate and chloride content. The mean values of sulfate concentration in rain and hail collected in the region of sulfur extraction gas plants were 2.7 mg/liter and 2.9 mg/liter, respectively. The mean value of the sulfate content of a large number of hail samples collected from one severe storm for a major SO2 source was 0.6 mg/liter. Several snow samples collected in Alberta and southern British Columbia had a mean sulfate content of less than 0.5 mg/liter. Most of the sulfate found in central Alberta precipitation is of local industrial origin. By comparing the sulfate deposition in precipitation around one isolated gas plant with the known SO2 emission rate, a local atmospheric sulfur budget was derived. The summertime convective storms are a very efficient mechanism for removing the SO2 from the atmosphere; between 32% and 46% of the sulfur emitted as SO2 arrives at the ground as sulfate sulfur within a radius of 25 miles of the source. In contrast snow is a very inefficient removal mechanism; in winter less than 2% of the sulfur emission is deposited in the snowfall near the source. (Knapp-USGS)
W74-07164

WATER RETENTION OF GRANITIC SOILS IN THE IDAHO BATHOLITH,
Forest Service, (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2G.
W74-07170

GEOLOGIC ASPECTS OF WASTE SOLIDS AND MARINE WASTE DEPOSITS, NEW YORK METROPOLITAN REGION,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
M. G. Gross.
Geol Soc Am Bull. Vol 83, No 11, p 3163-3176, 1972. Illus.
Identifiers: Carbon, Copper, Geologic aspects, Lead, Metropolitan areas, *New York Bight, Silver, *Solid wastes, *Waste disposal.

Waste solids from the New York metropolitan region were a major source of sediment to adjacent ocean areas from 1964-1968. The annual discharge of solids (excluding refuse and floatable debris) to the New York Bight averaged 4.6 million metric tons per yr: 76% from dredged wastes, 12% from construction and demolition rubble, 7.6% from solids in waste chemicals and 4.3% from sewage sludges. Waste containing deposits covered 160 km sq of New York Harbor and more than 50 km sq of continental shelf in New York Bight. The continental shelf area used for waste disposal received no other sediment in quantities sufficient to bury the waste deposits. Waste disposal operations were the largest sediment transport and depositional process active in the mid-Atlantic region. Production of waste solids in the metropolitan region exceeded sediment yields per unit area of any other major drainage basin in the new England-Middle Atlantic area.--Copyright 1973, Biological Abstracts, Inc.
W74-07171

COMPARISON OF CONDITIONAL STABILITY CONSTANTS OF NORTH CAROLINA HUMIC AND FULVIC ACIDS WITH CO(II) AND FE(III),
Geological Survey, Denver, Colo.
R. L. Malcolm.
In: Environmental Framework of Coastal Plain Estuaries; 18th Annual Meeting of Southeastern Section of the Geological Society of America, April 10-11, 1969, Columbia, S C: Geological Society of America, Inc, Memoir 133, p 79-83, 1972. 1 tab, 5 ref.

Descriptors: *Cobalt, *Iron, *Humic acids, *Fulvic acids, *Estuaries, Chelation, Organic compounds, *North Carolina.
Identifiers: *Metal-organic complexes.

Both humic and fulvic acid fractions of soil and sediment organic matter form stable water-soluble complexes and perhaps chelates with ions of Co(II) and Fe(III). The conditional stability constants (log K values) for these complexes were determined at a constant ionic strength of 1.0 in KC1. The conditional stability constants were 4.0 (pH 4.5) and 6.6 (pH 6.0) for fulvic acid-Co(II) complexes; 6.0 (pH 4.5) and 8.3 (pH 6.0) for humic acid-Co(II) complexes; 5.4 (pH 4.5) and 5.6 (pH 6.0) for fulvic acid-Fe(III) complexes; and 6.8 (pH 4.5) and 7.2 (pH 6.0) for humic acid-Fe(III) complexes. Humic acid-metal complexes may be as important as fulvic acid-metal complexes in geochemical transport of metal ions because they form water-soluble complexes with metal ions, they are more abundant in nature than fulvic acids, and they form more stable metal-organic complexes than corresponding fulvic acid-metal complexes. Fulvic acids form stable complexes with Co(II) in marine and simulated estuarine waters with conditional stability constants of 4.9 and 5.3, respectively; therefore, the formation of metal-organic complexes may be an important factor in considering natural processes in estuarine and marine environments. (See also W74-07225) (Knapp-USGS)
W74-07228

STRONTIUM ISOTOPE COMPOSITION AND SEDIMENT TRANSPORT IN THE RIO DE LA PLATA ESTUARY,
Lamont-Doherty Geological Observatory, Palisades, N. Y.
For primary bibliographic entry see Field 2L.
W74-07240

PROCESSES AFFECTING GAS DISTRIBUTIONS IN ESTUARINE SEDIMENTS,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 2L.
W74-07242

BIOGEOCHEMICAL VARIABLES IN BOTTOM SEDIMENTS OF THE RAPPHANNOCK RIVER ESTUARY,
South Carolina Univ., Columbia. Coll. of Arts and Sciences.
For primary bibliographic entry see Field 2L.
W74-07244

PREVENTION AND CONTROL OF INFILTRATION AND INFLOW,
American Public Works Association, Chicago, Ill.
For primary bibliographic entry see Field 5D.
W74-07257

COMBINED SEWER OVERFLOW REGULATOR FACILITIES,
American Public Works Association, Chicago, Ill.
For primary bibliographic entry see Field 5D.
W74-07258

THE EPA STORMWATER MANAGEMENT MODEL: A CURRENT OVERVIEW,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5D.
W74-07265

LAND APPLICATION OF SEWAGE SLUDGE,
Guelph Univ. (Ontario). Dept. of Land Resource Science.
For primary bibliographic entry see Field 5D.
W74-07266

INTERDISCIPLINARY MODELING IN THE ANALYSIS OF THE SALINITY PROBLEMS OF THE SAFFORD VALLEY,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
A. B. Muler.
Water Resources Bulletin, Vol 10, No 2, p 245-255, April 1974. 6 fig, 9 ref.

Descriptors: *Water quality control, Saline water intrusion, *Groundwater, *Irrigation, *Economic efficiency, *Management, Water resources development, Hydrology, Rivers, Social aspects, Aquifers, Agriculture, Cotton, Alfalfa, Model studies, Systems analysis, *Arizona, *Salinity.
Identifiers: Interdisciplinary modeling, Safford Valley(Ariz).

In recent years, there have been significant declines in the quality of groundwater used for irrigation in the Safford Valley, Arizona. Reports of changes over a few weeks from freshwater to brine incited an investigation of the Valley's salinity situation. An interdisciplinary approach was chosen in which the physical, social and economic systems in the Valley were modeled in the classical methods of each field; then a composite flow relationship model was constructed to examine the interrelationship of these systems and identify multiple aspects of the salinity change in the area. The hydrologic study, salinity modeling, and economic analysis are discussed, as well as interdisciplinary implications. The composite model shows that, based on salinity trends, the Valley's principal agricultural crop--cotton--will remain economical to cultivate for a significant time beyond the model's limit of prediction. Alfalfa, however, should go out of production in large areas of the Valley by 1990 and not be under economical cultivation by 2040. The sociologic model, based on the cluster analysis of questionnaire data, shows an awareness of the salinity problems of the area but little concern over them. Interdisciplinary model-based salinity control recommendations are made. (Bell-Cornell)
W74-07297

NONLINEAR PROGRAMMING IN RIVER BASIN MODELING,
Calgary Univ. (Alberta). Faculty of Business.
M. B. Bayer.
Water Resources Bulletin, Vol 10, No 2, p 311-317, April 1974. 3 tab, 31 ref.

Descriptors: *Water quality control, *Model studies, *River basins, Linear programming, *Dynamic programming, Costs, Optimization, Treatment facilities, Biochemical oxygen demand, Dissolved oxygen, Standards, Streams, Systems analysis, *Oregon.
Identifiers: *Nonlinear programming, *Willamette River(Ore).

Since the real world is seldom linear, nonlinear programming is theoretically the ideal method for obtaining solutions for complex water quality problems. The use of nonlinear programming in river basin water quality modeling is explored. Ap-

plications recently reported in the literature, along with the author's experience with nonlinear programming, are reviewed. Several difficulties which still exist in applying the method are discussed. Computational results obtained using linear, dynamic, and nonlinear programming to solve a river basin water quality optimization problem are compared. Data are from Liebman's simplified version of the Willamette River system in Oregon. The water quality models have objective functions with continuous first partial derivatives, and several inequality and variable bound constraints. Results obtained are the efficiencies of treatment plants and the total cost of building or expanding the treatment plants to accommodate specified BOD loads and stream DO standards. Compared are a linear and nonlinear program of Bayer, a dynamic program of Liebman, and a linear program of ReVelle. (Bell-Cornell)
W74-07298

A SYSTEMS ANALYSIS OF WATER QUALITY SURVEY DESIGN,
Clemson Univ., S.C. Coll. of Engineering.
L. C. Wilcox.
Available from the National Technical Information Service as AD-768 865; $3.00 in paper copy, $1.45 in microfiche. Department of the Army Annual Report, U.S. Army Medical Research and Development Command, Washington, D.C., August 1973. 38 p, 5 fig, 1 tab, 4 appen. DADA 17-72-C-2152.

Descriptors: *Water quality, *Surveys, *Design, *Systems analysis, *Industrial wastes, *Monitoring, Pollutants, *Data collections, Simulation analysis, Sewers, Networks, Effluents, Measurement, Sites, Water sampling, Topography, Mathematical models, Resources.
Identifiers: Information management, Munitions manufacture.

In a three-year project, the design of water quality surveys is being investigated by an interdisciplinary team using systems analysis. The first year's progress in formulating and implementing models for munitions manufacturing processes, site topology, measurement resources and a resource matching program is reviewed; included also is a survey of current data handling procedures and recommendations for improvements. The surveys being studied are 15 days long and designed to characterize pollutant types and levels at the site being monitored. Resources available for data collection are limited and a 'best' sampling and analysis program must be chosen to maximize data collection. Moreover, the sites being surveyed are large and include processes with a variety of potential pollutants. Therefore, this investigation seeks to provide an information management system. Each principal process associated with munitions manufacture is modeled to provide a pollutant load as a function of production level. These process models, plus a topological model of the plant site which defines the sewer network, produce the steady-state pollutant load at each point in the sewer network and at the plant effluent points. These are combined with a model defining the United States Army Environmental Health Agency's resources available for measurement, sampling, and analysis. This gives an indication of performance and utilization of resources. Thus, the available personnel, equipment, and services available to USAEHA can be used to a maximum degree, insuring maximum useful information. (Bell-Cornell)
W74-07310

REGIONAL WATER QUALITY MANAGEMENT BY THE GENERALIZED REDUCED GRADIENT METHOD,
Kansas State Univ., Manhattan. Inst. for Systems Design and Optimization.
C. L. Hwang, J. L. Williams, R. Shojalashkari, and L. T. Fan.
Water Resources Bulletin, Vol 9, No 6, p 1159-1181, December 1973. 7 fig, 4 tab, 22 ref, append. OWRR-A-038-KAN(5) and B-030-KAN(4).

Descriptors: *Water quality control, *River basins, *Management, *Thermal pollution, *Organic wastes, Optimization, Biochemical oxygen demand, Dissolved oxygen, Water temperature, Standards, Dynamic programming, Mathematical modeling, Systems analysis.
Identifiers: *Nonlinear programming, Cost minimization.

Basin-wide water quality management is considered. A river system receives thermal and organic wastes, and at-source treatment is imposed. The related water quality standards are: minimum DO concentration; maximum allowable BOD concentration; maximum allowable stream temperature; and allowable rise in stream temperature. A general dynamic mathematical model representing the spatial distribution and temporal change of temperature and BOD and DO concentration is presented. Temperature effects on BOD and DO concentrations are also given. The model is highly nonlinear in nature. The optimal management problem involving the model is solved by a recently developed nonlinear programming technique, the generalized reduced gradient (GRG) method. The objective is to minimize the costs incurred when certain levels of water quality standards are to be achieved. Comparison of results obtained by the GRG method vs. dynamic programming, and of results using a more realistic mathematical model vs. a simple model is presented. The analysis procedure can be applied to designing new and examining existing water quality programs, and to study the influence of alternate policies and constraints. (Bell-Cornell)
W74-07311

ON THE DETERMINATION OF TURBULENT DIFFUSIVITY IN SHALLOW WATERS BY AERIAL PHOTOGRAPHY OF FLOATING MARKERS,
Texas A and M Univ., College Station. Dept. of Meteorology.
For primary bibliographic entry see Field 2H.
W74-07316

THE IDENTIFICATION OF THE REACTION PRODUCTS FORMED BY THE OXIDATION OF AQUEOUS AMMONIA WITH POTASSIUM FERRATE VI,
Ohio State Univ., Columbus. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W74-07333

PLANNING AND OPERATION OF URBAN WATER QUALITY MANAGEMENT SYSTEMS,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 5D.
W74-07334

FUNCTION OF MARSHES IN REDUCING EUTROPHICATION OF ESTUARIES OF THE MIDDLE ATLANTIC REGION,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 5C.
W74-07336

MODULAR WASTEWATER TREATMENT SYSTEM DEMONSTRATION FOR THE TEXTILE MAINTENANCE INDUSTRY,
Linen Supply Association of America. Miami Beach, Fl. and Institute of Industrial Launderers Washington, D.C.
For primary bibliographic entry see Field 5D.
W74-07343

PHOSPHORUS SUPPLY CHARACTERISTIC OF ACID ORGANIC SOILS AS MEASURED B DESORPTION AND MINERALIZATION,
North Carolina State Univ., Raleigh
For primary bibliographic entry see Field 2G
W74-07345

RADIATION SAFETY PROBLEMS IN THE OPERATION OF ATOMIC ELECTRIC POWER STATIONS, (IN RUSSIAN),
I. G. Arkhangel'skaya, M. A. Baranov, N. V. Beskrestnov, M. S. Egorova, and N. G. Gusev
Gig Sanit. Vol 37, No 4, p 59-63. 1972. (English summary).
Identifiers: Atomic energy, *Electric power plants, Environmental, Operations, *Radiation safety, *USSR.

Radiation safety of both the personnel of atomic electric power stations (AEPS) and the population living in its vicinity was studied. Investigations performed at the Novovoronezhskaya and Beloyarskaya AEPS showed the yearly average irradiation level of the personnel to be within 50% of the maximal permissible doses in the USSR. The pollution levels of the environment, such as the atmosphere, plants, water, etc., serve as a radiation background and are determined by the global falls. Experience of the first 15 yr operation of AEPS in the USSR proves them to be quite safe in respect to irradiation of both the personnel of AEPS and the population of the neighboring territories. Some problems still exist in the construction of large AEPS in the vicinity or within the boundary of large towns.—Copyright 1973, Biological Abstracts, Inc.
W74-07363

POLLUTION CAUSED BY AGRICULTURE,
Norges Veterinarhoegskole, Oslo. Institutt for Naeringsmiddelhygiene.
R. Gudding.
Nor Vet Tidsskr. Vol 84, No 7/8, p 430-436. 1972.
Identifiers: *Agriculture, *Air pollution, Biocides, *Norway, *Soil contamination, Wastes, *Water pollution sources.

Pollution of water, air and soil by agriculture (in Norway) can take place by acid ensilage, rinse water of straw-steeping works, animal and artificial manures, pathogenic microorganisms, biocides, and the common sewer.—Copyright 1973, Biological Abstracts, Inc.
W74-07366

EFFECT OF EFFLUENTS FROM HYDROLYSIS PLANT ON THE SURVIVAL OF TYPHOID FEVER AND DYSENTERY BACTERIA, (IN RUSSIAN),
Meditsinskii Institut, Irkutsk (USSR).
For primary bibliographic entry see Field 5C.
W74-07367

PREDICTING THE QUALITY OF STREAM WATER UNDER CONDITIONS OF OXYGEN DEFICIENCY (O PROGNOZE KACHETVA VODY VODOTOKOV PRI BOL'SHIKH DEFITSITAKH KISLORODA),
M. Ya. Krupnik, and A. I. Shishkin.
Khimiya i Tekhnologiya Tsellyulozy i Bumagi – Trudy Leningradskogo Tekhnologicheskogo Instituta Tsellyulozno-Bumazhnoi Promyshlennosti, No 28, p 113-118, 1972. 4 fig, 3 ref.

Descriptors: *Waste assimilative capacity, Water pollution effects, Water quality, *Self-purification, Streams, *Aeration, *Oxygen sag, *Dissolved oxygen, Equations, Anaerobic conditions, *Mathematical models, Biochemical oxygen demand, *Pulp wastes, Chemical reactions, Organic wastes, Biodegradation.
Identifiers: Streeter-Phelps equations.

e self-purification capacity of receiving waters discharged pulp and paper mill effluents is ally evaluated with the aid of the Streeter-elps equations, based on the assumption that mineralization process is a monomolecular ction. An analysis of these equations indicates t they cannot be applied under extreme oxygen iciency, i.e., under anaerobic conditions, ause they would yield negative values for the centration of oxygen in plots of dissolved ox-n and hence of BOD changes. A modified tem of equations is presented which takes into ount the effect of oxygen concentration on the eralization process. (Stapinski-IPC)
4-07388

TER REUSE AND RECYCLE IN KRAFT EACHERIES,
Research Ltd., Hawkesbury (Ontario).
primary bibliographic entry see Field 5D.
4-07394

RINE FUNGI ISOLATED FROM A KRAFT LP MILL OUTFALL AREA,
ion Fraser Univ., Burnaby (British Columbia).
t. of Biological Sciences.
M. Churchland, and M. McClaren.
adian Journal of Botany, Vol 51, No 9, p 1703-0, Sept. 1973. 5 fig, 5 tab, 21 ref.

scriptors: *Aquatic fungi, *Pulp wastes, *Water lution effects, *Water pollution sources, nada, *Marine fungi, Fungi, Aquatic microor-isms, Microorganisms, Effluents, Sampling, assay, Discharge(Water), Benthic flora, Water lity, Salinity, Saline water, Hydrogen ion con-tration, Stratigraphy, Oceanography, Hydrog-hy.
ntifiers: Kraft mills, Howe Sound(B.C.).

od- and leaf-inhabiting marine fungi were col-ed from two depths near the effluent outlets of raft pulp mill in Howe Sound, B.C. Other sites ich were not directly affected by pulp mill ef-ents were also sampled. All groups of fungi w poorly on baits which rested on the bottom the mill. At 30 cm depth, Phycomycetes were lated as frequently from the mill as from control s. Of the Fungi imperfecti, Monodictys agica was isolated more frequently, but erion maritimum less frequently from the mill than from control sites. Phialophora fastigiata s found solely around the mill discharge site. comycetes were rarely found on panels sub-rged near the mill. Hydrographic measurements wed that the water temperature at the mill sam-site was not affected by the effluent. Salinity l pH were generally lower at the mill than at trol sites and may have been responsible in t for the observed distributional differences. itt-IPC)
4-07396

SIDUALS IN MANUFACTURE OF PAPER,
sources for the Future, Inc., Washington, D.C.
T. Bower, G. O. G. Lof, and W. M. Hearon.
rnal of the Environmental Engineering Divi-n, American Society of Civil Engineers, Vol 99, EE 1, p 1-16, Feb 1973. Paper 9543. 2 fig, 2 tab.

scriptors: *Pulp wastes, *Pulp and paper indus-, *Water pollution sources, *Waste disposal, aste water disposal, *Bleaching wastes, Water lution control, Pollution abatement, yproducts, Specifications.
ntifiers: Tissue papers.

ta are presented on the kinds and amounts of iduals generated in the production of tissue pers. They are shown to be primarily a function the type of raw material, pulping, bleaching, d papermaking processes employed, and of the d-product specifications. The amounts of iduals discharged may be controlled in principle altering the product specifications and by con-verting them to saleable by-products or to other residuals that are less harmful to the environment. (Buchanan-IPC)
W74-07399

A PRELIMINARY DESCRIPTION OF THE PHYSICO-CHEMICAL CHARACTERISTICS AND BIOTA OF THREE STRIP MINE LAKES, SPENCER COUNTY, INDIANA,
Saint Meinrad Coll., Ind. Dept. of Biology.
M. W. Coe, and D. V. Schmelz.
Proceedings of the Indiana Academy of Science, Vol 82, p 184-188, 1972. 4 tab, 14 ref.

Descriptors: Lakes, *Strip mine lakes, *Aquatic life, Water properties, *Water chemistry, *Lake stages, *Aquatic productivity, *Indiana, Missouri, Illinois, United States, Water quality.
Identifiers: Spencer County(Ind).

Three strip mine lakes about 30 years old in Indiana were compared for chemical, physical, and biological characteristics. One of the three was relatively fertile both in organism density and number of genera; the other two were rather sterile. Differences may be explainable by variations in area/volume ratios, basin slopes, and watersheds. The lakes resembled strip mine lakes studied in Missouri and Illinois and can be considered to be in the alkaline stage of recovery. All results reinforced the theory that each strip mine lake is modified chemically, physically, and biotically at its own rate. (Brown-IPC)
W74-07403

A PRACTICAL AND TROUBLE-FREE SEWER SPILL MONITOR,
Prince Albert Pulp Co. Ltd. (Saskatchewan).
For primary bibliographic entry see Field 5D.
W74-07404

THE ESTIMATION OF VERTICAL EDDY DIFFUSIVITIES BELOW THE THERMOCLINE IN LAKES,
California Univ., Davis. Dept. of Physics.
For primary bibliographic entry see Field 2H.
W74-07416

WATER POLLUTION ASPECTS OF STREET SURFACE CONTAMINANTS,
URS Research Co., San Mateo, Calif. Environmental Systems Div.
J. D. Sartor, G. B. Boyd, and F. J. Agardy.
Journal of Water Pollution Control Federation, Vol 46, No 3, p 458-467, March 1974 (Part 1). 1 fig, 7 tab, 4 ref.

Descriptors: *Urban runoff, *Water pollution sources, Water quality, Urban hydrology, Organic matter, Heavy metals, Path of pollutants, Storm water.

Materials commonly found on street surfaces contribute to urban pollution when washed into receiving waters by storm runoff. A study was performed that provides a basis for evaluating the significance of this source of water pollution relative to other pollution sources. The study was designed to include information from communities having a broad range of sizes, geographical locales, and public works practices. Information was developed for major land use areas within the cities. In general, street runoff was/a greater pollutant than sanitary wastewater, at least during storms. The major constituent of street surface contaminants is inorganic, mineral-like matter, similar to common sand and silt. The quantity of contaminant material existing at a given test site depends on the length of time elapsed since the site was last cleaned, either intentionally by sweeping or flushing or by rainfall. A great portion of the overall pollutional potential is associated with the fine solids fraction of the street surface contaminants. Current street cleaning practices are essentially for aesthetic purposes and, even under well-operated and highly efficient street sweeping programs, their efficiency in the removal of the dust and dirt fraction of street surface contaminants is low. Catch basins as they are normaliy used are reasonably effective in removing coarse inorganic solids (coarse sand and small gravel) from storm runoff, but are ineffective in removing fine solids and most organic matter. (Knapp-USGS)
W74-07418

ULTRA-VIOLET ABSORPTION CHARACTERISTICS OF NATURAL WATERS,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 2K.
W74-07419

THE CHEMISTRY OF CADMIUM IN NATURAL WATER--II. THE ADSORPTION OF CADMIUM ON RIVER MUDS AND NATURALLY OCCURRING SOLIDS,
Stevenage (England). Water Pollution Research Lab.
For primary bibliographic entry see Field 2K.
W74-07420

EROSIONAL LOSSES OF S-TRIAZINE HERBICIDES,
Pennsylvania State Univ., University Park. Dept. of Soil Chemistry.
J. K. Hall.
Journal of Environmental Quality, Vol 3, No 2, p 174-180, April-June 1974. 4 fig, 2 tab, 15 ref.

Descriptors: *Soil erosion, *Runoff, *Herbicides, *Path of pollutants, *Pesticide residues, Pesticides, Alfalfa, Corn(Field).
Identifiers: *Atrazine.

Erosional losses of two chloro-s-triazines, atrazine and GS13529, were evaluated in 1970 and 1971 from field runoff plots planted to corn and situated on Hagerstown silty clay loam of 14% slope. Losses of a methoxy-s-triazine, GS14254, were assayed in 1971 and 1972 from an alfalfa stand. Herbicides were applied premergent to corn and to dormant alfalfa only once during the initial growing season or initial season of evaluation of two rates, 2.2 and 4.5 kg/ha. Total losses of atrazine during the first and most critical season at the respective rates were 5.0% and 4.8% of that applied; 87% to 93% of this loss resulted within the first month following application. One month after application an average of 35.3% of the applied atrazine remained; five months later an average level of 11.8% was residual. Recovery of GS13529 ranged from 65.5% to 9.8% for the same time period. Runoff losses of GS14254 from alfalfa were inconsequential. Little runoff was obtained from this cropping system, no sediment was ever collected and runoff concentrations of the herbicide were extremely small. Total losses of this herbicide for the year were 0.02 and 0.03% for the respective application rates. (Knapp-USGS)
W74-07421

LAND DISPOSAL OF WASTE GASES: III. SORPTION PATTERNS FROM BURIED GAS INJECTION PIPES,
Arizona Agricultural Experiment Station, Phoenix.
S. Miyamoto, A. W. Warrick, and R. J. Prather.
Journal of Environmental Quality, Vol 3, No 2, p 161-166, April-June 1974. 7 fig, 7 ref.

Descriptors: *Soil disposal fields, *Sorption, *Gases, Air pollution, Soil chemical properties, Waste disposal, *Path of pollutants, *Pipes.
Identifiers: Gas disposal.

The advancement of sorption fronts resulting from the injection of reactive gases into soils through

buried porous pipes was analyzed mathematically and verified experimentally. The sorption front advances in ellipsoidal patterns with faster rates above the pipes in a homogeneous profile. The useful volume of soil is larger for corrugated surfaces than for plane surfaces. The corrugated surface is formed with the highest elevation directly over an injection pipe and the lowest point midway between pipes. When a shallow sorptive layer overlies a nonreactive material, the shape of the front is not circular but extends towards the midpoint between parallel pipes where the most water would infiltrate. The sorption fronts determined experimentally by injecting a dry air and nitrogen dioxide mixture into a small soil tank agreed well with the predicted positions based on an instantaneous reaction. (See also W74-04479 and W74-04480) (Knapp-USGS)
W74-07422

RELATIVE MOVEMENT OF BROMIDE AND NITRATE THROUGH SOILS,
Agricultural Research Service, Durant, Okla. Water Quality Management Lab.
S. J. Smith, and R. J. Davis.
Journal of Environmental Quality, Vol 3, No 2, p 152-155, April-June 1974. 3 fig, 4 tab, 14 ref.

Descriptors: *Leaching, *Path of pollutants, *Nitrates, *Bromides, Biodegradation, Nutrients, Anion exchange, Soils.

Miscible displacement experiments were conducted with eight different surface soils (0-15 cm depth) and their associated subsoils (61-76 cm depth). Results indicate that the movement of bromide relative to that of nitrate is identical in subsoils but variable in surface soils. Differences in relative movement of the two anions may be attributed to microbial activity involving nitrate. With the exception of 5% anion sorption in a Greenville subsoil, anion exclusion values ranged from 5% to 39%, indicating the anions were moving 1.05 to 1.64 times as fast as they would if they had been uniformly associated with all the soil water. The results support the view that bromide has utility for following the potential path of nitrate movement through soils. (Knapp-USGS)
W74-07423

VOLATILITY OF DDT RESIDUES IN SOIL AS AFFECTED BY FLOODING AND ORGANIC MATTER APPLICATIONS,
Agricultural Research Service, Riverside, Calif. Soil and Water Conservation Research Div.
W. F. Spencer, M. M. Cliath, W. J. Farmer, and R. A. Shepherd.
Journal of Environmental Quality, Vol 3, No 2, p 126-129, April-June 1974. 4 tab, 22 ref.

Descriptors: *DDT, *Degradation(Decomposition), *Flooding, *Organic matter, *Pesticide removal, Pesticide residues, Soil chemistry, DDE, DDD, Water pollution control, *California.
Identifiers: Coachella Valley(Calif).

Flooding with and without organic matter additions was evaluated as a means of preferentially degrading residual DDT and thereby changing the ratio of the various isomers and metabolites volatilizing from the soil surface. Flooding for a 7-week period, either with or without manure or alfalfa meal applications, effectively degraded DDT isomers, primarily to the respective DDD isomers, but had little effect on DDE isomers. Both flooding and organic matter decreased the volatility even when soil concentrations were not affected, apparently because of increased adsorption of the compounds by added organic matter or by organic matter in the soil altered by flooding. Minor changes in vapor concentration ratios were accomplished by flooding and organic matter additions, but regardless of treatment, the major constituent evaporating from the surface was DDE. To accomplish significant changes in volatilization patterns, it will be necessary to use such management practices before a major part of the DDT has been degraded to DDE. However, flooding and organic matter treatments will ultimately decrease the total quantity of DDE volatilizing from residual DDT in soils over long time periods because of their effectiveness in degrading DDT to DDD instead of DDE. (Knapp-USGS)
W74-07424

METHYLMERCURY FORMATION IN MERCURY-TREATED RIVER SEDIMENTS DURING IN SITU EQUILIBRATION,
Wisconsin Univ., Madison. Dept. of Soil Science.
L. W. Jacobs, and D. R. Keeney.
Journal of Environmental Quality, Vol 3, No 2, p 121-126, April-June 1974. 2 fig, 4 tab, 26 ref.

Descriptors: *Mercury, *Bottom sediments, Rivers, *Wisconsin, Heavy metals, Poisons, Path of pollutants, Translocation, Bed load, Sediment transport.
Identifiers: *Methyl mercury, Wisconsin River, Fox River(Wis).

Methylmercury (MeHg) production in and Hg loss from sediments treated with mercuric chloride (HgC12) or phenylmercuric acetate (PhHgAc) were studied in two environmentally different river sites (one each on the Wisconsin and Fox rivers). Bulk sediment was collected from each river site, treated with approximately 1, 10, or 100 ppm Hg (oven-dry basis) as HgC12 or PhHgAc, and returned to the river site with untreated controls for 2, 4, or 12 weeks of equilibration with the aquatic environment. After retrieval, the sediments were analyzed for total Hg. Hg losses from stationary sediments were minimal and sediment transport is probably the major source of Hg movement in a river system. In both sediments, more MeHg was produced from PhHgAc than from a similar concentration of HgC12, and MeHg concentration increased as the Hg treatment with either compound was increased. The MeHg concentration increased as the Hg treatment with either compound was increased. The MeHg concentrations found in the Wisconsin River sediments were substantially higher than in the Fox River sediments with a similar Hg treatment. The large differences in MeHg production between these two sediments may be partially attributed to their chemical dissimilarities. The Wisconsin River sediment is acidic and contains more organic materials compared to the Fox River sediment which is more alkaline and contains larger amounts of sulfide sulfur. (Knapp-USGS)
W74-07425

LOSSES OF INORGANIC NITROGEN FROM AQUATIC SYSTEMS,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agronomy.
D. R. Bouldin, R. L. Johnson, C. Burda, and C--W. Kao.
Journal of Environmental Quality, Vol 3, No 2, p 107-113, April-June 1974. 1 fig, 11 tab, 15 ref.

Descriptors: *Nitrogen, *Ponds, *Denitrification, *Ammonia, Sediments, Evaporation, Nitrates, Nitrogen cycle, *New York, Nitrogen compounds.

Loss of NH4 and NO3 from solution was followed over a 2-month period in 6 ponds with the objective of investigating the mechanisms and magnitude of losses of inorganic nitrogen. Biological immobilization of nitrogen was small in relation to the total amount added. Losses of NH4 ranged from 2% to 38% per day. A model based on concentration of ammonium N and water pH was consistent with the experimental data, and the results were in agreement with the hypothesis that the major avenue of NH4 loss was by NH3 volatilization across the air-water interface. Nitrate losses ranged from 7% to 15% per day. The results were consistent with the hypothesis that nitrate loss was primarily by denitrification in the bottom sediments. Models for loss of both ions were derived. The models are based on general chemical and physical parameters which are not peculiar to the ponds studied (that is, depth of water, water pH, and a reduced zone of sediments underlying a thin oxidized layer of sediment). The results suggest that volatilization and denitrification are mechanisms which may account for appreciable losses of N from many bodies of water. (Knapp-USGS)
W74-07426

PREDICTING PESTICIDE RUNOFF FROM AGRICULTURAL LAND: A CONCEPTUAL MODEL,
Environmental Protection Agency, Athens, Ga. Agro-Environmental Systems Branch.
G. W. Bailey, R. R. Swank Jr., and H. P. Nicholson.
Journal of Environmental Quality, Vol 3, No 2, p 95-102, April-June 1974. 4 fig, 47 ref.

Descriptors: *Path of pollutants, *Pesticides, *Runoff, *Mathematical models, Model studies, Rainfall-runoff relationships, Translocation, Erosion, Pesticide kinetics.
Identifiers: Pesticide runoff.

A mathematical model of the dynamic, single-rainfall-event type describes pesticide runoff as a function of pesticide and soil properties, agricultural practices, watershed characteristics, and climatic factors. The conceptual structure of the model includes source term effects, loss of pesticide from the soil surface during runoff producing rainfall events because of mass transfer from soil surface into the moving runoff film and pickup of sediment containing pesticide particulates. (Knapp-USGS)
W74-07427

MINERAL SPRINGS IN THE SUEZ RIFT VALLEY - COMPARISON WITH WATERS IN THE JORDAN RIFT VALLEY AND POSTULATION OF A MARINE ORIGIN,
Israel Atomic Energy Commission, Yavne. Soreq. Nuclear Research Center.
For primary bibliographic entry see Field 2K.
W74-07444

DISPERSION OF CONTAMINATED SEDIMENT BED LOAD,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. W. Shen, and H. F. Cheong.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY11, p 1947-1965, November, 1973. 15 fig, 2 tab, 6 ref.

Descriptors: *Bed load, *Dispersion, *Erosion, *Sedimentation, Hydraulics, Water pollution sources, Radioactivity, Sediment transport, *Path of pollutants.

Dispersion of instantaneously released contaminated bed sediments is analyzed within the framework of a Lagrangian probabilistic model. The time and space concentration distributions, with the parameters computed on the basis of the same rate of mass movement and a constant rate of spread, approach Gaussian form asymptotically. A procedure is suggested for deriving approximations to the envelopes of the distribution curves parameterized by either the time or distance. The method is also applicable when the shape factor of the particle step length distribution takes on nonintegral values greater than one. Where the normality approximation is satisfactory, the critical duration for a given degree of pollution varies in direct proportion to the square root of the distance from the source. Graphical results for the critical time limits for the absorption of radiation from contaminated particles for different positions of the subject are also presented. (Skogerboe-Colorado State)
W74-07446

EACHING LOSSES OF SULFUR DURING INTER MONTHS WHEN APPLIED AS GYPUM, ELEMENTAL S OR PRILLED S,
orth Carolina Agricultural Experiment Station, aleigh.
D. Rhue, and E. J. Kamprath.
gronomy Journal, Vol 65, No 4, p 603-605, July-ugust, 1973. 4 fig, 2 tab, 12 ref.

escriptors: *Sulfates, *Sulfur, Sulfur compunds, *Gypsum, Inorganic compounds, Leaching, Water pollution sources.

terest has developed in the use of elemental sulr as a means of maintaining an adequate supply sulfur where leaching is a problem. Studies ere conducted with gypsum, finely divided elental sulfur, and prilled sulfur on a Wagram amy sand and a Georgeville silty clay loam to termine the levels of sulfate sulfur resulting om additions of these sources. Sulfate contents the 0 to 15-, 15 to 30- and 30 to 45-cm depths ere determined at various times over aperiod of 0 days after the different sulfur sources were aped in October. Almost all of the sulfate, that ded sypsum and that resulting from the oxidan of elemental sulfur, had been leached from e top 45 cm of the Wagram soil 180 days after apcation. There was essentially no movement of lfate, however, in the Georgeville soil. Very litoxidation of prilled sulfur appeared to be occurg in either soil. (Skogerboe-Colorado State)
74-07449

EXPLANATORY WORK ON THE OXIDAON OF AMMONIA BY POTASSIUM FERTE (VI),
io State Univ., Columbus. Dept. of Chemical gineering.
r primary bibliographic entry see Field 5D.
74-07454

STABILITY OF WATER COOLED FROM OVE,
rdue Univ., Lafayette, Ind. School of Mechani Engineering.
r primary bibliographic entry see Field 2H.
74-07458

MMONIUM AND NITRATE UPTAKE BY RN (ZEA MAYS L.) AS INFLUENCED BY TROGEN CONCENTRATION AND 4(+)/NO3(-) RATIO,
chigan State Univ., Lansing.
r primary bibliographic entry see Field 3F.
74-07459

ORE HEAT THAN LIGHT: THERMAL POLTION VERSUS HEAT ENERGY UTILIZAON,
essard L. Holland Law Center, Gainesville, Fla.
E. Maloney.
iversity of Florida Law Review, Vol 25, p 693-, 1973. 207 ref. OWRR A-999-FLA(6).

scriptors: *Thermal power, *Thermal pollution, ater pollution, *Water pollution sources, ollutant identification, Thermal capacity, Water llution control, Pollution abatement, Legal ects, Heated water, Nuclear powerplants, ater temperature, Rivers and Harbors Act.
ntifiers: Federal Water Pollution Control Act.

at discharges from electric generating plants, th fossil-fueled and nuclear, have become own as thermal pollution because of their tenncy to adversely affect aquatic ecology. Courts plying common law doctrines have universally emed such discharges to be pollution. A subntial number of state pollution statutes include at in the definition of pollution, and the Federal ater Pollution Control Act amendments will quire each state to establish thermal pollution ndards. A recent case defined refuse as including thermal discharges, thereby allowing enforcement against such discharges under the Rivers and Harbors Act. Control in the future over thermal discharges will be accomplished through licensing requirements at both the state and federal level. In addition, comprehensive power plant siting legislation can force pre-selection planning to avert or minimize harm from waste heat discharges. Another method of preventing thermal heat from becoming thermal pollution is to incorporate beneficial uses of the discharge into the powerplant's operation. The potential beneficial use of thermal discharges is limited only by technological imagination. Florida's Aquaculture Law is an example of a legal framework for encouraging this type of development, providing authority to lease submerged lands for aquaculture purposes. (Ritchie-Florida)
W74-07465

SOME ASPECTS OF THE TEMPERATURE, OXYGEN AND NUTRIENT DISTRIBUTIONS IN MONTEREY BAY, CALIFORNIA. ANNUAL REPORT, PART 1, 1973,
Moss Landing Marine Labs., Calif.
For primary bibliographic entry see Field 5C.
W74-07469

NUTRITIVE IMPORTANCE AND STRUCTURE OF DETRITUS,
For primary bibliographic entry see Field 5C.
W74-07471

AN INVESTIGATION OF THE PHYSICAL IMPACT OF SEWAGE OUTFLOW ON A RIVER-ESTUARINE ENVIRONMENT,
Naval Academy, Annapolis, Md.
For primary bibliographic entry see Field 5C.
W74-07477

A STUDY OF THE MOVEMENT OF PHOSPHOROUS IN THE LITTLE RIVER ESTUARY, N.S.W.,
Australian Atomic Energy Commission Research Establishment, Lucas Heights.
M. S. Giles.
Report AAEC/TM-616, October 1972. 22 p, 7 fig, 2 tab, 16 ref.

Descriptors: *Absorption, *Radioisotopes, *Phosphorus, *Estuaries, Phytoplankton, Chlorophyll, Zooplankton, Dissolved oxygen, Nuclear wastes, Movement, Tritium, Tracers, Food chains, Metabolism, Photosynthesis, *Australia.
Identifiers: Little River(N.S.W.), Phosphorus-32.

Knowledge of the physical and biological modes of dispersion of radioactivity and of how released radioactivity can progress through food chains, sometimes with a concentration factor, is necessary in order to determine the rates at which the various steps in this cycle occur so that dispersion or concentration may be predicted. The estuary of the Little River, N.S.W. was mapped and measurements made of phytoplankton productivity, phosphorus content, chlorophyll-a content, zooplankton biomass, salinity, temperature, and oxygen content. Phosphorus-32 and hydrogen 3 were injected into the estuary and the rate of phosphorus-32 movement into the phytoplankton and zooplankton calculated. Soluble P-32 in the estuary moved rapidly into the phytoplankton with a turnover time of about two hours. Phosphorus-32 incorporated into the phytoplankton was found to be dispersed and diluted in the same way as tritiated water released at the same time. Movement of P-32 into the zooplankton was much slower. During a tidal phase of the estuary, P-32 taken up by the phytoplankton (comprising at least 90% of the total isotope released) was flushed from the system. During the same phase P-32 in the zooplankton was retained in the estuary. (Jones-Wisconsin)
W74-07483

PROCEEDINGS 2ND ANNUAL TECHNICAL CONFERENCE ON ESTUARIES OF THE PACIFIC NORTHWEST.
For primary bibliographic entry see Field 2L.
W74-07491

A STRATEGY FOR MODELING PRIMARY PRODUCTION IN STRATIFIED FJORDS,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W74-07494

PHYSICAL MODELING OF RESIDENCE TIMES IN TIDAL BASINS,
Alaska Univ., College. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 2L.
W74-07496

SUPPLY OF TERRIGENOUS MATERIAL TO THE BALTIC SEA (PITANIYE BALTIYSKOGO MORYA TERRIGENNYM MATERIALOM),
Akademiya Nauk SSSR, Kaliningrad. Institut Okeanologii.
For primary bibliographic entry see Field 2J.
W74-07501

BROMINE IN GROUNDWATER OF UZBEKISTAN (BROM V PODZEMNYKH VODAKH UZBEKISTANA),
Institute of Hydrogeology and Engineering Geology, Tashkent (USSR).
For primary bibliographic entry see Field 2K.
W74-07505

GROUND-WATER FLOW PATTERNS IN CONFINED AQUIFERS AND POLLUTION,
Iowa State Water Resources Research Inst., Ames.
D. Kirkham, and R. R. Van der Ploeg.
Journal of the American Water Works Association, Vol 66, No 3, p 192-197, March 1974. 9 fig, 13 ref. OWRR B-019-IA(6).

Descriptors: *Flow nets, *Artesian aquifers, *Groundwater movement, *Path of pollutants, Aquifers, Aquifer characteristics, Hydrogeology, Steady flow.
Identifiers: Confined aquifers.

A flow net may be made for an arbitrarily shaped, confined aquifer from which water is drawn by means of a well. A knowledge of the shape of the aquifer and the hydraulic head on the boundaries of the aquifer, which are not impervious, is required. Flow nets for a number of elliptical-shaped confined aquifers, by which naturally occurring aquifers may be approximated, are presented. At points in the aquifer where the velocities are low (streamlines far apart), a source of pollution will not be as dangerous as an equal source placed at a location in the pumped aquifer where the velocities are high (streamlines close together). The theory is valid for any shape of aquifer and any diameter of well for any location of the well in the aquifer. The steady-state results indicate approximately what happens under non-steady-state conditions. (Knapp-USGS)
W74-07510

WINTER-REGIME THERMAL RESPONSE OF HEATED STREAMS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
P. P. Paily, E. O. Macagno, and J. F. Kennedy.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY4, Paper 10479, p 531-551, April 1974. 9 fig, 1 tab, 13 ref, 3 append. OWRR B-018-IA(2), NSF Grant GK-35910X.

Descriptors: *Thermal pollution, *Ice cover, *Rivers, *Melting, Thermal powerplants, Mixing, Water temperature, Heated water, Path of pollutants, Dispersion.
Identifiers: Ice prevention, Ice control.

The increase in water temperature in natural streams due to waste heat disposal from thermal powerplants leads to extensive ice-free reaches during winter periods. The surface heat exchange between water and the atmosphere can be expressed, for most practical purposes, as a linear function of the water temperature. Using this approximation, a closed-form solution of the one-dimensional unsteady convection-diffusion equation was developed to predict temperature distributions in streams and the lengths of ice-free reaches downstream from the thermal discharge sections. (Knapp-USGS)
W74-07511

SALT DISPLACEMENT INTO DRAIN TILES UNDER PONDED LEACHING,
Arizona Univ., Tucson. Dept. of Soils, Water, and Engineering.
For primary bibliographic entry see Field 2G.
W74-07518

AN EXPERIMENTAL STUDY OF IMMISCIBLE DISPLACEMENT WITH AN UNFAVORABLE MOBILITY RATIO IN POROUS MEDIA,
Purdue Univ., Lafayette, Ind. School of Chemical Engineering.
For primary bibliographic entry see Field 2F.
W74-07524

QUALITY OF WATER DISCHARGED FROM TWO AGRICULTURAL WATERSHEDS IN SOUTHWESTERN IOWA,
Agricultural Research Service, Council Bluffs, Iowa. North Central Watershed Research Center.
R. E. Burwell, G. E. Schuman, R. F. Piest, R. G. Spomer, and T. M. McCalla.
Water Resources Research, Vol 10, No 2, p 359-365, April 1974. 5 tab, 15 ref.

Descriptors: *Water quality, *Sediment yield, *Soil conservation, Land management, *Iowa, Pesticides, Contour farming, Terracing, Farm management.

To evaluate the influence of the level-terrace conservation practice on water, sediment, and plant nutrients discharged in surface runoff and base flow, data obtained from this watershed were compared with data obtained from a 33.6-ha contour-planted corn-cropped watershed near Treynor, Iowa. The quality of water discharged from the 157.5-ha diversified conservation-farmed watershed in southwestern Iowa was within acceptable limits for potable water except for the levels of ammonia, inorganic phosphorus, and coliform. Total coliform levels exceeded the established criteria on two occasions, and fecal coliform once during the 2-year study. Nutrient concentration was high occasionally, but the nutrient quantities discharged from the watershed were low, showing the effectiveness of the level-terrace system in controlling surface runoff and erosion. Atrazine residue in the runoff and sediment was detected in only one sample. Even though several chlorinated hydrocarbon and organophosphate compounds had been applied to the watershed, none was detected in runoff or sediment. A comparison of the data from the 33.6-ha contour-farmed watershed with the data from the 157.5-ha well-planned conservation watershed showed the benefits and necessity of controlling runoff and erosion to prevent loss of agricultural chemicals. (Knapp-USGS)
W74-07528

DISTRIBUTION AND CHEMISTRY OF PHOSPHORUS IN AN ALBAQUALF SOIL AFTER 82 YEARS OF PHOSPHATE FERTILIZATION,
Missouri Agricultural Experiment Station, Columbia.
C. W. Kao, and R. W. Blanchar.
Journal of Environmental Quality Vol 2, No 2, p 237-240, April-June 1973. 2 fig, 3 tab, 25 ref. OWRR A-031-MO(3) 14-31-0001-3225.

Descriptors: *Phosphates, Phosphorus, *Phosphorus compounds, Groundwater, Water pollution sources, *Distribution, *Path of pollutants, Soils, Loan.
Identifiers: *Albaqualf soils).

The distribution of P in a fertilized and unfertilized Mexico silt loam soil was measured. After 82 years of P fertilization, the added P was found in Ap (0-23 cm), smaller amounts in the A and B, and B2 (23-86 cm), and large amounts in the B3 and upper C (86-137 cm) horizons. In the fertilized soil the distribution of P, particularly inorganic and available, was similar to that of original P in the soil profile. The P adsorption capacities of fertilized and unfertilized soils were similar. These data indicated that the soil fertilized with P for 82 years had nearly double the total P content, but the ability of the soil to adsorb additional P was the same. Ion products indicated that the P level in the soil solution was controlled by the solubility of strengite.
W74-07532

POPULATION DYNAMICS OF PROTOZOA ASSOCIATED WITH THE DECAY OF ORGANIC MATERIALS IN FRESH WATER,
Bonn Univ. (West Germany). Institut fuer Landwirtschaftliche Zoologie und Bienenkunde.
For primary bibliographic entry see Field 5C.
W74-07541

REACTIONS OF CHLORAMINES WITH ACTIVE CARBON,
Greeley and Hansen, Chicago, Ill.
R. C. Bauer, and V. L. Snoeyink.
Journal Water Pollution Control Federation, Vol 45, No 11, p 2290-2301, November 1973. 8 fig, 12 ref.

Descriptors: *Chemical reactions, *Activated carbon, *Nutrient removal, Ammonia, Nitrogen compounds, Chlorination, Chlorine, Hydrogen ion concentration.
Identifiers: *Chloramines, Monochloramine, Dichloramine, Chlorine residual, Trichloramine.

The purpose of this study was to determine the nature of the NH2Cl-active carbon and NHC12-active carbon reactions. These reactions are of importance if carbon is to be used to eliminate combined residual chloride from an effluent and if it is to aid in the oxidation of NH3-N to N2. The tests were performed in small-scale batch systems with pH control being used to maintain either NH2Cl or NHC12 as the predominant species in the C1-NH3 solution. NHC12-N is readily oxidized by carbon to N2. NH2C1-N is reconverted to ammonia by fresh carbon; however, carbon that has an accumulation of surface oxides, which develop through reaction of free and combined chlorine with carbon, will partially oxidize NH2C1-N to N2. (Mortland-Battelle)
W74-07544

HYDROGEN SULFIDE PRODUCTION BY SYNECHOCOCCUS LIVIDUS Y52-SI,
Montana Univ., Missoula. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W74-07546

EFFECT OF LIGHT INTENSITY AND GLYCEROL ON THE GROWTH, PIGMENT COMPOSITION, AND ULTRASTRUCTURE CHROOMONAS SP.,
Smithsonian Institution, Rockville, Md Radiat Biology Lab
For primary bibliographic entry see Field 5C
W74-07548

A CONTINUOUS CULTURE STUDY PHOSPHATE UPTAKE, GROWTH RATE A POLYPHOSPHATE IN SCENEDESMUS SP.,
New York State Dept. of Health, Albany Div Labs. and Research
For primary bibliographic entry see Field 5C
W74-07549

THE CHEMICAL FORM AND BODILY D TRIBUTION OF MERCURY IN MARINE FISH
Tohoku Univ., Sendai(Japan). Dept of Pub Health.
For primary bibliographic entry see Field 5A.
W74-07551

THE PHOTOCHEMISTRY OF CARBAMATE 1. THE PHOTODECOMPOSITION OF ZE TRAN: 4-DIMETHYLAMINO-3,5-XYLYL METHYL CARBAMATE,
New Brunswick Univ., Fredericton. Dept. Chemistry.
P. J. Silk, and I. Unger.
International Journal of Environmental Analyti Chemistry, Vol 2 No 3, p 213-220, February 19 1 tab, 11 ref.

Descriptors: *Carbamate pesticides, *Pollut identification, Methodology, Laboratory tes Degradation(Decomposition), Insecticides. radiation, Mass spectrometry, Nuclear magne resonance.
Identifiers: *Zectran, *Photodecompositio *Photoproducts, *Fate of pollutan Photochemistry, Infrared spectra, NMR spect Mass spectra, Degradation products, Thin lay chromatography, 4-Dimethylamino-3 5-dimeth phenol, 4-Hydroxy-2 6-dimethyl-N-methyl benz mide, 4-Monomethylamino-3 5-xylyl-N-meth carbamate, Infrared spectrophotometry, Samp preparation.

The photodecomposition of 4-dimethylamino-3, xylyl-N-methyl carbamate (Zectran) in aerat and degassed solution has been carried out. Thr major photoproducts were detected and chara terized to be: 4-dimethylamino-3,5-dimeth phenol, 4-hydroxy-2,6-dimethyl-N-methyl benz mide and 4-monomethylamino-3,5-xylyl-N-meth carbamate. The phenol and benzamide produc suggest that one of the pathways of photodecor position of Zectran is via a photo-Fries rearrang ment. The ortho-benzamide (5-dimehylamino-4, dimethyl-2-hydroxy-N-methyl benzamide) whi could also be expected to occur in a photo-Fri reaction, was not observed. The excitatio wavelength was greater than 296.7 nm, i.e. radi tion available in the solar spectrum. Thus t products observed in this study may be expecte to occur in the environment as a result of the a tion of sunlight on Zectran. (Holoman-Battelle)
W74-07552

DETERMINATION OF OIL CONCENTRATIO AND SIZE DISTRIBUTION IN SHIP BALLAS WATERS. METHOD AND REPRESENTATIV RESULTS,
Hydronautics Inc., Laurel, Md.
F. E. Witmer, and A. Gollan.
Environmental Science and Technology, Vol No 10, p 945-948, October 1973. 8 fig, 6 ref.

Descriptors: *Oily water, *Separation technique Dispersion, Surfactants, Stabilization, Emulsions Analytical techniques, Turbidity, Oil, Distribu tion, Photography, Microscopy.
Identifiers: *Light transmittance, *Microscopi photography, Ballast water, Droplet size, Crud oil, Bunker C oil.

aightforward techniques to determine the state dispersion - i.e., quantity and droplet size distution - for oily ballast waters are outlined. Oil ncentrations were determined by using light nsmittance through an ultrasonically emulsed, surfactant-stabilized sample, while oil plet size distributions were directly measured ng a microscopic photography cell. When these hniques were applied to actual deballasting erations, it was confirmed that oily ballast rifiers for crude oil tankage must be able to han- oil fines that are as small as microns in diame- along with very high levels of oil contamination ich may exceed 10 percent on occasion. The centration of crude and Bunker 'C' oil (10-5000 n) in distilled water samples was reproducibly asured on a turbidity meter. The instrument sisted of a light source, sample holder cell, an asonic emulsifier, and a photocell. Transmitted t was used to make the measurement. Since put was sensitive to the oil type, calibration ves have been obtained with standards duced from Kuwait, and Venezuela crudes and nker 'C'. The droplet size distribution apatus consists of a small transparent flow cell in. wide by 3/8 in. mounted on a microscope form. Photographs are taken of the sample am while it flows through the cell. The optical tem consists of a direct light source nsmitted through the sample cell), microscope rel and reflex camera. The microscope and light rce have been mounted to a shock-insulated form to facilitate field use. (Mortland-Battelle)
4-07564

ETYLENE REDUCTION BY BEIJERINCKIA DER VARIOUS PARTIAL PRESSURES OF YGEN AND ACETYLENE,
dan Univ. (Nigeria). Dept. of Agronomy.
primary bibliographic entry see Field 5C.
4-07572

VITRO FORMATION OF NITRATE REDUCSE USING EXTRACTS OF THE NITRATE DUCTASE MUTANT OF NEUROSPORA ASSA, NIT-1, AND RHODOSPIRILLUM BRUM,
kland Univ., Rochester, Mich. Dept. of Biologi- Sciences.
A. Ketchum, and C. L. Sevilla.
rnal of Bacteriology, Vol 116, No 2, p 600-609, vember 1973. 6 fig, 3 tab, 25 ref.

scriptors: *Laboratory tests, Biochemistry, ay, Nitrates, Molybdenum, Hydrogen ion contration, Fungi, Bacteria.
ntifiers: *Nitrate reductase, *Biosynthesis, ell extracts, *In vitro synthesis, Neurospora ssa, Rhodospirillum rubrum, Subcellular coments, Enzyme activity, NADPH-nitrate reduce, FADH2-nitrate reductase, MVH-nitrate uctase, Mutants, Sample preparation, Bacterial siology.

vitro formation of reduced nicotinamide nine dinucleotide phosphate (NADPH)-nitrate uctase (NADPH: nitrate oxido-reductase, EC 6.2) has been attained by using extracts of the ate reductase mutant of Neurospora crassa, 1, and extracts of either photosynthetically or erotrophically grown Rhodospirillum rubrum, ich contribute the constitutive component. The vitro formation of NADPH-nitrate reductase is racterized by conversion of the flavin adenine ucleotide (FAD) stimulated NADPHochrome c reductase, contributed by the N. ssa nit-1 extract from a slower sedimenting m (4.5S) to a faster sedimenting form (7.8S). e 7.8S NADPH-cytochrome c reductase peak ncides in sucrose density gradient profiles with NADPH-nitrate reductase, FADH2-nitrate uctase and reduced methyl viologen (MVH)ate reductase activities which are also formed vitro. The constitutive component from R. rum is soluble (both in heterotrophically and otosynthetically grown cells), is stimulated by the addition of 0.0001 M Na2MoO4 and 0.01 M NaNO3 to cell-free preparations, and has variable activity over the pH range from 3.0 to 9.5. The activity of the constitutive component in some extracts showed a threefold stimulation when the pH was lowered from 6.5 to 4.0. The constitutive activity appears to be associated with a large molecular weight component which sediments as a single peak in sucrose density gradients. However, the constitutive component from R. rubrum is dialyzable and is insensitive to trypsin and protease. These results demonstrate that R. rubrum contains the constitutive component and suggests that it is a low molecular weight, trypsin- and protease-insensitive factor which participates in the in vitro formation of NADPH nitrate reductase. (Holoman-Battelle)
W74-07577

RESIDUES OF ATRAZINE, CYANAZINE, AND THEIR PHYTOTOXIC METABOLITES IN A CLAY LOAM SOIL,
Ontario Ministry of Agriculture and Food, Guelph. Pesticides Residue Lab.
For primary bibliographic entry see Field 5A.
W74-07585

PHARMACODYNAMICS OF METHYL MERCURY IN THE RAINBOW TROUT (SALMO GAIRDNERI): TISSUE UPTAKE, DISTRIBUTION AND EXCRETION,
State Univ. of New York, Buffalo. Dept. of Biochemistry.
For primary bibliographic entry see Field 5C.
W74-07597

5C. Effects Of Pollution

DISTRIBUTION AND STANDING CROPS OF CHIRONOMID-LARVAE IN SHIOZU BAY OF LAKE BIWA (IN JAPANESE),
M. Hiro, and M. Sato.
Jap J Limnol, Vol 33, No 2, p 21-28, 1972, Illus, English summary.
Identifiers: Bays, *Chironomid larvae, Chironomus-plumosus, Distribution, *Japan(Lake Biwa), Phaenopsectra, *Standing crops.

The distribution pattern and the standing crops of chironomid-larvae were investigated at Shiozu Bay of Lake Biwa (Japan). The bottom was sampled 4 times through the year; April, Aug., Oct., 1968 and Jan., 1969. Phaenopsectra sp. B, Phaenopsectra sp. C, Procladius sp. B and so on were dominant species next to Chironomus plumosus. Most species lived in the mud, some of them in gravel, and are distributed on bottoms shallower than 30 m. None were found on the sand bottom. Phaenopsectra sp. B is very widely distributed from the lake-side to a depth of about 60 m. The number of investigations for sampling by a bottom sampler are 2.3-3.8 times for C. plumosus and 46.2-66.3 times for Phaenopsectra sp. C, in 50% confidence limits, respectively. C. plumosus was dissected for the examination of food habit. In the 5 examples, some algae were recognized in the alimentary canal.--Copyright 1973, Biological Abstracts, Inc.
W74-07101

FACTORS AFFECTING PHYTOPLANKTON PRODUCTION IN A EUTROPHIC RESERVOIR,
Naval Academy, Annapolis, Md. Div. of Mathematics and Science.
B. L. Kimmel.
Arch Hydrobiol Vol 71, No 1, p 124-141. 1972.
Identifiers: *Eutrophication, *Nutrients, Phosphates, *Phytoplankton, Reservoirs, *Productivity.

Phytoplankton production averaged 857 mg C m-2 day-1 and 390 mg C m-3 day -1. Variation in phytoplankton productivity and environmental factors affecting productivity occurred among the reservoir areas sampled. Nutrient limitation was minor near points of tributary inflow, but production was limited by phosphate availability in the reservoir's main body.--Copyright 1973, Biological Abstracts, Inc.
W74-07121

LAUNDRY DETERGENTS AND ENVIRONMENTAL QUALITY,
Indiana Univ., Bloomington. Poplars Research and Conference Center.
R. S. Howe, J. G. Morris, and H. W. Poston.
Occasional Papers No 2, May 1973. 25 p, 8 fig, 9 tab, 15 ref.

Descriptors: *Detergents, *Phosphates, *Sewage treatment, *Laundering, Formulation, Safety, Effluents, Illinois, Standards, Legislation, Prices, Capital costs, Operating costs, Judicial decisions.
Identifiers: *Chicago(Ill), Nonphosphate detergents, Cleaning ability, Phosphorus removal costs.

The laundering effectiveness, public hazards, and costs between a public policy requiring a laundry product reformulation and treatment measures to reduce phosphates discharged into the environment are compared. Detergents having different phosphate levels are evaluated with respect to safety, cleaning ability, and effect on phosphate effluent level. Reports, including those of the Chicago Board of Health and the Food and Drug Administration, indicate that no additional health hazards are created by use of non-phosphate detergents. Similarly, comparison of alternative detergent formulations reveal comparable soil removal abilities. Chicago consumers' response to the nonphosphate detergents provides another indicator of acceptable performance. Surveys in other jurisdictions having legislated against detergents having high phosphate levels indicate favorable responses. Examination of effluent data in these areas also indicates improvements in water quality. In Erie County, New York, for example, a reduction of phosphate contents to zero percent between 1970 and 1972 has resulted in total phosphate and biochemical oxygen demand reductions of 44 and 48% respectively. Evaluation of consumer price fluctuations indicates no significant relationship with policy change. Overall, product reformulation appears to have lower direct cost in compliance with effluent standards requiring phosphorus concentrations of less than 1.0 mg/l. (Schroeder-Wisconsin)
W74-07122

BIOCHEMISTRY OF SELECTIVE TOXICITY AND BIODEGRADABILITY: COMPARATIVE O-DEALKYLATION BY AQUATIC ORGANISMS,
Illinois Univ., Urbana. Dept. of Entomology.
L. G. Hansen, I. P. Kapoor, and R. L. Metcalf.
Comp Gen Pharmacol Vol 3, No 11, p 339-344. 1972.
Identifiers: Aquatic animals, Biochemistry, DDT, *Dealkylation, Degradability, *Gambusia-Affinis, Larvae, Minnow, Mosquito, Snails, *Toxicity, *Biodegradation.

Female Gambusia affinis have a greater capacity for O-dealkylation of p-nitrophenyl ethers and DDT analogues and the formation of acid-labile conjugates than do mosquito larvae, fat-head minnows, or 2 species of pulmonate snails. The p-nitrophenyl ethers are O-de-ethylated most readily by all species, while the DDT analogues are O-demethylated most readily. Fish absorb the greatest amount of insecticide in a 24 hr period; the excretion rate is highest in Gambusia and lowest in the minnow. The toxicity of DDT analogues correlates with metabolism data, except in snails, which are naturally tolerant to chlorinated hydrocarbons.--Copyright 1973, Biological Abstracts, Inc.
W74-07126

THE PREDICTED INFLUENCE OF KRAFT MILL EFFLUENT ON THE FISHERY RESOURCES,
Oregon State Univ., Corvallis. Sea Grant Marine Advisory Program.
H. F. Horton, and L. P. Parrish.
In: Multi-disciplinary Study of Water Quality Relationships. A Case Study of Yaquina Bay, Oregon, Oregon Agricultural Experiment Station, Special Report 348, February 1972. p 33-64, 3 fig, 11 tab. WP-00107.

Descriptors: *Estuarine fisheries, *Water pollution effects, *Economic impact, Sport fishing, Recreation, Pulp wastes, Lethal limit.
Identifiers: *Yaquina Bay(Ore.).

Biological losses to recreational fishing caused by kraft mill effluent (KME) were examined for Yaquina Bay, Oregon. An angler survey conducted to determine principal sports fishes and invertebrates and their distribution in the bay found white seaperch to be the most important of the total estimated catch, followed by starry flounder and pile seaperch. Bioassays were conducted to determine the 48 and 96-hour median tolerance limit value of KME for each species. The maximum allowable KME for each species tested, computed with an application factor of 1/10 of the 48-hr median TL was: white seaperch 1.7%, striped seaperch 1.7%, starry flounder 2.5%, English sole 1.9% and kelp greenling 3.1%. Using each of these test elements and an earlier prediction of KME concentration the impact of several alternative waste disposal methods and sites on the fishing resource was estimated. Additional data is necessary to better apply bioassay results to various water quality situations which should include better knowledge of the avoidance reaction of estuarine fish to various dilutions of KME. Tests must also be comducted on the impact of KME on the food chain and on the taste of fish. (See also W74-07142) (Schroeder- Wisconsin)
W74-07145

EFFECTS OF MAN-MADE WORKS ON THE HYDRAULIC, SALINITY, AND SHOALING REGIMENS OF ESTUARIES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Div.
H. B. Simmons, and F. A. Herrmann, Jr.
In: Environmental Framework of Coastal Plain Estuaries; 18th Annual Meeting of Southeastern Section of the Geological Society of America, April 10-11, 1969, Columbia, S C: Geological Society of America, Inc, Memoir 133, p 555-570, 1972. 15 ref.

Descriptors: *Estuaries, *Water circulation, *Sedimentation, *Water control, *Environmental effects, Dams, Dredging, River training, Flood control, Levees, Reservoir operation, *Salinity, Streamflow, *Southeast U.S.
Identifiers: Shoaling regimens.

Within the relatively recent past, many works of man have been constructed in estuaries and in their freshwater tributaries in the interest of improving navigating conditions, or regulating the river flow for hydroelectric power generation and flood control. In some cases such works have produced major and sometimes undesirable changes in the hydraulic, salinity, and shoaling characteristics of the estuaries involved. The undesirable effects have in some cases been so drastic that the overall effects may have been detrimental rather than beneficial. The works of man have influenced the hydraulic, salinity, and shoaling regimens in the passes of the Mississippi River, the lower Savannah River, and Charleston Harbor. The histories of these changes strongly recommend that any proposed changes should be thoroughly evaluated by all practicable means before their implementation to insure that the proposal will be beneficial to the system as a whole. (See also W74-07225) (Knapp-USGS)
W74-07249

EFFECT OF INCREASING DEPTH ON SALINITY IN THE JAMES RIVER ESTUARY,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 2L.
W74-07250

FUNCTION OF MARSHES IN REDUCING EUTROPHICATION OF ESTUARIES OF THE MIDDLE ATLANTIC REGION,
Virginia Inst. of Marine Science, Gloucester Point.
D. M. Axelrad, M. E. Bender, and K. A. Moore.
Available from the National Technical Information Service as PB-231 767 $4.00 in paper copy, $1.45 in microfiche. Completion Report, February 1974, 91p, 44 tab. OWRR B-027-VA (1).

Descriptors: *Nitrogen *Phosphorus, *Carbon, Detritus, Budgeting, *Salt marshes, Waterquality, *Eutrophication, *Virginia, Estuaries, Tidal effects, Path of pollutants.
Identifiers: Ware Creek(Va), Carter Creek(Va).

Annual nitrogen, phosphorus and carbon budgets for two Virginia salt marshes were determined by monthly measurements of water discharge and constituent concentrations over tidal cycles. Considering all three forms of phosphorus measured (total, dissolved organic and orthophosphate) there was a net loss from the estuary to the marshes. The data reveal a loss of particulate phosphorus of estuarine origin to marsh sediments and mineralization of this phosphorus in the marshes with subsequent export of dissolved inorganic and organic phosphorus back to the estuary. Nitrogen flux data show a loss of nitrate and nitrite to the marshes. Particulate nitrogen is imported to the marshes where it is mineralized and returned to the estuary as ammonia and dissolved organic nitrogen. The magnitude of nitrogen export suggests significant fixation of atmospheric nitrogen by marsh flora with subsequent export as dissolved species. Carbon flux data show significant contributions of both particulate and dissolved organic carbon to the estuary from the marshes. Estimates of export, based on marsh grass productivity, suggest a loss of 36 and 49% of a years primary production on the marshes as detritus for Ware and Carter Creeks respectively.
W74-07336

SYSTEMS SIMULATION OF THE EFFECT OF TERTIARY TREATMENT FOR CARBON, NITROGEN, AND PHOSPHORUS REMOVAL UPON PRIMARY PRODUCTIVITY, STANDING CROP, AND COMMUNITY STRUCTURE OF AUTOTROPHIC AND HETERTROPHIC COMMUNITIES IN RECEIVING MODEL STREAMS.
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
J. Cairns, Jr., K. L. Dickson, J. Smrchek, P. H. King, and C. W. Randall.
Available from the National Technical Information Service as PB-231 759 $4.25 in paper copy, $1.45 in microfiche. Completion Report, December 1973, 23 p, 2 fig, 13 tab. OWRR B-039-VA (1) 14-31-0001-3660.

Descriptors: *Standing crops, *Biological communities, *Primary productivity, *Nutrients removal, Periphyton, *Eutrophication, *Tertiary Treatment, Simulation analysis, Biomass, Chlorophyll, Nitrogen phosphorus, Carbon, Waste water treatment, Filtration, Coagulation, Activated carbon, Absorption, *Simulation analysis, Water pollution effects.
Identifiers: Systems Simulation, Laboratory models(Streams).

Accelerated eutrophication caused by man continues to be a major water pollution problem. A controllable laboratory system has been designed, composed of several model streams established under comparable environmental conditions. The streams were used in studying the effects, during six experiments, of various conventional tertiary nutrient removal schemes upon the standing crop biomass, phytopigments, primary productivity and community structure, of autotrophic periphyton communities. Ferric chloride coagulation-precipitation, breakpoint chlorination, and activated carbon absorption with dual media filtration was used for removal of phosphorus, nitrogen, and carbon respectively. All types of tertiary treatment methods studied resulted in varying increases in the above biological parameters. Single nutrient removal methods caused greater increases than double or triple nutrients removal methods. These results indicate that using accepted methods for nutrient removal may not prevent algal productivity resulting in more rapid eutrophication.
W74-07337

EXTRACELLULAR PRODUCTS OF ALGAE IN FRESHWATER,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
G. E. Fogg.
Ergeb Limnol. 5. p 1-25. 1971.
Identifiers: *Algae, Amino acids, Carbohydrates, Enzymes, Extracellular products, Glycolic acid, Growth, Light, Oligotrophic conditions, *Organic compounds, Peptides, Phosphates, Photosynthesis, Saccharides, Sexual, Toxins, Vitamins, *Reviews, *Carbon compounds.

A review of the available information suggests that the liberation from healthy algal cells of organic substances in soluble form is a general phenomenon. Especially under oligotrophic and light-inhibited conditions a substantial proportion of the C fixed in photosynthesis is liberated extracellularly as glycollic acid or polysaccharides and these probably form an important energy source for other aquatic organisms. Other substances excreted include carbohydrates, amino acids, peptides, organic phosphates, volatile substances, enzymes, vitamins and other growth promoting substances, sexual substances, inhibitors and toxins, many of which may exert important effects in natural ecosystems.--Copyright 1973, Biological Abstracts, Inc.
W74-07353

STUDY OF METABOLISM OF NICKEL ENTERING THE BODY WITH DRINKING WATER, (IN RUSSIAN),
Institute of General and Municipal Hygiene, Moscow (USSR).
N. P. Elakhovskaya.
Gig Sanit. Vol 37, No 6, p 20-22. 1972. (English summary).
Identifiers: Gastro intestinal elimination, *Metabolism, *Nickel, *Potable water, Rodents, Water pollution effects.

Elimination of Ni from the body takes place through the intestinal tract. Retention of the microelement in the organs of rats occurred after introduction of a maximal dose (5 mg/kg). Changes in the functional activity of the gastrointestinal tract did not occur in administration of Ni in a dose of 0.5 mg/kg.--Copyright 1973, Biological Abstracts, Inc.
W74-07361

EFFECT OF EFFLUENTS FROM HYDROLYSIS PLANT ON THE SURVIVAL OF TYPHOID FEVER AND DYSENTERY BACTERIA, (IN RUSSIAN),
Meditsinskii Institut, Irkutsk (USSR).
G. A. Borodina, and L. A. Mironova.
Gig Sanit. Vol 37, No 8, p 101-102. 1972.
Identifiers: *Bacteria(Dysentery), Bactericidal properties, Dysentery, Effluents, Fever, Furfural, *Hydrolysis plants, *Sewage, *Typhoid fever, *USSR(Tulunsk).

Sewage temperature from the Tulunsk plant was 28-40 degrees, pH was 5, biochemical oxygen requirement was 200 mg/1, oxidizing ability 1550

/1, and furfural content was 45 mg/1. crobiological tests showed that the bac- ıocidal propreties of sewage were not sufficient arding Sonne dysentery and typhoid fever bac- a.--Copyright 1973, Biological Abstracts, Inc.
4-07367

EDICTING THE QUALITY OF STREAM ATER UNDER CONDITIONS OF OXYGEN FICIENCY (O PROGNOZE KACHETVA DY VODOTOKOV PRI BOL'SHIKH DEFIT- 'AKH KISLORODA),
primary bibliographic entry see Field 5B.
4-07388

RINE FUNGI ISOLATED FROM A KRAFT LP MILL OUTFALL AREA,
ıon Fraser Univ., Burnaby (British Columbia). ɔt. of Biological Sciences.
primary bibliographic entry see Field 5B.
4-07396

PRELIMINARY DESCRIPTION OF THE YSICO-CHEMICAL CHARACTERISTICS D BIOTA OF THREE STRIP MINE LAKES, ENCER COUNTY, INDIANA,
nt Meinrad Coll., Ind. Dept. of Biology.
primary bibliographic entry see Field 5B.
4-07403

ONOMIC DAMAGES FROM RESIDENTIAL E OF MINERALIZED WATER SUPPLY,
vironmental Protection Agency, Washington, C. Economic Analysis Div.
P. Tihansky.
ter Resources Research, Vol 10, No 2, p 145- , April 1974. 8 fig, 5 tab, 38 ref.

scriptors: *Water quality, *Domestic water, amages, Public health, Scaling, Corrosion, onomics, Abrasion, *Costs, Plumbing, mputer programs, Clogging.

usehold appliances and personal items in con- t with water supplied municipally or from vate sources are subject to physical damages m chemical and other constituents of the water. onomic losses are calculated for a typical sehold and aggregated to the national and in- idual state levels. The types of physical nages expected and the associated water quali- determinants were identified, and the physical ects were then translated into economic losses. mage functions were formulated to predict like- impacts of water quality changes on each sehold unit affected. A computer program ed on these functions was designed to estimate al damages per typical household and to ag- gate them over selected regions. The program s applied to state-bystate data describing water ply sources and socioeconomic parameters. al annual damages to U.S. residents in 1970 re estimated to be in the range $0.65-$3.45 bil- , the mean being $1.75 billion. The mean trans- es to $8.60 per person annually. States having highest total damages were California ($230 lion) and Illinois ($164 million). On a per capita is, Arizona ($22.53) and New Mexico ($18.58) ked highest, whereas South Carolina ($1.15) Oregon ($1.73) were at the other end of the ctrum. When per capita damages were com- ed by source of water supply, private wells re highest at an average of $12.34, treated undwater was next at $11.20, and treated sur- e water was last at $5.83. (Knapp-USGS)
4-07417

LCANIC AIR POLLUTION: DELETERIOUS FECTS ON TOMATOES,
waii Agricultural Experiment Station, Honolu-

A. Kratky, E. T. Fukunaga, J. W. Hylin, and R. Nakano.
Journal of Environmental Quality, Vol 3, No 2, p 138-140, April-June 1974. 2 fig, 3 tab, 6 ref.

Descriptors: *Air pollution, Volcanoes, *Hawaii, *Air pollution effects, *Tomatoes, Hydrogen ion concentration, Chlorides, Sulfates, Rainfall, Morbidity, Phytotoxicity.
Identifiers: *Volcanic air pollution.

From the winter of 1969-70 to the summer of 1973, severe yield and quality reductions related to volcano eruptions occurred on field grown tomatoes in the Kona district on the Island of Hawaii. Symptoms included blossom drop, poor fruit set, hollow, small, and almost seedless fruits, and a less luxuriant appearance. A definite atmospheric haze was caused by fumes from active and degassing vents located 75 km away and associated with Kilauea Volcano. Tomato plants under plastic rainshelters grew normally. Rainwater was acidic (pH 4.0) and contained appreciable quantities of Cl and SO4 plus 27 detectable organic compounds. When tomato leaf discs were immersed in rainwater samples, more Ca, Mg, and K were leached from these acidic samples then from less acidic rainwater samples and the distilled water controls. In a pollen germination medium containing rainwater, pollen germination and tube lenghts decreased as the pH of the rainwater decreased. The rainwater samples from a single heavy rainfall were less acidic than from cumulative samples of lighter rainfalls. (Knapp-USGS)
W74-07430

NUTRIENT CYCLING AND PRODUCTIVITY OF DYSTROPHIC LAKE-BOG SYSTEMS (PART B),
Notre Dame Univ., Ind. Dept. of Biology.
R. W. Greene.
Available from the National Technical Information Service as COO-1770-4; $5.25 in paper copy, $1.45 in microfiche. Report COO-1770-4, March 1973. 62 p, 2 fig, 24 tab, 39 ref. AEC AT (11-1)-1770.

Descriptors: *Cycling nutrients, *Productivity, *Dystrophy, *Bogs, Baseline studies, Phosphorus, Cations, Ions, Metabolism, Calcium, Lime, Iron, Organic matter, Predation, Midges, Zooplankton, Mosses, Food webs, Alkalinity, *Indiana.
Identifiers: *Lake-bog systems, Chaoborus americanus, Sphagnum.

Baseline data were collected on several different bog-lakes. Total phosphate determinations were done on material trapped in the sediment collectors placed throughout the water column. It was suggested that if the bog lakes were permanently meromictic, then perhaps all vertical transport (especially through the monimolimnion) is by biological transport. In general, alkalinity is increased throughout the water column following liming, and slowly drops back to normal values in a matter of weeks. To gain some insight into iron cycling and abundance at various depths, total iron analyses were done on material caught in sediment traps throughout the water column. It was found that both calcium and iron were bound to the large-molecule organic fraction, but differed in extent. The predatory potential of the Chaoborus populations is a function of two behavioral responses: the functional response of individual predators and the numerical response of the predator populations. Any input of alkaline earth cations into one bog studied will rapidly be sequestered by Sphagnum of the bog mat. As a result the main cause of increased productivity due to artificial alkalinization is the chemical effect which increases the buffering capacity and therefore the available carbon in the system. (Jones-Wisconsin)
W74-07466

SEASONAL ABUNDANCE AND VERTICAL DISTRIBUTION OF CRUSTACEAN ZOOPLANKTON IN A COLOURED DYSTROPHIC LAKE IN NORTHEASTERN ONTARIO,
Atomic Energy of Canada Ltd., Chalk River (Ontario). Environmental Research Branch.
J. W. McMahon.
Available from the National Technical Information Service as AECL 4312; $1.00 in paper copy, $1.45 in microfiche. Atomic Energy of Canada, Ltd., Report AECL-4312, January 1973. 26 p, 12 fig, 1 tab, 22 ref.

Descriptors: *Distribution, *Crustaceans, *Zooplankton, Dystrophy, *Canada, Copepods, Daphnia, Seasonal, Spatial distribution, Temporal distribution, Dominant organisms.
Identifiers: Diaptomus reighardi, Cyclops bicuspidatus, Bosmina coregoni, Daphnia catawba, Upper Bass Lake(Ontario), Chalk River(Ontario).

Information is provided on abundance and species numbers of net zooplankton present in one of the numerous colored-water lakes lying within the eastern limits of the Precambrian Shield. Weekly plankton samples were collected at 10 stations in upper Bass Lake, Ontario. Twelve species of crustacean plankton were identified, consisting of seven copepods and five cladocerans. Maximum observed abundance, seasonal and vertical distribution were also noted. Histograms show vertical distribution and weekly abundance of the different species. The calanoid copepod Diaptomus reighardi, the most abundant crustacean was found in the plankton throughout the year. Several species of Cladocera were present, Bosmina coregoni and Daphnia catawba being the second and third most dominant crustacea in the zooplankton community. Four dominants were noted consisting of Diaptomus reighardi (29.5%), Cyclops bicuspidatus (15.2%), Daphnia catawba (19.2%) and Bosmina coregoni (22.4%). Tropocyclops prasinus, while not dominant, accounted for 5% of the total crustacean population. The ratio of total Copepoda to total Cladocera for each of the three years remained constant with the copepods accounting for approximately 60% of the zooplankton. (Jones-Wisconsin)
W74-07467

SOME ASPECTS OF THE TEMPERATURE, OXYGEN AND NUTRIENT DISTRIBUTIONS IN MONTEREY BAY, CALIFORNIA. ANNUAL REPORT, PART 1, 1973,
Moss Landing Marine Labs., Calif.
W. M. Smethie, Jr.
Available from the National Technical Information Service as COM-73-11648; $4.25 in paper copy, $1.45 in microfiche. Technical Publication 73-1, 1973. 97 p, 29 fig, 12 tab, 41 ref, 2 append. NOAA SGP2-94.

Descriptors: *Bays, *Temperature, *Dissolved oxygen, *Nutrients, *Distribution, *California, Water circulation, Upwelling, Tides, Photosynthesis, Nitrates, Phosphates, Ammonia, Outfall sewers, Tidal effects, Seasonal, Oceanography, Physical properties, Chemical properties, Dispersion.
Identifiers: *Monterey Bay(Calif.), Flushing.

Seasonal changes, seasonal cycles, upwelling, general water movement, nutrient-oxygen relations and salinity were surveyed in Monterey Bay. Three oceanographic periods occur in the bay: The Davidson Current period November to February, upwelling period February to September, and oceanic period from September to November. Seasonal variations were similar for the canyon area of the bay and nearshore areas. Over the head of Monterey Submarine Canyon, daily variations of physical and chemical parameters can be as large as seasonal variations. Upwelling apparently occurred in the submarine canyon during all months except perhaps March and April 1972. The average ratio of delta apparent oxygen utilization: delta nitrate: delta phosphate was 279:14:1 by atoms of O, N, and P and is in good agreement

with the expected O:N:P ratio of 276:16:1. Rates of carbon fixation were estimated from phosphate uptake, nitrate uptake, and oxygen production rates. Nitrate was observed to be the limiting nutrient. Residence time of water during upwelling was estimated to average 3 to 8 days in the northern and southern ends of the bay. Ammonia concentrations were highly variable with time and showed no seasonal trend. (Jones-Wisconsin)
W74-07469

NUTRITIVE IMPORTANCE AND STRUCTURE OF DETRITUS,
A. G. Rodina.
Available from the National Technical Information Service as NRC TT1625, $3.00 in paper copy, $1.45 in microfiche. National Research Council of Canada, Ottawa, Technical Translation 1625, 1972. 11 p, 4 fig, 35 ref. Translated from Biologicheskie Resursy Vodoemov. Puti ikh Rekonstruktsii i Ispol'zovaniya Izdatel'stvo 'Nauka, Moscow 1966, p 35-42.

Descriptors: *Nutrients, *Detritus, *Benthic fauna, Productivity, Bacteria, Microorganisms, Proteins, Vitamins.
Identifiers: *Structure of detritus.

The common characteristic of detritus is its heterogeneity. The sources, components, and nutritional value of detritus in various waters are discussed. The development of fluorescent techniques makes it possible to investigate its structure. Detritus consists of a complex conglomeration of organic substances serving as substrate for development of an immendsely rich microorganism population. Every minute particle is saturated with bacteria and contains live microalgae, various protozoans, and rotifers; a detrital particle is a seat of high bacteriological activity at the water-particle interface. The structure of detritus is closely related to the nature of the water body, the development of life in it, and the time of year. Rivers carry mostly detritus digested by bacteria, broken up into minute particles by water, and containing large quantities of live microscopic algae. The absorption of dissolved and colloidal material by organic and inorganic particles is of great importance in the alteration of detritus and for the development of microorganisms in it. Different origins of detritus and predominance of either plant or animal remains determine the development of its bacterial processes, which, in turn, determines its pH. Detritus is a source of proteins, vitamins, and other biostimulants in the nutrition of aquatic animals. (Jones-Wisconsin)
W74-07471

FIELD AND EXPERIMENTAL STUDIES ON THE SYSTEMATICS AND ECOLOGY OF ULVA CURVATA AND ULVA ROTUNDATA,
North Carolina Univ., Chapel Hill. Dept. of Botany.
C. F. Rhyne.
Available from the National Technical Information Service as COM-73-10783, $3.00 in paper copy, $1.45 in microfiche. University of North Carolina, Sea Grant Publication UNC-SG-73-09, March 1973. 123 p, 26 fig, 5 tab, 167 ref.

Descriptors: *Marine algae, *Systematics, *Estuaries, Life history studies, *Bioindicators, Salt marshes, Eutrophication, Cytological studies, Water pollution effects, Biorhythms, Ecology, *North Carolina.
Identifiers: *Ulva curvata, *Ulva rotundata, Eastern U.S. coasts, Calico Creek(N.C.).

With its sessile habit, simple morphology and handling ease in culture, Ulva and similar macrobenthic algae may be especially useful as indicators of nutrient pollution in eutrophication of marine and estuarine environments. To understand their taxonomy and ecology, Ulva curvata (marsh-like habitats) and Ulva rotundata (more saline habitats) were studied. To establish distribution of U. curvata, mating studies were carried out with plants from the principal research site in Calico Creek, North Carolina and material from Georgia and New Jersey. Male and female gametes released from thalli obtained at each locality mated with gametes from Calico Creek material and produced viable zygotes which germinated normally. Life cycle of U. curvata was demonstrated in field and laboratory studies to involve an alternation of isomorphic gametophyte and sporophyte generations. While all nuclear phases and growth forms appear to be connected to one another by meiosis and syngamy, somatic diploidization of female plants leading to parthenosphorophytes is frequent. Germination, early development, thallus growth, reproduction and senescence were investigated under laboratory conditions to account for life history and ecological adaptations of U. curvata observed in the field. These studies demonstrate that Ulva can serve as important indicators of eutrophication. (Jones-Wisconsin)
W74-07473

AN INVESTIGATION OF THE PHYSICAL IMPACT OF SEWAGE OUTFLOW ON A RIVER-ESTUARINE ENVIRONMENT,
Naval Academy, Annapolis, Md.
D. D. Wagner.
Available from the National Technical Information Service as AD-769 514, $3.50 in paper copy, $1.45 in microfiche. A Trident Scholar Project Report No 50, May 1973. 69 p, 9 fig, 5 tab, 30 ref, 3 append.

Descriptors: *Mathematical models, *Waste dilution, *Estuaries, *Rivers, Dispersion, Physical properties, *Maryland, Currents(Water), Outfall sewers, Tidal effects, *Chesapeake Bay, Nutrients, Computer programs, Density stratification, Salinity, Convection.
Identifiers: Eastport(Md.), Severn River(Md.), River-estuarine environment.

The possible physical impact of sewage discharges into the Severn River from the treatment plant located in Eastport, Maryland is described. Problems result because the system does not behave entirely in either a riverine or esturine manner. Using the classification of a river-estuarine environment, which incorporates characteristics of both rivers and estuaries, allows design of a numerical flushing model that predicts excess sewage concentrations in the river-estuary. Several runs were conducted with the model to determine the impact of the sewage. A buoyant plume model of the behavior of the sewage upon introduction to the receiving water indicates dilution to a 3% sewage concentration by the time the waste reaches the surface. Bottom currents were investigated and compared with surface flows to assess their effect on dispersion of the contaminants. Finally, a tidal flushing model was constructed that predicts a uniform sewage pollution excess over the conditions of the Chesapeake Bay of approximately .05% throughout the Severn. Effects of various environmental changes are discussed as predicted by modification of the numerical model. Under present circumstances, no detrimental physical impact on the environment was shown to exist. (Jones-Wisconsin)
W74-07477

THE PLANKTON OF PONDS ENRICHED WITH WASTES FROM BEET SUGAR FACTORIES,
Polish Academy of Sciences, Krakow. Zaklad Biologii Wod.
K. Kyselowa.
Acta Hydrobiologica, Vol 15, No 1, p 51-88, 1973. 7 fig, 5 tab, 60 ref.

Descriptors: *Sewage lagoons, *Plankton, Sugar beets, *Food processing industry, Phytoplankton, Zooplankton, Self-purification, Chlamydomonas, Euglena, Euglenophyta, Biochemical oxygen demand, Wastes, Stagnant water, Rotifers, Crustaceans, Cyanophyta, Biomass, Eutrophication, Succession, Systematics, Waste treatment.
Identifiers: *Sugar beet processing wastes, *Poland

The effect of sugar factory effluents on waste ponds in Poland was investigated by characterization of phyto- and zooplankton populations. Phytoplankton was represented by 293 systematic units, consisting of 241 species with varieties and forms. Certain taxons were determined from the Cyanophyceae, Euglenophyceae, Cryptophyceae, Flagellata apochromatica, Volvocales, Chlorococcales and Conjugales. In the zooplankton 63 species and 33 higher systematic units were determined. The succession of individual groups of plankton followed in four stages whose length was affected by the concentration of wastes. Stage I (heterotrophy) showed the beginning of development of Volvocales and Euglenophyceae and an almost total lack of zooplankton. It was a period of high biochemical and chemical oxygen demand and of oxygen deficit. Stage II (hyperautotrophy) was characterized by the appearance of Chlorococcales and Cryptophyceae with growing numbers of zooplankton (mainly rotifers). It was correlated with a further decrease in biochemical and chemical oxygen demand and with a high oxygen content. In the IIId (transition stage), a decrease in algal numbers and an increase in Cladocera were observed. Stage IV was characterized by stabilization of the chemical conditions and by the formation of phyto- and zooplankton communities characteristic of normally utilized ponds. (Jones-Wisconsin)
W74-07478

DISEASES OF POND FISHES,
For primary bibliographic entry see Field 8I.
W74-07481

A STUDY OF THE MOVEMENT OF PHOSPHOROUS IN THE LITTLE RIVER ESTUARY, N.S.W.,
Australian Atomic Energy Commission Research Establishment, Lucas Heights.
For primary bibliographic entry see Field 5B.
W74-07483

UTILIZATION OF ERTS-1 DATA TO MONITOR AND CLASSIFY EUTROPHICATION OF INLAND LAKES,
Bendix Aerospace Systems Div., Ann Arbor, Mich.
P. E. Chase, and V. E. Smith.
Available from the National Technical Information Service as N-73-18331, $5.50 in paper copy, $1.45 in microfiche. Report No BSR 4010, February 1973. 70 p, 35 fig, 2 tab, 40 ref, NAS 521810.

Descriptors: *Satellites(Artificial), *Remote sensing, *Eutrophication, Classification, Lakes, Algae, Detritus, Monitoring, Color, Water quality, Trophic level, *Michigan, Baseline studies, Data transmission, Computers, Spectrophotometry, Technology.
Identifiers: *ERTS-1, Computer compatible tapes, Imagery interpretation, Spectral bands, Oakland County(Mich.).

Preparation phase accomplishments and accomplishments during the initial review of Earth Resources Technology Satellite (ERTS-1) are described. The capability of ERTS-1 to resolve different sizes and shapes of lakes in each MSS band is necessary to correlate ERTS-1 data to lake water color. Water quality data collected over the past three years have been tabulated and compared for the purpose of classifying four Michigan lakes as to relative trophic level. Although all four are mildly to moderately eutrophic, they can be arranged in a series of increasing enrichment. Further study of these lakes is being carried out by the Cranbrook Institute of Science. The 'baseline'

a on water quality have been considered care-
ly in setting up the water analysis procedures
concurrent ERTS and ground monitoring of
es. Any such monitoring program must be a
mpromise between expediency and data yield,
ce full coverage of all the lakes within two
irs of the ERTS overflights is highly desirable.
ien computer compatible tapes are available,
image density patterns on selected lakes can be
npared to their bathymetry and to low altitude
agery to determine whether variations in water
or are recorded by ERTS. (Jones-Wisconsin)
4-07484

INVESTIGATION OF PROPAGATION AND
E MINERAL NUTRITION OF SPARTINA
TERNIFLORA,
rth Carolina State Univ., Raleigh. Dept. of Soil
ence.
W. Broome, W. W. Woodhouse, Jr., and E. D.
neca.
ailable from the National Technical Informa-
n Service as COM-73-11290, $4.50 in paper
py, $1.45 in microfiche. University of North
rolina Sea Grant Publication UNC-SG-73-14,
3. 121 p, 18 fig, 49 tab, 46 ref.

scriptors: *Seeds, *Grasses, *Germination,
ant growth, *North Carolina, Nutrients, Soil
perties, Salinity, Mathematical models, Salt
rshes, Estuaries, Nitrogen, Phosphorus, Potas-
m, Iron, Bank stabilization, Storage.
ntifiers: *Spartina alterniflora, Propagation,
t marsh cord grass.

rtina alterniflora is the dominant plant of inter-
l zone of bays and estuaries along nearly all the
t coast of North America. Effect of seed
rces and storage treatments on viability of its
d and seed plant performance in North
rolina estuaries is reported. Under favorable
ditions, S. alterniflora produces large quanti-
of viable seed. Seed should be collected from
prous stands and stored overwinter submerged
stuarine or sea water at temperatures around 2-
Field experiments have shown that direct
ding can be effective in establishing new stands
dredge spoil material. Results indicate tissue
centrations of several nutrients and several soil
perties are significantly associated with varia-
ns in yield and height of S. alterniflora. The im-
tance of Mn and S in both the yield and height
ations and Fe in the height equation suggest in-
tigation into influence of chemical effects of
erlogging of the marsh soil. Increased growth
S. alterniflora in response to applications of fer-
er indicates that the productivity of some salt
rshes is limited by nutrient supplies. Nitrogen
P fertilizers were shown to enhance growth of
dlings and transplants artificially established on
dge spoil. (Jones-Wisconsin)
4-07486

UDIES ON ORGANISMS FOUND IN ARCTIC
A ICE,
ska Univ., College. Inst. of Marine Science.
A. Horner.
ailable from the National Technical Informa-
Service as AD-768 399, $4.75 in paper copy,
5 in microfiche. Final Report to Arctic In-
ute of North America, Washington, D.C.,
rch 1973. 150 p, 9 fig, 3 tab, 31 ref, append. NR
-105. N00014-70-A-0219-0001.

scriptors: *Aquatic microorganisms, *Arctic,
e, Nutrients, Salinity, Chlorophyll, Kelps,
toms, Dinoflagellates, *Alaska, Sea water,
ae, Zooplankton, Systematics, Invertebrates.
ntifiers: Flagellates, Ciliates, *Barrow(Alaska).

dies of ice organisms near Barrow, Alaska
wed that the shore-fast ice is a habitat for a
tively complex assemblage including diatoms,
nented and non-pigmented dinoflagellates and
ellates, and ciliates. Samples were collected,
d measurements made and laboratory studies performed. Species from each station in five locations were investigated and are listed. The deep-water stations were sampled to see if the spring phytoplankton bloom was occurring in the sea-water under the ice and to try to determine the areal extent of the organism layer in the bottom few centimeters of ice. The sampling technique had possed a problem as pieces of ice would break from the core and be lost. When ice cores are brought to the surface, cells are exposed to extremes of temperature and light whose effect is not known. Melting the ice at room temperature may also affect the cells. Small flagellates seem to be the most abundant organisms found in new ice in the fall. Perhaps many of the ice organisms, especially the diatoms, are benthic species which may be brought into the water column during the fall storms and remain long enough to become trapped as the ice forms. A recently discovered kelp bed is described. (Jones-Wisconsin)
W74-07487

POSSIBLE EFFECTS OF CONSTRUCTION AND OPERATION OF A SUPERTANKER TERMINAL ON THE MARINE ENVIRONMENT IN NEW YORK BIGHT,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
J. L. McHugh, J. J. Ginter, W. E. Knapp, A. L. Tsao, and M. D. Greenfield.
Available from the National Technical Information Service as PB-219 649, $3.00 in paper copy, $1.45 in microfiche. Final Report to Council on Environmental Quality, Washington, D.C. November 15, 1972. 213 p, 55 fig, 17 tab, 119 ref.

Descriptors: *Environmental effects, *Offshore platforms, *Harbors, *Projections, *Water pollution sources, New York, Dredging, Structures, Disposal, Oil spills, Ships, Coasts, Oil industry, Construction, Import, Pipelines, Biota, Connecticut, New Jersey, Economic justification, Value, Geology, Physical properties, Chemical properties.
Identifiers: *New York Bight, *Supertanker terminals, Offshore ports, Sandy Hook Bay(Conn.), Raritan Bay(N.J.).

Environmental effects of construction and operation of supertanker terminals are assessed by evaluating specific sites in the New York Bight. Information was obtained entirely from the existing literature and from discussions and correspondence. Oil and oil products made up at least one quarter of the cargoes transported by marine traffic. Physiography, geology, physical aspects, chemical aspects, and marine resources of New York Bight are presented. Adverse construction effects on the environment and biota will be much less at offshore sites than in Sandy Hook Bay. Sites in the New York Bight area are ranked on the basis of the effects of construction alone and in descending order to preference: Castle Hill, Tobay Beach, and Sandy Hook Bay. The effects and possible effects of dredging on the marine environment are described. In regard to Raritan Bay, a major supertanker terminal is not consistent with plans for pollution abatement. Environmental effects of supertanker terminal operation appear to be related primarily to chronic oil leakage or accidental spills. The Tobay Beach site, farther offshore and in deeper water than the Castle Hill site, may be less desirable because it might interfere with commercial clamming and fishing operations. (Jones-Wisconsin)
W74-07488

KELP HABITAT IMPROVEMENT PROJECT, ANNUAL REPORT JULY 1, 1970 - JUNE 30, 1971.
California Institute of Tech., Pasadena. W. M. Keck Lab. of Environmental Health Engineering.
Available from the National Technical Information Service as COM-73-10861, $4.50 in paper copy, $1.45 in microfiche. (1971). 159 p, 49 fig, 22 tab, 41 ref. Sea Grant GH-92.

Descriptors: *Resources development, *Kelps, *Habitats, Life history studies, Animal parasites, Animal diseases, Epizootiology, Marine animals, Nutrients, Amino acids, Reproduction, Pest control, Grazing, *California, Phaeophyta, Limiting factors, Cultures, Planting management, Control.
Identifiers: *Kelp beds improvement, *Macrocystis, *Sea urchins control, Lytechinus.

Kelp beds are believed to contribute significantly to coastal biology and the kelp community is an important marine resource. About 1940, persistent deteriroation began of certain kelp beds off the southern California coast. By 1960, a number of significant kelp areas had dwindled to scattered patches or entirely disappeared. It was concluded that in addition to the recent damage caused by a period of warm water, hordes of grazing sea urchins were destroying large quantities of kelp and preventing normal reforestation. Loss of an important natural urchin predator, the sea otter, may have contributed to the situation. It was possible to restore more than half of a deteriorated kelp area off Point Loma solely by urchin control measures. During 1970-71, dispersion of kelp embryos was first attempted on a large scale. Final phases of a research project on nutrition of sea urchins are reported. A facility for mass-culturing Macrocystis (kelp) embryos went into operation December 1970. Studies were made on sea urchins including commensals and parasites, internal conditions, juveniles and larval urchins, and urchin diseases. Autoradiographic analysis confirmed previous finds that urchins can remove dissolved amino acids from sea water in low concentrations. (Jones-Wisconsin)
W74-07489

KELP HABITAT IMPROVEMENT PROJECT, ANNUAL REPORT JULY 1, 1971 - JUNE 30, 1972.
California Institute of Tech., Pasadena. W. M. Keck Lab. of Environmental Health Engineering.
Available from the National Technical Information Service as COM-73-10862, $4.75 in paper copy, $1.45 in microfiche. (1972). 200 p, 57 fig, 18 tab, 14 ref. Sea Grant GH-92.

Descriptors: *Resources development, *Kelps, *Habitats, *California, Marine animals, Marine algae, Grazing, Life history studies, Nutrient requirements, Competition, Limiting factors, Cultures, Reproduction, Pest control, Planting management, Control, Methodology.
Identifiers: *Kelp beds improvement, *Macrocystis, Sea urchin control.

Rehabilitation of the deteriorating kelp beds off the southern California coast is discussed. Persistent deterioration of Macrocystis began about 1940 due to an interval of warm temperatures followed by grazing of vast numbers of sea urchins who were destroying the remains of several important kelp beds. Preliminary experimentation revealed that dispersal of embryonic Marcrocystis sporophytes yielded modest numbers of juvenile plants. A kelp-culturing facility was constructed in 1970 and began producing large scale cultures in 1971. Kelp restoration activities in San Diego, Orange, and Los Angeles Counties are reported. Grazer control operations were carried on at Abalone Cove. Dispersals of cultured kelp embryos indicated that pretreatment of the bottom with quicklime enhanced ability of tiny plants to become established. Significant kelp beds appeared between Corona del Mar and Pelican Point during 1971-72. Large numbers of juvenile plants were recorded off Corona del Mar. Times of appearance and distribution of the small plants correlated well with times and sites of the kelp embryo dispersal operations. A preliminary model of relations between grazing fishes and kelp resources was developed. Techniques for emplanting PVC rings bearing cultures of tiny kelp plants onto the sea floor were developed. (Jones-Wisconsin)
W74-07490

PROCEEDINGS 2ND ANNUAL TECHNICAL CONFERENCE ON ESTUARIES OF THE PACIFIC NORTHWEST.
For primary bibliographic entry see Field 2L.
W74-07491

A STRATEGY FOR MODELING PRIMARY PRODUCTION IN STRATIFIED FJORDS,
Washington Univ., Seattle. Dept. of Oceanography.
D. F. Winter, and K. Banse.
In: Proceedings 2nd Annual Technical Conference on Estuaries on the Pacific Northwest, March 16-17, 1972. Oregon State Univ., Corvallis (Engineering Experiment Station Circular No 44), p 30-41 (1972). 9 fig, 1 tab, 21 ref.

Descriptors: *Mathematical models, *Primary productivity, *Fjords, Pacific coast region, Zooplankton, Phytoplankton, Inlets(Waterways), Estuaries, Mixing, Hydrodynamics, Eutrophication, *Washington, Circulation, Hydrography.
Identifiers: *Puget Sound(Wash).

Most numerical phytoplankton models are based on a conservation equation that attributes algal biomass variations to photosynthetic respiratory activity, sinking of cells, herbivore grazing, and to mixing and advection in the medium. In some inlets, or segments thereof, certain numerical tasks can be obviated by using approximate expressions for hydrodynamic variables derived by using similarity techniques. This procedure is described. The general approach is illustrated with a model of springtime phytoplankton blooms in the main basin of Puget Sound in the spring 1966. Those features of inlet flow which are relevant to the problem are reviewed. To avoid incapacitating complexity, attention is confined to primary production in a steep-sided, relatively straight fjord segment. From modeling experiments with data from zooplankton hauls, the conclusion is that grazing pressure by herbivores probably does not reduce the chlorophyll density in Puget Sound by more than 10% to 20% during blooms. Although conclusions are still tentative, a reasonable, self-consistent picture of phytoplankton ecology in deep inlets is emerging. It is believed that the modeling strategy described will enable specification with some confidence of environmental factors which control algal blooms in Puget Sound system and elsewhere. (See also W74-07491) (Jones-Wisconsin)
W74-07494

AN ECOSYSTEM STUDY IN THE INSIDE PASSAGE OF SOUTHEASTERN ALASKA,
Oregon State Univ., Corvallis. Dept. of Oceanography.
H. C. Curl.
In: Proceedings 2nd Annual Technical Conference on Estuaries of the Pacific Northwest, March 16-17, 1972. Oregon State Univ., Corvallis (Engineering Experiment Station Circular No 44), p 42-49 (1972). 5 fig, 1 tab, 10 ref.

Descriptors: *Bays, *Alaska, *Productivity, Estuaries, Nutrients, Plankton, Enzymes, Zooplankton, Nitrogen, Amino acids, Nitrates, Ammonia, Eutrophication, Phytoplankton, Light intensity, Model studies, Mixing.
Identifiers: *Auke Bay(Alaska), Alaska Inside Passage.

In Auke Bay near Juneau and the Alaskan Inside Passage there is a strong, two-layered circulation in summer, upwelling is frequent, seasonal cycles are similar from year to year, zooplankton usually occur as a single, mid-summer pulse, and most chemical and biological properties, except zooplankton, are homogeneously distributed in the horizontal plane. A study was made of the differences in the activity of the enzyme nitrate reductase between Thalassiosira and Skeletonema. Effect of light intensity on nitrate assimilation and nitrate supported growth of the two organisms was studied. The sequence of events is now thought to be that the initial spring bloom is initiated by the onset of stability, increasing solar radiation, and high levels of initial nutrients. Species composition at this time is controlled by temperature acting on enzymatic processes and by nutrient availability. Subsequent blooms and their composition are controlled by periodic wind mixing, replenishing nutrients from beneath the pycnocline, in situ nutrient regenerations by grazing zooplankton, or possibly, directly from phytoplankton, advection and stream flow, rainfall, and grazing by zooplankton. The biological response varies according to the interactions of the forcing functions. (See also W74-07491) (Jones-Wisconsin)
W74-07495

THE ENVIRONMENTAL IMPACT OF CADMIUM,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 5A.
W74-07530

EVALUATION OF METHODS OF PUMPING TEST ANALYSES FOR APPLICATION TO HAWAIIAN AQUIFERS,
Hawaii Univ., Honolulu. Water Resources Research Center.
J. A. Williams, and R. L. Soroos.
Technical Report No 70, July 1973. 159 p, 64 fig, 46 tab, 74 ref, append.

Descriptors: *Aquifers, Analytical methods, Drawdown, *Pumping, Transmissivity, Hydraulic conductivity, Anisotropy, Geology, *Hawaii, Logging(Recording), *Aquifer testing, *Well data, *Methodology, Storage.

Pumping test data from eight locations including the islands of Oahu, Maui, and Molokai were selected and analysed. The test data were selected on the basis of completeness, reliability, and aquifer type and boundary conditions involved. Analyses included the standard Theis, Thiem, and Jacobs methods as well as those techniques which deal with boundaries (Stallman method), partial penetration of the well (Hantush-Theis method), leaky aquifers (Walton method), and anisotropy (Hantush method for anisotropic aquifers). In addition, the Zanger method for partially penetrating wells and equilibrium data was also used. Results of the several different analyses were compared and recommendations made as to which method or combination of methods seemed best suited for Hawaii aquifers. In the case of the principal basal aquifer, the Hantush-Theis method for non-equilibrium data or the Zanger method for equilibrium data are recommended. In the event that leakage or boundaries are a factor, the former method used with early-time data is recommended.
W74-07531

AN EPIDEMIOLOGICAL STUDY ON CLONORCHIS SINENSIS AT THE NORTHERN PART OF WAKAYAMA PREFECTURE, MIDDLE JAPAN, (IN JAPAN),
Kyoto Prefectural Univ. of Medicine (Japan). Dept. of Medical Zoology.
Misao, Nagahana, Yukio Yoshida, Kikuo Matsuo, Horohito Sugihara, and Kaoru Kondo.
Jap J Parasitol. Vol 21, No 2, p 96-100, 1972, Illus. (English summary).
Identifiers: *Clonorchis-Sinensis, *Epidemiological studies, Gnathopogon-Elongatus-Elongatus, *Japan(Wakayama), Parafossarulus-Manchouricus, Pseudorasbora-Parva.

An epidemiological study on C. sinensis was carried out at the northern part of Wakayama Prefecture, middle Japan during the period from 1964-1970. The first intermediate host snail, Parafossarulus manchouricus, was detected from 9 ponds and 1 river out of 62 stations examined. Two kinds of freshwater fishes (154 in total num Gnathopogon elongatus elongatus and dorasbora parva, were collected from the where the snail host was abundantly found out of 136 former fish and in 4 out of 18 latte the metacercaria of C sinensis was infected minimum number of the metacercaria per fis 1, and the maximum was 32. In order to clarif human infection with this fluke, 286 specimens were collected from farm vi located close to the ponds where the interme hosts were found. As the result, C. sinensis were detected in 5 persons (1.8%).--Copy 1973, Biological Abstracts, Inc.
W74-07540

POPULATION DYNAMICS OF PROTOZOA SOCIATED WITH THE DECAY OF ORGA MATERIALS IN FRESH WATER,
Bonn Univ. (West Germany). Institut fuer L wirtschaftliche Zoologie und Bienenkunde.
H. Bick.
Am Zool. Vol 13, No 1, p 149-160. 1973, Illus.
Identifiers: *Decaying organic matter, *Popul dynamics, *Protozoa(Ciliates), Water pollutio fects.

The high intensity of decomposition in heavily luted systems favors high individual counts of tain species of ciliate Protozoa, in spite of the of dissolved oxygen and the presence of amm and other products of septic decay. Other sp grow best under the particular concitions of ing re-aeration or nitrification, respectively general, the whole range of the self-purifica process may be divided into zones which characterized by particular associations of cili The population growth of these species is lated by: availability of food, for example, teria; abiotic environmental factors, such as ygen and products of septic decay; and com tion and predatory-prey relations.--Copy 1973, Biological Abstracts, Inc.
W74-07541

LEECH COMMUNITIES (HIRUDINEA) IN MAZURIAN AND BIALYSTOK REGIONS THE POMERANIAN LAKE DISTRICT,
Polish Academy of Sciences, Warsaw. Inst Ecology.
H. Sandner, and J. Wilkialis.
Ekol Pol. Vol 20, No 27, p 345-365. 1972.
Identifiers: *Eutrophic lakes, La *Leeches(Hirudinea), *Poland(Pomerani Water pollution effects.

Studies were made of the occurrence of lee (Hirundnea) in eutrophic lakes in the Mazu and Bialystok regions and in the Pomeranian L District (Poland) on working stations situate and outside bays, either sheltered behind a bel vegetation or open from the lake side, and als shallow and warm waters and in highly eutro lakes. Results are given.--Copyright 1973, Biol cal Abstracts, Inc.
W74-07542

EFFECTS OF THICKNESS ON BACTERI FILM,
Virginia Polytechnic Inst. and State Un Blacksburg. Dept. of Civil Engineering.
R. C. Hoehn, and A. D. Ray.
Journal Water Pollution Control Federation, 45, No 11, p 2302-2320, November 1973. 21 fi tab, 18 ref.

Descriptors: *Nutrients, *Absorption, Cultu Organic matter, Metabolism, Chemical oxygen mand, Pseudomonas, *Slime, Films, Oxyg Growth rates.
Identifiers: *Bacterial films, *Substrate utili tion, Thickness, Oxygen diffusion, Film dens Flavobacterium, Bacillus, Micrococc Microbacterium, *Glucose.

nvestigation was initiated to determine the ef- of thickness on the nutrient utilization city of bacterial films, that is, whether that remains constant or decreases as the film h increases. Bacterial films were developed in ratory-scale rotating cylinders. Lyophilized and cultures maintained on agar were used to ulate a drum at the beginning of any particular ring operation. The isolates were identified as nging to the genera Bacillus, Micrococcus, domonas, Flavobaterium, and Microbacteri- Ten sections of each cylinder could be ved so that film thickness could be measured dically. A shallow stream of synthetic media ed continuously through the cylinders during ulturing operations, and the differences in in- t and effluent concentrations of organic er were used to calculate nutrient uptake . These rates were examined as functions of ness. In one series of studies, film solids were sured and examined as functions of thickness. ient uptake rates attained a maximum at ness between 100 and 150 microns and, if all were composited, appeared to stabilize. n data from individual experiments were ex- ed separately, however, nutrient utilization n decreasing between 100 and 150 microns, nuing until the films were approximately 400 ons thick. Beyond that thickness, the rates in- ed again to their former levels. (Mortland- elle)
-07545

ROGEN SULFIDE PRODUCTION BY ECHOCOCCUS LIVIDUS Y52-SI,
tana Univ., Missoula. Dept. of Botany.
Sheridan.
nal of Phycology, Vol 9, No 4, p 437-445, mber 1973. 7 fig, 5 tab, 30 ref.

riptors: *Anaerobic conditions, nophyta, *Hydrogen sulfide, *Water pollu- sources, Plant growth, Aquatic algae, tes, Plant physiology, Chemical reactions, ition, Chemical analysis, Cultures, Organic ounds.
ifiers: *Algal physiology, *Synechococcus us, *Photoproduction, Thermophilic algae, ochemistry, Substrate utilization, Biosynthes- Thiosulfates, Plant metabolism, 3-(3 4- lorophenyl)-1 1-dimethyl urea, fluoroacetic acid, Photoreduction, Carbonyl lorophenyl-hydrazone, Quantitative analysis, ose, Glucose, Sodium monofluoroacetate.

r anaerobic conditions and in the absence of the thermophilic blue-green alga chococcus lividus Y52-s evolved hydrogen le in both darkness and light. The mechanism is process was investigated and compared photo- and dark reductions in organisms senting several phyla. The photoproduction 2S from either sulfate or thiosulfate was in- d by 3-(3,4-dichlorophenyl)-1, 1-dimethyl (DCMU) and carbonyl m-chlorophenyl- azone (m-C1-CCP). The inhibitory effect of U showed the requirement for photosysytem electron donor. Inhibition by m-C1-CCP also cated ATP as an energy source. fluoroacetate partially inhibited production of H2S. This indicated that ox- e metabolism may act as a source of elec- to reduce the photooxidant under certain itions. Thiosulfate acts only as electron ac- r and is reductively cleaved to sulfide and e ions. Thiosulfate and sulfate appeared to ce CO2 in the light and O2 in darkness as ron acceptors. The phosphorylation un- lers dinitrophenol and m-C1-CCP stimulated H2S production. (Holoman-Battelle)
-07546

ECT OF LIGHT INTENSITY AND CEROL ON THE GROWTH, PIGMENT

COMPOSITION, AND ULTRASTRUCTURE OF CHROOMONAS SP.,
Smithsonian Institution, Rockville, Md. Radiation Biology Lab.
M. A. Faust, and E. Gantt.
Journal of Phycology, Vol 9, No 4, p 489-495, December 1973. 7 fig, 1 tab, 17 ref.

Descriptors: *Plant growth, *Plant pigments, *Light intensity, Environmental effects, Solvent extractions, Aquatic algae, Electron microscopy, Carbohydrates, Plant physiology, Cultures.
Identifiers: *Chroomonas, *Glycerol, *Ultrastructure, *Algal physiology, Sample preparation, Heterotrophic nutrition, Cryptomonads, Chlorophyll a, Chlorophyll c, Phycocyanin, Culture media, Substrate utilization, Sugars.

Growth of Chroomonas sp. increased with light intensity (100, 1800, and 2700 microwatts/sq cm) with a five-fold increase from the lowest to the highest intensity. Chlorophyll and phycocyanin content per cell were greater in cells grown at low light intensity, but the ratio of chlorophyll a and c did not vary appreciably. Cells grown at low light intensity had 30 percent more phycocyanin than cells grown at high intensities of light. The chloroplast of cells with the higher phycocyanin content had average intrathylakoidal widths of 300 A, whereas those cells with the lower phycocyanin content had average intrathylakoidal widths of 200 A. This result is compatible with the hypothesis that phycocyanin is located in the intrathylakoidal spacein the cryptophyte algae. Of the various energy sources tested, only glycerol was able to support limited growth under nonphotosynthetic conditions. Under no condition was the chloroplast reduced to an etioplast or proplastid state. Starch accumulation was greatest in cells grown in continuous white light in glycerol. Eyespots were commonest in cells grown in darkness and interrupted every 24 hr by a few seconds of white light. It was concluded that this organism is an obligate phototroph. (Holoman-Battelle)
W74-07548

A CONTINUOUS CULTURE STUDY OF PHOSPHATE UPTAKE, GROWTH RATE AND POLYPHOSPHATE IN SCENEDESMUS SP.,
New York State Dept. of Health, Albany. Div. of Labs. and Research.
G-Y. Rhee.
Journal of Phycology, Vol 9, No 4, p 495-506, December 1973. 16 fig, 1 tab, 62 ref.

Descriptors: *Phosphates, *Growth rates, *Scenedesmus, *Absorption, *Path of pollutants, Kinetics, Cultures, Plant growth, Aquatic algae, Phosphorus, Lipids, Nutrients, Plant physiology.
Identifiers: *Polyphosphates, Continuous cultures, *Algal physiology, Substrate utilization, Enzyme activity, Enzymatic inhibitors, Substrate concentration, Sample preparation, Alkaline phosphatase.

The kinetics of phosphate uptake and growth in Scenedesmus sp. have been studied in continuous culture with particular reference to the shifts in the cellular P compounds as a function of growth rate. Uptake velocity is a function of both internal and external substrate concentrations and can be described by the kinetics of noncompetitive enzyme inhibition. The concentrations of polyphosphates (alkali-extractable or 7-min) can be substituted as inhibitors in the kinetic equation. The apparent half-saturation constant or uptake, K sub m, is 0.6 microM, growth is less than K sub m by 1 order of magnitude. Growth is a function of cellular P concentrations, and the polyphosphates (alkali-extractable or 7-min) appear to regulate growth rate directly or indirectly. To understand P limitation, therefore, it is necessary to measure both external P and internal polyphosphate levels. Evidence indicates that alkali-extractable polyphosphates, which can be quantitatively determined by a simple method of measuring surplus P, are involved in cell division process and that a maintenance concentration of functional phosphate exists in the form of polyphosphates. Alkaline phosphatase activity has an inversely linear relationship to growth rate and to the reciprocals of both polyphosphates and surplus P. Changes in lipid P, RNA P, and presumably all other forms except DNA are related to changes in growth rate. (Holoman-Battelle)
W74-07549

THE EFFECT OF SELENITE ON THE PHYSIOLOGICAL AND MORPHOLOGICAL PROPERTIES OF THE BLUE-GREEN ALGA PHORMIDIUM LURIDUM VAR. OLIVACEA,
Medical Coll. of Ohio, Toledo. Dept. of Microbiology.
M. Sielicki, and J. C. Burnham.
Journal of Phycology, Vol 9, No 4, p 509-514, December 1973. 6 fig, 16 ref.

Descriptors: *Plant morphology, *Cyanophyta, *Bioassay, Photosynthesis, Inhibition, Plant growth, Water pollution effects, Plant physiology, Aquatic algae, Poisons, Lethal limit, Proteins, Pollutants.
Identifiers: *Phormidium luridum var. olivacea, *Selenite, *Algal physiology, Pollutant effects, Light microscopy, Sodium selenite.

Phormidium luridum cultures were treated with sodium selenite in concentrations ranging from 1 microM to 0.01 M. In contrast to the increasing culture turbidity of control and 1 microM selenite cultures, the turbidity of the other selenite cultures declined in proportion to time and selenite concentration. Chlorophyll extraction revealed similar results. Photosynthetic activity was inhibited within 6 hr in all cultures except control and 1 microM selenite. Phormidium at concentrations greater than 1 microM selenite showed a gradual loss of the bright green color and turned semitransparent. Cell-associated granules of reduced selenium were observed at higher selenite concentrations. Other structural changes observed were the presence of intracellular and intercellular spaces, spheroplast formation, and gradual cell lysis. Protein analyses of total cell samples and supernatant fractions confirmed cellular breakdown of selenite-treated algal cells. (Holoman-Battelle)
W74-07550

BYGLANDSFJORDEN. PRIMARY PRODUCTION AND OTHER LIMNOLOGICAL FEATURES IN AN OLIGOTROPHIC NORWEGIAN LAKE,
Oslo Univ. (Norway). Dept. of Limnology.
A. Lande.
Hydrobiologia, Vol 42, Nos 2-3, p 335-344, August 15, 1973. 3 fig, 2 tab, 14 ref.

Descriptors: *Primary productivity, *Trophic level, *Water quality, *Oligotrophy, Dissolved oxygen, Hydrogen ion concentration, Specific conductivity, Calcium, Magnesium, Sodium, Potassium, Chlorides, Alkalinity, Sulfates, Water analysis.
Identifiers: *Norway(Byglandsfjorden).

Byglandsfjorden is a lake situated in southern Norway, about 80 km north of Kristiansand. The catchment area consists of archean rocks. The river Otra flows through the lake. Water samples were taken from the lake 4 times during the summer of 1971, and analyzed for DO, pH, specific conductivity, Ca, Mg, Na, K, alkalinity, chloride, and sulfate. Primary productivity was measured three times by the C-14 method. The results show that the lake is acid and poor in electrolytes. pH-values vary between 5.3 and 6.0, and the specific conductivity lies at about 10. Primary production is rather high, and per sq m lake surface the values are about the same as in Svinsjoen, a rather eutrophic lake near Oslo. However, an index used by Rodhe (1965) shows that the lake is of a more oligotrophic type. (Little-Battelle)
W74-07554

HABITAT DISTRIBUTION OF THE SHORE FLIES OF NORTHEASTERN OHIO (DIPTERA: EPHYDRIDAE),
Kent State Univ., Ohio. Dept. of Biological Sciences.
J. F. Scheiring, and B. A. Foote.
The Ohio Journal of Science, Vol 73, No 3, p 152-166, May 1973. 10 fig, 19 ref.

Descriptors: *Ohio, *Aquatic habitats, *Ecological distribution, *Aquatic insects, Diptera, Seasonal, Animal populations, Shores, Mud, Sands, Grassed waterways, Floating plants.
Identifiers: *Shore flies, Species diversity, Limnic wrack, Sedge meadow, Marsh reed, Mud shore, Sand shore, Grass shore, Floating algal, Rain pool, Salt pool, Athyroglossa granulosa, Athyroglossa ordinata, Atissa litoralis, Ptilomyia enigma, Pseudohecamede, Allotrichoma, Discocerina obscurella, Hydrochasma buccatum, Diclasiopa lacteipennis, Ditrichophora, Polytrichophora orbitalis, Psilopa dupla, Leptopsilopa atrimana, Trimerina madizans.

A study of the babitat distribution of 68 species of shore flies (Ephydridae) was carried out in northern Ohio between April, 1968 and November, 1969. Ten ephydrid habitats were recognized: mud-shore, sand-shore, grass-shore, limnic-wrack, marsh-reed, sedge-meadow, floating-vegetation, floating-algal-mat, rain-pool, and salt-pool habitats. The mud shore contained the greatest diversity of Ephydridae, whereas the salt-pool habitat produced the largest populations. The floating algal mat possessed the fewest number of species, as well as the least number of individuals. Three species were recorded from Ohio for the first time: Atissia litoralis (Cole), Ephydra cinera Jones, and E. niveicips Cresson. A listing of all species collected, together with information on habitat from which taken abundance, and relation of data to other published material, is also included. (Holoman-Battelle)
W74-07556

EFFECTS OF TEMPERATURE ON ACTIVITY AND MORTALITY OF THE SCYPHOZOAN MEDUSA, CHRYSAORA QUINQUECIRRHA,
Maryland Univ. Prince Frederick. Natural Resources Inst.
A. J. Gatz, Jr., V. S. Kennedy, and J. A. Mihursky.
Chesapeake Science, Vol 14, No 3, p 171-180, September 1973. 6 fig, 3 tab, 23 ref.

Descriptors: *Water temperature, *Mortality, *Sea nettles, *Laboratory tests, *On-site tests, Marine animals, *Chesapeake Bay, Lethal limit, Jelly fish, Mature growth stage, Immature growth stage, *Maryland.
Identifiers: Activity, Chrysaora quinquecirrha, Coelenterates, Medusa, Scyphozoans, Data interpretation, Polyps, Pulsation rate.

Pulsation rate of Chrysaora quinquecirrha medusae was inversely and linearly related to bell diameter over the natural temperature range (15-32C) of this life history stage of the sea nettle in the upper Chesapeake Bay. At unnatural, elevated temperatures this relationship was disrupted. Pulsation rates generally increased with temperature increase from 15C to 30C and then decreased at higher temperatures. The rate-temperature curve for acclimated medusae was similar in shape (increase and decrease in pulsation rate with temperature change) to rate-temperature curves reported for warm water medusae; its shape was different from those reported for cold water medusae. Acclimation of pulsation rate to changed temperature was faster than acclimation of upper lethal temperature, although both were measured in hours. Upper lethal temperatures measured over 20-30C were directly related to acclimation temperature and were similar to those reported for sea nettle polyps (34-35C). Medusae were more sensitive than polyps to cold, with death occurring at 10C. Thermal discharges into the upper Chesapeake Bay which raise water temperature above 30C are probably stressful to sea nettle medusae. Temperatures above 38C could be lethal in a few minutes. (Holoman-Battelle)
W74-07561

INCIDENCE OF RESISTANCE TO TETRACYCLINE, CHLORAMPHENICOL AND AMPICILLIN AMONG SALMONELLA SPECIES ISOLATED IN THE NETHERLANDS IN 1969, 1970 AND 1971,
Rijksinstituut voor de Volksgezondheid, Bilthoven (Netherlands).
C. E. Voogd, P. A. M. Guinee, A. Manten, and J. J. Valkenburg.
Antonie van Leeuwenhoek, Vol 39, No 2, p 321-329, 1973. 7 tab, 2 ref.

Descriptors: *Antibiotics(Pesticides), *Salmonella, Domestic animals, Enteric bacteria, Aerobic bacteria, Water pollution sources, Resistance, Isolation, Poultry, Cattle, Hogs, Farm wastes.
Identifiers: *Tetracycline, *Ampillicin, *Chloramphenical, *Kanamycin, Drug resistance, Serotypes, Culture media, Salmonella dublin, Salmonella typhimurium, Salmonella anatum, Salmonella panama, Salmonella cholerae suis var. kunzendorf, Salmonella infantis, Salmonella montevideo, Salmonella eimsbuettel, Salmonella brandenburg, Salmonella bredeney, Salmonella derby, Salmonella enteritidis, Salmonella heidelberg, Salmonella manchester, Salmonella meleagridis, Salmonella mokola, Salmonella muenchen.

In 1969, 1970 and 1971 respectively, 11761, 13844 and 20053 Salmonella strains were screened for resistance to ampicillin, chloramphenicol and tetracycline. Each Salmonella strain was transferred to agar slants containing 25 micrograms of tetracycline, 50 micrograms of chloramphenicol, 25 micrograms of ampicillin or 25 micrograms of kanamycin per milliliter at pH 7.4. If growth occurred, the bacteria were identified again in order to exclude any possibility of contamination with drug-resistant bacteria of other species. If the same serotype was found, the degree of resistance was determined by tube-dilution assay on 5 percent sheep-blood agar slants made of nutrient agar pH 7.4 to which citrated sheep blood was added. The tubes were inoculated with one drop of a dilute suspension containing 1 million bacteria per ml in 0.85 percent NaCl solution. After incubation at 37 C for 20 hours any strain growing in tubes containing one of the above antibiotics at a concentration of 50 micrograms/ml was considered to be resistant. This drug level roughly corresponds to 10 times the normal minimal inhibitory concentration. It was found that in these years respectively 23.4 percent, 19.3 percent and 15.1 percent of the isolated strains were resistant to one or more of these antibiotics. Most strains appeared to be only tetracycline-resistant. Resistance to chloramphenicol remained low (0.56 percent and less). During 1971 64 kanamycin-resistant strains (0.32 percent) were isolated. Resistance was largely confined to S. typhimurium and S. panama. (Holoman-Battelle)
W74-07562

PSYCHROPHILIC YEASTS ISOLATED FROM MARINE FISH,
University of Strathclyde, Glasgow (Scotland). Dept. of Applied Microbiology.
For primary bibliographic entry see Field 5A.
W74-07563

EFFECT OF RESTRICTED USE OF PHOSPHATE-BASED DETERGENTS ON ONONDAGA LAKE,
O'Brien and Gere Engineers Inc., Syracuse, N. Y.
C. B. Murphy, Jr.
Science, Vol 182, No 4110, p 379-381, October 26, 1973. 2 fig, 1 tab, 9 ref.

Descriptors: *Phosphates, Lakes, *Detergents, Legislation, Diatoms, Chlorella, Scenedesmus, *Cyanophyta, Chlorophyta, Hydrogen ion concentration, Nitrogen, Biochemical oxygen demand, Dissolved oxygen, *New York, Analytical techniques, Hypolimnion, Limiting factors, Sewage effluents, Water sampling, Carbon, Water quality, Epilimnion, Eutrophication, Nutrients.
Identifiers: *Onondaga Lake(NY), Oocystis, Orthophosphates, Aphanizomenon

A marked decrease in the concentration of total inorganic phosphate in the epilimnion and hypolimnion of Onondaga Lake, New York State, has been observed during the 1 1/2 years between July 1971 and January 1973. A monitoring program for Onondaga Lake has been carried out since 1968. Grab samples, collected every 2 weeks at 3-m intervals from the surface to the bottom at a station located in the southern basin, have shown decreases of 85 and 76 percent in the average condensed inorganic phosphate concentrations in the epilimnion and hypolimnion, respectively. The orthophosphate concentrations were found to decline by 47 and 15 percent, respectively, over the same period of time. Standard analytical procedures were used to determine the concentrations of total orthophosphate, total inorganic phosphate, and the derived value for total condensed inorganic phosphate. In the past 5 years, a characteristic seasonal succession of phytoplankton has been observed within the lake. There is little growth of plankton in the winter, when the lake is covered by ice; a diatom population develops in the spring; and the green algae Chlorella, Scenedesmus obliquus, Scenedesmus quadricauda, and Oocystis parva dominate the summer period. Blue-green algae of the genus Aphanizomenon follow the die-off of the greens, and dominate the late summer and early fall. In 1972, Aphanizomenon was absent in the succession. Instead, the green algae blooms continued through the summer and fall with cell counts comparable to those measured in previous years. It appears that the alteration of the phytoplankton seasonal succession is the result of reducing the phosphorus concentrations in the photic zone. (Mortland-Battelle)
W74-07566

ACETYLENE REDUCTION BY BEIJERINCKIA UNDER VARIOUS PARTIAL PRESSURES OF OXYGEN AND ACETYLENE,
Ibadan Univ. (Nigeria). Dept. of Agronomy.
E. D. Spiff, and C. T. I. Odu.
Journal of General Microbiology, Vol 78, No 2, p 207-209, October 1973. 1 fig, 9 ref.

Descriptors: *Oxygen, *Nitrogen fixing bacteria, *Nitrogen fixation, Soil bacteria, Methodology, Environmental effects, Nitrogen.
Identifiers: *Beijerinckia indicum, *Acetylene reduction, *Acetylene, Partial pressures, Enzyme activity, Substrate utilization, Fate of pollutants, *Bacterial physiology, Flame ionization gas chromatography, Nitrogenases, Ethylene.

Different partial pressures of acetylene and oxygen greatly affect the level of acetylene reduction by Beijerinckia, a nitrogen-fixing bacterium found in some acidic tropical soils. Nitrogenase activity was measured by the acetylene reduction technique using three replicate vials for each treatment. A milliliter-sample of Beijerinckia culture was usually injected to initiate the reaction and the reaction was usually terminated by injecting 5 N H2SO4 into the reaction mixture. The vials were incubated in a 30 C water bath with reciprocal shaking (152 strokes/min). The ethylene produced was measured by flame ionization gas chromatography. Acetylene reduction increased with an increase of pC2H2 up to 0.74 atm. Acetylene reduction was linear for at least 40 min. The oxygen partial pressure also affected activity with most acetylene reduction at a pO2 of 0.15 atm for liquid cultures grown in air. (Holoman-Battelle)
W74-07572

N VITRO FORMATION OF NITRATE REDUC-ASE USING EXTRACTS OF THE NITRATE EDUCTASE MUTANT OF NEUROSPORA RASSA, NIT-1, AND RHODOSPIRILLUM UBRUM,
Dakland Univ., Rochester, Mich. Dept. of Biological Sciences.
or primary bibliographic entry see Field 5B.
V74-07577

HE EFFECT OF LACK OF A CARBON OURCE ON NITRATE-REDUCTASE ACTIVI-Y IN ASPERGILLUS NIDULANS,
a Trobe Univ., Bundoora (Australia). Dept. of enetics.
. J. Hynes.
ournal of General Microbiology, Vol 79, No 1, p 55-157, November 1973. 1 fig, 10 ref.

escriptors: *Cultures, *Inhibitors, *Carbon, imiting factors, Bioassay, Enzymes, Biochemisy, Fungi.
dentifiers: *Aspergillus nidulans, *Nitrate reducse, *Culture media.

ycelia of Aspergillus nidulans were grown under ducing conditions and then transferred to varius media and incubated further. Samples were arvested at various intervals and assayed to study e effect of carbon starvation on nitrate-reducse activity. Nitrate-reductase activity rapidly sappeared in medium in which further synthesis the enzyme was not possible or in medium cking a carbon source. Absence of inducer and pression by ammonium caused rapid loss of acvity. Cycloheximide, at 10 micrograms/ml, only ightly reduced the rate of enzyme loss and, in ct, cycloheximide itself caused loss of nitrateductase activity. A lower concentration of ycloheximide (1 microgram/ml) has a similar effct. Methylammonium chloride caused rapid loss activity in this strain. An even greater rate of nzyme disappearance was found when mycelium as starved for carbon. An attempt to demonrate in vitro inactivation of nitrate reductase and utamate dehydrogenase by mixing crude myceli extracts and incubating was not successful. owever, this experiment did show that it was unkely that accumulation of an inhibitor of the enymes during carbon starvation could account for e results. Pre-induced beta-galactosidase activity not rapidly lost from carbon-starved mycelium, or does the activity of this enzyme increase in edium lacking a carbon source in the absence of inducer. Therefore it seems that various enymes show different responses to carbon starvaon and different absolute requirements for the esence of inducer. In the case of nitrate reducse there is an absolute requirement for inducer d for the presence of a carbon source. (Littleattelle)
74-07581

ATURE AND TOXICITY OF TWO OX-CHLORDANE PHOTOISOMERS,
gricultural Research service, College Station, ex. Veterinary Toxicology and Entomology esearch Lab.
. W. Ivie.
ournal of Agricultural and Food Chemistry, Vol , No 6, p 1113-1115, November/December 1973. ig, 1 tab, 18 ref.

escriptors: *Pesticide toxicity, Degradaon(Decomposition), Light.
entifiers: *Oxychlordane, Photodecomposition, *Photoisomers, Chlordane, mple preparation, Photooxidation, Isomers.

mixture of 2.5 mmol each of oxychlordane and nthone in 50 ml of chloroform was streaked over e surface of several 0.25-mm silica gel chroatoplates to a concentration of about 0.2 mg of xychlordane/sq cm. The plates were exposed to rect sunlight for 24 hr over a period of 3 days; en the gel was scraped and the products were extracted with chloroform. Tlc revealed two major photoproducts in addition to the parent compound. These derivatives were methylene-bridged isomers, one containing a keto group generated by photochemical cleavage of the oxychlordane oxirane ring and the other with an intact epoxide moiety. Their information was greatly accelerated by xanthone photosensitizer. Oxychlordane and its keto photoisomer are quite toxic to white mice, but the second isomer is of very low toxicity. (Little-Battelle)
W74-07584

BACTERIA-ASSIMILABLE ORGANIC COMPOUNDS, PHOSPHATE, AND ENHANCED GROWTH OF BACTERIA-ASSOCIATED BLUE-GREEN ALGAE,
Cincinnati Univ., Ohio. Tanners' Council Lab.
W. Lange.
Journal of Phycology, Vol 9, No 4, p 507-509, December 1973. 20 ref.

Descriptors: *Aquatic bacteria, *Aquatic algae, *Eutrophication, *Nutrients, *Algal control, *Water pollution control, Organic compounds, Limiting factors, Plant growth, Plant physiology, Cyanophyta, Nutrient requirements, Phosphorus, Cobalt, Iron, Lake Erie, Water quality control.
Identifiers: *Algal physiology, Organic carbon, Metal chelates, Species interaction, Assimilation.

The complexities of algal physiology and nutrition make it likely that diverse and often substantial nutrient limitation will be required to control eutrophication in different situations. In defense of a policy exemplified by the generalization 'phosphorus is the primary limiting nutrient in most lakes,' Schindler of the Canadian Freshwater Institute has misquoted the work of Lange. Key points of Lange's conclusions are properly quoted, and the reader is cautioned against an oversimplification of a single approach to algal control. (Holoman-Battelle)
W74-07587

EFFECT OF ANHYDROUS AMMONIA ON A CENTRAL TEXAS POND, AND A REVIEW OF PREVIOUS RESEARCH WITH AMMONIA IN FISHERIES MANAGEMENT,
Texas A and M Univ., College Station. Dept. of Biology.
M. A. Champ, J. T. Lock, C. D. Bjork, W. G. Klussmann, and J. D. McCullough, Jr.
Trans Am Fish Soc., Vol 102, No 1, p 73-82, 1973. Illus.
Identifiers: *Ammonia(Anhydrous), Crayfish, *Fisheries management, Frogs, Phytoplankton, Ponds, Reviews, Shrimp, *Texas, Vegetation, Zooplankton.

A pond located on the Texas A and M University range area, College Station, (1.78 surface ha, 40-427 m3) was treated with anhydrous ammonia in Nov. 1968, for evaluation of this technique for simultaneous fish eradication, pond fertilization, and aquatic vegetation control. The effect of such treatment on pond ecology is reported. Chemical, physical, and biological data were taken 1 wk prior to, on the day of, and at selected intervals for 12 mo. following treatment. Ammonia N levels before treatment were 0.2 to 0.4 ppm. The day after treatment the ammonia N level stabilized to 37.7 ppm and gradually declined to 5.0 ppm after 3 mo. The pH before treatment was 6.9. A maximum pH of 10.3 was recorded during treatment and it stayed above 9.0 for 2 wk following treatment. Titratable CO2 decreased as the pH and carbonates increased. Phytoplankton counts were reduced by 96% and zooplankton counts were reduced 99% following treatment. Rooted aquatic vegetation was decimated. Dead frogs and tadpoles were observed. The most adversely affected macroinvertebrates were crayfish and freshwater shrimp. A total fish kill was indicated since no live fish were taken by trawl, or seine, and none were observed after treatment.--Copyright 1973, Biological Abstracts, Inc.
W74-07595

PHARMACODYNAMICS OF METHYL MERCURY IN THE RAINBOW TROUT (SALMO GAIRDNERI): TISSUE UPTAKE, DISTRIBUTION AND EXCRETION,
State Univ. of New York, Buffalo. Dept. of Biochemistry.
F. J. Giblin, and E. J. Massaro.
Toxicol Appl Pharmacol. Vol 24, No 1, p 81-91, 1973. Illus.
Identifiers: *Distribution, Excretion, *Methyl mercury, *Rainbow trout, Salmo-Gairdneri, Scintillation spectrometer, *Absorption, Fish tissue.

The tissue distribution, rate of uptake and concentration of 203 Hg-labeled methyl mercury was investigated in 20 different tissues/organs over a period of 100 days following a single intragastric dose of 0.5 Hg/kg body weight. Mercury content was analyzed by gamma scintillation spectrometry. After 1 hr, mercury concentration factors > 0.1 were detected in the blood, heart, liver, spleen and kidney (a concentration factor (CF) of 1.0 equals mercury concentration in dose). Highest mercury concentrations (CF > 7.0) were observed in the blood (at 7 days) and spleen (at 14 days). After 100 days, the CF of the blood was >2.0 and the CF values of the spleen, Kidney and liver were >1.0. Maximum CF values were reached in the skeletal muscle, brain and lens after 34, 56 and >90 days respectively. Maximum values were reached in most other tissues.organs at approximately 7 days. Skeletal muscle appeared to function as a reservoir for methyl mercury and accumulated 50% of the dose from 34-100 days post administration. Methyl mercury accumulation in the brain was limited to 0.1% of the dose. The rate of mercury excretion appeared to be biphasic as a result of a slow elimination from the skeletal muscle relative to the other tissues/organs. Employing both the slow and fast rate, the half-retention time for methyl mercury in rainbow trout was estimated to be >200 days. The toxicity to humans of methyl mercury present in fish tissues was mentioned.--Copyright 1973, Biological Abstracts, Inc.
W74-07597

5D. Waste Treatment Processes

SANITARY SERVICES IN TENNESSEE, 1972.
Tennessee State Planning Office, Nashville.
Available from the National Technical Information Service as PB-221 531, $7.50 in paper copy, $1.45 in microfiche. Final Report. May 1973. 102 p, 15 tab. HUD CPA-TN-04-33-1006.

Descriptors: *Utilities, *Water supply, *Sewerage, *Waste disposal, *Tennessee, Waste dumps, Rates, Sources of supply(Water), *Treatment facilities.
Identifiers: *Sanitary services inventory.

This tabulation of data on water and sewer systems, and refuse and garbage collection services in Tennessee was compiled by means of mailed questionnaires. Information on those systems which did not respond to the 1972-1973 questionnaire was, where available, repeated from the last report from those systems. Data on water and sewer systems in 279 cities and towns, arranged by population groupings, include information on the water source, daily capacity, the receiving stream (sewer), types of water treatment, types of sewer treatment, sewage output, net monthly rates for residential and non-residential users, the date the rates became effective, the number of customers during the last fiscal year, and gross revenue for that year. Data on 136 utility districts are similarly arranged. Refuse and garbage collection data are provided for 204 cities and towns, also arranged by population groupings. Included are data on the type of service provided, method of disposal, frequency of residential and commercial collection, and charges for residential

and commercial services. (Hoffman-North Carolina)
W74-07060

PRELIMINARY WATER AND SEWER PLAN FOR ALCORN, BENTON, MARSHALL, PRENTISS, TIPPAH, TISHOMINGO COUNTIES.
Northeast Mississippi Planning and Development District, Booneville.
Available from the National Technical Information Service as PB-223 320, $3.00 in paper copy, $1.45 in microfiche. April 1973. 16 p, 6 fig. HUD CPA-MS-04-25-1002.

Descriptors: *Sewerage, *Water supply development, Water wells, *Mississippi, *Water demand, *Projections, *Planning.
Identifiers: Alcorn County(Miss), Benton County(Miss), Marshall County(Miss), Prentiss County(Miss), Tippah County(Miss), Tishomingo County(Miss).

Existing water and sewer systems in the Northeast Mississippi Planning and Development District (NEMPDD) are inventoried. Proposed systems are based upon a preliminary analysis taking into consideration present and future needs, demands and desirability, excluding, however, any evaluation of economic feasibility. A detailed planning study and economic feasibility analysis will follow. Practically every municipality in NEMPDD's jurisdiction needs to expand and improve its existing sewer system. Most municipalities fail to serve the entire population within their corporate limits and even fewer serve the entire limits of the urban area. The preliminary sewer plan also proposes sewage facilities be constructed in the Yellow Creek Industrial Park in Northeast Tishomingo County. Water in NEMPDD's jurisdictional area is of uniformly high quality, and is primarily derived from wells. However, industrial demand for water quality of a higher standard, and a general decrease in recent years in the level of ground water tables, indicate the need for additional treatment facilities. One alternate would be a regional water supply grid system for Alcorn, Prentiss, Tippah, and Tishomingo Counties. A water filter plant on the Yellow Creek embayment of Pickwick Lake would be the primary water source for this system. (Hoffman-North Carolina)
W74-07062

WATER AND WASTEWATER SYSTEMS INVENTORY - REGION H, NORTH CAROLINA,
Pee Dee Council of Governments, Troy, N.C.
N. W. Chesson, and R. M. O'Brien.
Available from the National Technical Information Service as PB-222 565, $4.00 in paper copy, $1.45 in microfiche. July 1973. 32 p, 1 fig. NCP 1006-NM-5.

Descriptors: *Water supply, *Water sources, *Waste water treatment, *Waste water disposal, *North Carolina, Municipal wastes, Waste treatment, Water pollution, Water quality, Sewage effluents, Water treatment, Sewage treatment, Tertiary treatment, Water pollution sources, Water resources development, Water demand, Water policy, Waste disposal, Municipal water.
Identifiers: Anson County(NC), Montgomery County(NC), Moore County(NC), Richmond County(NC), *Regional planning.

Proposed and existing water and wastewater systems in Anson, Montgomery, Moore, and Richmond Counties of North Carolina are described and serve as a base for the regional plan being developed by the Pee Dee Council of Governments. While natural boundaries separate these counties and cause projects to be county-or sub-county-wide, region-wide projects are being studied. Water is abundant in the region, but many sub-areas are remote from the sources. These sub-areas are susceptible to contamination and will be costly in terms of the extent of treatment required; therefore, they are priority areas for water resource planning. Satisfactory wastewater disposal sites are not locally accessible to a large portion of Region H since most streams are too small to accept volume effluent discharges. Wastewater treatment plants must also be capable of tertiary treatment levels, and no plant is presently capable of this level. Regional wastewater systems planning is therefore a high priority. Several older communities must install wastewater facilities to avoid polluting nearby watersheds. Regional outfall and treatment systems should make these installations feasible. Significant development should not be undertaken until water quality determinations are made for that area. (Grden-North Carolina)
W74-07063

WALLOWA LAKE BASIN COMPREHENSIVE PLAN.
Stevens, Thompson and Runyan, Inc., Portland, Oreg.
Available from the National Technical Information Service as PB-224 147, $5.25 in paper copy, $1.45 in microfiche. Prepared for Board of County Commissioners, Wallowa County, Enterprise, Oregon. Comprehensive Plan, 13 p. (uncut) 4 fig, 2 tab and Technical Supplement, May 1973. 33 p, 2 fig, 1 tab, 1 append.

Descriptors: *Water zoning, *Urbanization, *Land use, Lake basins, *Comprehensive planning, Land development, Lake shores, Water distribution(Applied), Sewers, Sewerage, Public utilities, Costs, Lakes, Zoning, Local governments, *Oregon.
Identifiers: *Lake Wallowa(Ore), Joseph(Ore).

A Land Use Plan for long-range development and environmental protection of natural and scenic amenities of the Wallowa Lake Basin in Oregon is presented. The Plan outlines service areas for the provision of public water and sewerage facilities. These services are necessary to public health and safety as well as in preserving the high water quality of Wallowa Lake. Preliminary designs for water and sewer, showing general location and type of facilities necessary and cost estimates are given. Limited development will continue on the south, west, and north sides of the lake. A sewer collection system will serve these areas and will connect to the City of Joseph's system. A separate water system will serve the south and west portion of the lake while an improved Joseph water system will serve the north shore area. In light of the Land Use Plan, recommendations for updating the County Zoning Ordinance are also suggested. These include the addition of zones for rural-residential, open space, resort-residential, and timber; the modification of present C-2 zone which allows for the uncontrolled mix of residential and commercial uses; increasing minimum lot sizes for the agricultural zones; and amendment of the zoning map to conform with the Land Use Plan. (Hoffman-North Carolina)
W74-07065

UTILITIES AND FACILITIES FOR NEW RESIDENTIAL DEVELOPMENT: A SURVEY OF MUNICIPAL POLICY,
Urban Land Inst., Washington, D.C.
J. R. McKeever.
Technical Bulletin No 27, December, 1955. 100 p, 5 tab.

Descriptors: *Planning, *Water supply, *Sewerage, *Financing, *Urbanization, *Land development, *Utilities, Water demand, Surveys, Cities, Sewers, Political aspects, Legal aspects.
Identifiers: Utility extension, Subdivision regulations, Land developers, Questionnaire, Urban growth, Urban counties, Sanitary sewers, Water mains, Municipalities.

Responsibility for utility installation has gradually shifted from the municipality to the land developer in suburban growth. Many local governments cannot cope financially with the necessary expenditures nor can individual homeowners carry the burden of property tax levies. Thus municipalities upgrade their requirements governing the development of land and shift the responsibility. Friction arising between developers and the municipality over the matter of who installs and pays for utilities and facilities comes when developers want to avoid their proper responsibilities, or when approval authorities strive to overreach the extent of their assigned functions. Subdivision regulations must adequately differentiate between improvements required for the immediate project and those needed to serve a territory beyond. Based on this 1955 survey of the responding cities (115 out of 140) having 50,000 or more population, 61% required the developer to pay for all water mains where called for by subdivision regulations, 78% for all sanitary sewers, and 71% for all storm sewers. In 64% of the cities replying, the developer was not reimbursed for any installation costs on these and other utilities such as sidewalks and paving. In 43% of the cities, the city paid the cost of larger water and sewer mains when these were needed to serve development outside the subdivision. In urban counties, the trend is toward requiring the developer to pay for items required to transform raw acreage into finished house sites. (Edwards-North Carolina)
W74-07071

WATER QUALITY MANAGEMENT ELEMENT FOR THE KENTUCKY RIVER AREA DEVELOPMENT DISTRICT COMPREHENSIVE WATER AND SEWER PROGRAM.
Mayes, Sudderth and Etheredge, Inc., Lexington, Ky.
Available from the National Technical Information Service as PB-223 046; $6.75 in paper copy, $1.45 in microfiche. HUD-CPA-KY-04-35-1000.

Descriptors: *Stream pollution, *Water supply, *Water quality control, Waste water(Pollution), Water pollution sources, Sewerage, Coal mines, Mine wastes, *Waste water treatment, Sewage lagoons, Kentucky, Treatment facilities.
Identifiers: *Kentucky River, Kentucky River Area Development District.

The Kentucky River Area Development District contains most of the headwaters of the Kentucky River, one of the principal rivers in Kentucky. Many municipalities, both within and without the District use it as a water supply source. Consequently, pollution of the river is of great concern. There are 3 major sources of pollution in the Kentucky River: coal mining activities, untreated domestic waste, and municipal plant effluents. A major hindrance to the reduction or elimination of the pollution problems has been the lack of water quality data, including knowledge on the exact source of the pollution, the magnitude of the pollution, and mine site locations. A District-wide Authority would be the best vehicle for a coordinated approach to water quality control. The Authority would be responsible for all potable water production facilities and such water distribution facilities that would elect to join the Authority, plus all the sewage treatment facilities in the District and the sewage collection facilities that elect to join the Authority. The need for additional sewage collection and treatment facilities in the individual service areas is set forth. Alternate methods of sewage treatment include the use of tertiary lagoons, where physically possible, and advanced tertiary treatment facilities. (Hoffman-North Carolina)
W74-07077

INTERIM STORM DRAINAGE PLAN REPORT-LITTLE ROCK-NORTH LITTLE ROCK METROPOLITAN AREA.
Metroplan, Little Rock, Ark.
Available from the National Technical Information Service as PB-221 037; $6.00 in paper copy,

.45 in microfiche. March, 1973. 71 p, 9 fig, 2 tab, ippend. HUD-CPA-AA-06-37-1008.

escriptors: *Storm runoff, *Storm drains, Flood control, *Drainage systems, *Storm water, ities, Costs, Subsurface drainage, *Arkansas, rainage programs, Drainage engineering.
lentifiers: *Little Rock metropolitan area(Ark), ulaski County(Ark.), Saline County(Ark.), ourche Creek(Ark.).

compilation of the existing storm water plans d flood control reports for local governments in e Little Rock-North Little Rock SMSA is given. ssentially these, when regarded collectively, ver most of the urban and urbanizing area in Puski and Saline Counties. Part One of this report cuses on the City of Little Rock including most pects of storm water drainage, i.e. basic ydrology, topography, inventory of existing ainage facilities, drainage plans, cost estimates d priorities for recommended improvements. aps which show existing and proposed storm ainage facilities are located by reference. Part wo suggests solutions for areas in Pulaski County here major problems already exist and where inreasingly serious problems will develop as urban evelopment continues. Preliminary engineering udies are given for Fourche Creek, Fourche land, Dark Hollow, White Oak Bayou and ayou Meto. The cities' deficiencies, short range ans and priorities for additional storm water cilities are assessed. For the benefit of those cies without a program an appendix is included hich displays unit costs for engineering and conruction services. (Hoffman-North Carolina)
74-07082

ATALYTIC OXIDATION OF PHENOL IN ILUTE CONCENTRATION IN AIR,
elaware Univ., Newark. Dept. of Chemical Engineering.
. A. Walsh, and J. R. Katzer.
ndustrial and Engineering Chemistry, Process esign and Development, Vol 12, No 4, p 477-481, 973. 3 fig, 2 tab, and 27 ref. OWRR A-014-EL(6), 14-31-0001-3208, 3508, 3808.

escriptors: *Catalysts, *Phenols, *Oxidation, Kinetics, *Air pollution, Chemical reactions, Industrial wastes, Copper oxide, Waste treatment, Waste water treatment, Order.
lentifiers: *Catalytic oxidation, Vapor-phase oxlation.

he vapor-phase oxidation of phenol at concentraons from 875 to 26 ppm (vol) over copper oxide n alumina was studied in a fixed-bed tubular reacr between 150 and 270 degrees C in the presence f 8.4 to 13.4 mol% water vapor. Catechol, ydroquinone, and organic acids, which are reorted to form in appreciable quantities in the omogeneous oxidation of phenol, are not oberved in the vapor-phase catalytic oxidation. Oranic intermediates, probably o- and p-benzoquine, occur in appreciable quantities in the catalytic xidation at intermediate phenol conversions. At oderate temperatures (250 degrees) and low conersions (30%) approximately one-half of the henol oxidized is converted completely to CO2 nd H2O. This indicates that ring opening is a relavely difficult step in the reaction network. The apor-phase oxidation is first order with respect to henol over the range of conditions studied and xhibits an Arrhenius activation energy of 10 cal/mol.
74-07086

CID NEUTRALIZATION DOESN'T COST IUCH,
falconbridge Nickel Mines Ltd., Toronto Ontario); and Acres Consulting Services, Ltd., oronto (Ontario).
. S. Rivett, and U. M. Oko.
Vater and Waste Engineering, p B12-B16, March 973. 4 tab.

Descriptors: *Waste water treatment, *Mine wastes, *Neutralization, Acid mine water, Capital costs, Operating costs, Limestones, Sulfur compounds, Sulfides, Heavy metals, Settling basins.
Identifiers: Mine tailings.

A major pollution problem associated with the mining and treatment of sulphide ores is the formulation of acids. The Falconbridge Nickel Mines, Ontario, has developed an effective program to neutralize acid and improve processing water quality at a modest investment and low operating costs. The initial problem arises when water comes in contact with the sulphide mineral pyrrhotite in processing causing small amounts of sulphur to dissolve forming a compound which eventually would oxidize into sulphuric acid. In developing its Strathcona mine and concentrator, the company faced two problems. The only available water source was inadequate; in addition Moose Lake water was already acidic, a result of earlier concentration operations. The solution was to utilize part of the lake both as a reservoir and an oxidizing basin. A dam and spillway were constructed to allow introduction of a continuous stream of finely ground limestone to neutralize acidity. The operation operates continuously and automatically producing a satisfactorily stream of good quality neutral water. Annual operating expenses average about $27,000, including $15,000 for limestone, $2,000 for power. Estimated cost of the plant, excluding building and dam costs, was 0.7 cents per 1000 gallons of water treated as compared to the over 10 cents treatment costs in much of North America. (Schroeder-Wisconsin)
W74-07124

COSTS OF WASTEWATER RENOVATION,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
R. Smith.
Available from the National Technical Information Service as PB231805, in $3.00 paper copy, $1.45 in microfiche. November 1971. 7 fig, 4 tab, 6 ref.

Descriptors: *Water treatment, *Water costs, *Water reuse, *Waste water treatment, Water supply, Design, Water distribution(Applied), Distillation, Demineralization, Reverse osmosis, Irrigation water, Industrial water, Potable water, Denitrification, Capital costs, Operating costs, Maintenance costs.

The economic feasibility of using renovated waste water to supplement raw water sources is examined. The first element considered is the total cost of water supplies from traditional sources. Operating, maintenance and capital costs are estimated to provide 1, 10, and 100 mgd supply requirements. Waste treatment costs are estimated to handle the discharge of waste water back into the environment. Operating and capital costs are also estimated for various waste water renovation processes to supply 1, 10, and 100 mgd requirements. The cost of such treatment is dependent on the uses to which the water will be applied. For example, some agricultural uses may be able to use secondary effluent. In general, waste water renovation may represent higher costs than water from normal sources. Waste water renovation, however, compares favorably with the development of new sources of raw water. Costs of these new sources are estimated under the Texas Water Plan, for the Metropolitan Water District of California, and for the City of Los Angeles. (Schroeder-Wisconsin)
W74-07141

WATER TREATMENT APPARATUS,
A. Wikey.
U.S. Patent No. 3,769,196, 3 p, 5 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 915, No 5, p 1841, October 30, 1973.

Descriptors: *Patents, *Aeration, *Sterilization, *Electrolysis, *Pollution abatement, *Waste water treatment, Biochemical oxygen demand, Bacteria, Equipment, Water pollution treatment, Industrial wastes.

An electrolysis unit uniquely suited for treating water by sterilization and aeration, comprises at least one pair of electrodes placed in juxtaposed position and being oppositely polarized. The polarization is periodically reversed to prevent residual build up on the plates. By simple modifications and by increasing the number of electrodes the unit may be used to treat water in flowing streams, lakes, ponds, aquariums, beach sections, in private homes, or in industrial plants. (Sinha - OEIS)
W74-07196

PROCESS OF SEPARATION OF EMULSIFIED OR DISPERSED MATTER FROM WATER,
E. H. Baer.
U.S. Patent No 3, 769,207, 3 p, 8 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 915, No 5, p 1843, October 30, 1973.

Descriptors: *Patents, *Waste water treatment, *Flotation, Sludges, Pollution abatement, Water pollution control, Water quality control, Equipment, Facilities, Emulsions, Suspended solids, Separation techniques.
Identifiers: Suction jets.

A chamber is adapted for flotation of impurities and production of floating sludge on and above the surface of the water within the chamber. A knife edge is situated above the water level, and parallel to it. The knife edge is adapted to sever that part of the floating sludge which extends above the water surface. A movable suction jet situated above the knife, moves in unison with the knife edge and pneumatically removes the severed sludge without disturbing the water surface. (Sinha - OEIS)
W74-07197

PLASTIC MOVING-SURFACE TREATMENT OF SEWAGE,
Biospherics, Inc., Rockville, Md. (assignee).
G. V. Levin.
U.S. Patent No 3,779,906, 5 p, 1 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 917, No 3, p 1086, December 18, 1973.

Descriptors: *Patents, *Sewage treatment, *Activated sludge, *Microorganisms, Pollution abatement, Water pollution control, Water quality control, Phosphates, Nutrients, Organic matter, Polymers, Plastics, *Waste water treatment.

Influent sewage is mixed with activated sludge providing a mixed liquor which is aerated in the presence of a quantity of particles of synthetic plastic. The added surface attracts microorganisms and the nutrients and organic matter necessary for their growth. The mixture is settled and subsequently the clarified liquid is removed while part of the sludge is recirculated along with the plastic particles. The plastic particles range in size from 0.05 to 1.0 mm in diameter and have a specific gravity ranging from about 0.9 to 1.3. Before recycling the sludge it may be passed to a phosphate-stripping zone. The microorganisms in the sludge release phosphate thus providing a phosphate enriched supernatant liquor. (Sinha - OEIS)
W74-07198

METHOD OF AND APPARATUS FOR THE PURIFICATION OF WATER CONTAINING ORGANIC CONTAMINANTS,
Laboratorium fuer Adsorptionstechnik, G.m.b.H., Frankfurt am Main (West Germany). (assignee).
W. Wisfeld, H. Wirth, W. Lotz, and A. Kratz.
U.S. Patent No 3,779,909, 5 p, 2 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 917, no 3, p 1086, December 18, 1973.

Descriptors: *Waste water treatment, *Patents, *Water purification, *Oxygenation, *Filtration, *Chlorination, Water treatment, Water quality control, Activated carbon, Equipment.

Ground or surface water containing unwanted organic matter is fed into a trickle tower. After being subjected to an oxygen containing gas stream, it is passed through an activated carbon filter system. The effluent is then treated with at least 0.05 mg/liter of chlorine or with an equivalent disinfectant. (Sinha - OEIS)
W74-07199

FLUOROCARBON AND OXYGEN-PROVIDING COMPOUND TREATMENT OF WASTE WATERS,
M. G. Hicks.
U.S. Patent No 3,781,200, 3 p, 4 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 917, No 4, p 1415, December 25, 1973.

Descriptors: *Patents, *Waste water treatment, Oxygenation, Pollution abatement, Water quality control, Water pollution treatment, Solvents, Ozone, Bubbles.
Identifiers: *Fluorocarbon, *Fat, *Freon, Oxygen compounds.

Heavy Freon is used as a solvent to remove fat from waste water. Freon is mixed with at least one oxygen containing compound selected from the group hydrogen peroxide, ozone, oxygen and air. The mixture is delivered into the wastewater and oxygen is diffused upward through the water in the form of bubles. The Freon containing the fat is continuously drawn off and taken to the next stage where the fat and Freon are separated so that the Freon can be used again. (Sinha - OEIS)
W74-07200

APN ARATUS FOR SEPARATING OIL AND SOLIDSFFRM M WATER,
Black, Sivalls and Bryson, Inc., Oklahoma City, Okla. (Assignee)
F. J. Barra, and K. R. Murrell.
U.S. Patent No 3,784,010, 5 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 918, No 2, p 679, January 8, 1974.

Descriptors: *Patents, *Filtration, *Waste water treatment, *Oil pollution, *Suspended solids, Pollution abatement, Water pollution control, Water quality control, *Separation techniques, Equipment.

A closed vessel is divided by a vertical partition. A second vertical partition is disposed within the lower portion of the first compartment dividing it into two separate filter areas each having a filter bed. An inlet water conduit extends within the first compartment and a pair of slotted water distribution conduits are positioned horizontally with the filter area. The conduits are connected to the inlet water conduit. Filtered water outlets are disposed in the bottom part of the second compartment. A backwash pump is connected to the conduit and valves control the flow of filtered water from the first to the second compartment. Backwash water flows from the second compartment separately to the filter area of the first compartment, through the filter beds and out of the first compartment by way of the slotted inlet water distribution conduits. (Sinha - OEIS)
W74-07202

SYSTEM AND METHOD FOR SEPARATING HEAVIER AND LIGHTER COMPONENTS OF LIQUID MIXTURES,
Esso Production Research Co., Houston, Tex. (assignee).
J. A. Garcia.
U.S. Patent No 3,784,468, 2 p, 4 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 918, No 2, p 790, January 8, 1974.

Descriptors: *Patents, *Flotation, Gases, *Aeration, *Oil pollution, *Waste water treatment, Pollution abatement, Water quality control, Water pollution control, Cyclones, *Separation techniques, Equipment
Identifiers: *Gravity separation

The method and system for separating the components of a liquid mixture in which cyclones are used to force gas into the mixture for the purpose of aiding in floating the lighter component in a specially provided flotation cell or series of flotation cells is disclosed. The misture of liquids (oil and water) is delivered by conduit to a cyclone by means of a pump. The bottom of the cyclone is positioned in the gas environment. The vortex formed in the center of the cyclone sucks gas up to mix with the swirling liquid under pressure. The rising gas floats oil and possibly light solids to the surface of the liquid. The floated oil and solids overflow into a trough and are led away through a duct. The heavier liquid is pumped through a conduit into another cyclone where the mixing and charging with gas is repeated. (Sinha - OEIS)
W74-07203

WATER PURIFICATION APPARATUS,
Walter Dorwin Teague Associates, New York. (assignee).
J. E. Ryan, and S. Gollin.
U.S. Patent No 3,785,490, 3 p, 2 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 918, No 3, p 1056, January 15, 1974.

Descriptors: *Patents, *Waste water treatment, Pollution abatement, *Aeration, *Froth flotation, *Water purification, *Suspended solids, Water pollution control, Water quality control, Equipment.

A pump is used to deliver influent from a storage reservoir into a froth flotation tank. The pump is subject to intermittent air-binding thereby introducing air into the influent prior to its delivery to the froth flotation tank. The reservoir receives influent at a substantially constant rate lower than the pump capacity so that the pump has a tendency to intermittently air-bind. This results in a large amount of extremely fine air bubbles being introduced into the influent to cause the formation of a froth which rises to the surface carrying with it suspended solids. (Sinha - OEIS)
W74-07209

WATER PURIFICATION SYSTEM,
Delro, Inc., New Castle, Del. Assignee.
L. E. Huffman.
U.S. Patent No 3,786,924, 6 p, 1 fig, 8 ref; Official Gazette of the United State Patent Office, Vol 918, No 4, p 1438, January 22, 1974.

Descriptors: *Patents, *Waste water treatment, *Water quality control, *Water purification, *Reverse osmosis, Membranes.

A water purification system consists of a reverse osmosis unit having a feed water inlet, a permeate outlet, and a membrane structure between the feed water inlet and the permeate outlet. The reverse osmosis unit also has a concentrate outlet upstream from the membrane structure in fluid communication with the feed water inlet. There is a conduit for delivering raw water from a supply source to the feed water inlet, and a pump in the conduit for establishing a pressure responsive device for activating and deactivating the pump in response to preselected levels of vessel pressure. (Sinha-OEIS)
W74-07213

FOAM FLOTATION CONCENTRATION OF SEWAGE,
FMC Corp., San Jose, Calif. Assignee.
E. H. Brink, and W. G. Palmer.
U S Patent No 3,787,316, 6 p, 7 fig, 5 ref, Offici Gazette of the United States Patent Office, V 918, No 4, p 1535, January 22, 1974

Descriptors *Patents, *Sewage treatment, *Was water treatment, *Aeration, *Activated sludg *Flotation, *Anaerobic digestion, Water quali control, Water pollution control, Bubbles, Foa ing.

Raw sewage is subjected to primary settling, aer tion and secondary settling to produce activate sludge. Part of the activated sludge from second ry settling is returned for aeration and part wasted Sludge from primary settling is delivere to an anaerobic digester. The wasted activate sludge is concentrated and a partially clarified ef fluent is derived from it. The concentrated was sludge is introduced into the anaerobic digeste The innovation comprises the steps of diffusing water foam of surfactant-stabilized air bubble into the wasted activated sludge before the latte enters the concentrator The wasted activate sludge is concentrated by the lifting action of th air bubbles to form a blanket. The blanket is the skimmed off for delivery to the digester. (Sinha OEIS)
W74-07214

WASTE WATER PROCESS TANK CONTRO FACILITY,
Carter (Ralph B.) Co., Hackensack, N. J. As signee.
W. O. Boschen, and O. A. Grieshaber.
U.S. Patent No 3,788,472, 4 p, 1 fig, 4 ref; Offici Gazette of the United States Patent Office, Vo 918, No 5, p 1847, January 29, 1974.

Descriptors: *Patents, *Waste water treatment *Pollution, abatement, Water pollution control Water quality control, Sensors, Equipment *Control systems.

The invention comprises a control box containing a control system having suitable relays and othe elements and a panel with indicators mounted thereon which may be located in the control box o removed thereform. Suitable sensors are located in critical portions of the system and the sensors are electrically connected to the control box to actuate indicators which are mounted on the pane and to aid in the localizing of trouble and the correcting of such trouble. Some of the sensors may also function as control devices and/or indicators during normal (nonmalfunction) operation. The control system shuts operation down on malfunction and controls the operation of the treatment system in its normal (automatic) condition or in a temporary condition after malfunction. (Sinha-OEIS)
W74-07216

SEWAGE TREATMENT SYSTEM,
D. F. Othmer.
U. S. Patent No 3,788,476, 8 p, 9 ref; Official Gazette of the United States Patent Office, Vol 918, No 5, p 1848, January 29, 1974.

Descriptors: *Patents, *Sewage treatment, *Wastewater treatment, *Oxygenation, Sedimentation, Pollution abatement, Water pollution control, Water quality control, Chemical reactions, Aerobic treatment, Atmospheric pressure, Sludge, *Solids contact processes.

A conventional solids-liquid contactor clarifier with some additions provides means for: (a) addition of air or purer oxygen to sewage waters; (b) pressurizing the sewage water up to 10 atmospheres to increase solubility and concentration of oxygen - hence velocity of chemical and/or aerobic reaction; (c) withdrawing and depressurizing the sewage water to atmospheric pressure to allow most of dissolved gases to be released and to be discharged because of lower solubility for gases at atmospheric pressure; (d) recycling the sewage

water for from 2 to 50 times through this pressurizing-depressurizing cycle; and, when used aboard ship, (e) means for installation in the ship's hold to minimize effects of the ship's movements on the sedimentation operation. It is particularly useful for smaller installations, for use on ships, and other places where waste from not more than several thousand people is to be handled. It also may be used as a sedimentation system alone wherein insoluble solids are settled out to give a clear effluent. The sludge solids produced in an earlier sedimentation, either with or without oxidation, may be oxidized and sedimented in a separate step in the equipment. (Sinha-OEIS)
W74-07217

TREATMENT APPARATUS,
L. S. Love.
U. S. Patent No 3,788,477, 8 p, 22 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 918, No 5, p 1849, January 29, 1974.

Descriptors: *Patents, *Aeration, *Waste water treatment, Pollution abatement, Water pollution control, Water quality control, Equipment, Sludge.
Identifiers: *Clarifiers.

An aeration or mixing basin and a clarifier are formed as one integral unit, separated by a baffle. Flow from the aeration basin into the clarifier is limited by flow control plates. The clarifier has a bottom which slopes toward the aeration basin bottom, so that solids settling in the clarifier flow down the clarifier bottom towards the aeration basin, where they are picked up by circulation in the earation basin and re-suspended. A sludge scraper scrapes the clarifier bottom periodically to dislodge sludge to the bottom, and a scum skimmer skims the clarifier surface periodically to remove scum. (Sinha-OEIS)
W74-07218

WASTE WATER TREATMENT,
Shell Oil Co., New York. Assignee.
W. E. Savage.
U. S. Patent No 3,788,478, 3 p, 2 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 918, No 5, p 1849, January 29, 1974.

Descriptors: *Patents, *Waste water treatment, *Froth flotation, Pollution abatement, Water pollution control, Water quality control, *Aeration, Equipment, Bacteria, Activated sludge, *Biological treatment.

The apparatus for biologically treating aqueous organically contaminated waste consists of an aeration basin in which an open-topped flotation cell is submerged. Separation of the bacterial suspension and recovery of clarified effluent takes place within the aeration zone. The froth formed in the flotation unit is immediately emitted into the surrounding bacterial suspension. As the bubbles of the froth rise, they carry the suspended particles of activated sludge upward for removal. (Sinha-OEIS)
W74-07219

AGITATING AND AERATING APPARATUS,
Xodar Corp., Warwick, R. I. Assignee.
R. L. Clough, Jr.
U. S. Patent No 3,788,616, 7 p, 8 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 918, No 5, p 1885, January 29, 1974.

Descriptors: *Patents, *Waste water treatment, *Aeration, *Pollution abatement, Water pollution control, Water quality control, Equipment.

A see-saw action is produced by a body that is pivotally mounted in the liquid with its pivot located intermediate of its ends. Air is fed to the lower side of the body. The body is adapted to trap alternately at each end enough air to cause that end to rise in the liquid. Trapped air is released when the end has risen a predetermined amount with the result that the body oscillates and agitates as it aerates the surrounding liquid. (Sinha-OEIS)
W74-07221

OZONE IN WATER AND WASTE WATER TREATMENT, A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
Available from the National Technical Information Service as PB-231 797, $4.75 in paper copy, $1.45 in microfiche. Water Resources Scientific Information Center Report WRSIC 74-204, April 1974, 131 p.

Descriptors: *Ozone, *Bibliographies, *Water treatment, *Waste water treatment, Water reuse, Chlorination, *Disinfection, *Oxidation, Potable water, Public health, Tertiary treatment, Viruses.

This report, containing 89 abstracts, is another in a series of planned bibliographies in water resources to be produced from the information base comprising Selected Water Resources Abstracts (SWRA). At the time of search for this bibliography, the data base had 65,916 abstracts covering SWRA through December 15, 1973 (Volume 6, Number 24). Author and subject indexes are included.
W74-07251

HYDROGEN PEROXIDE CURES FILAMENTOUS GROWTH IN ACTIVATED SLUDGE,
District of Columbia Dept. of Environmental Services, Washington.
C. A. Cole, J. B. Stamberg, and D. F. Bishop.
Copy Available from GPO Sup Doc as EP1.23:670/2-73-033, $0.65; microfiche from NTIS as PB-231 848, $1.45. Environmental Protection Agency, Technology Series Report EPA-670/2-73-033, October 1973. 20 p, 8 fig, 13 ref. EPA Project 11010 FYM. 14-12-818.

Descriptors: *Activated sludge, *Waste water treatment, *District of Columbia, *Sphaerotilus, Biological treatment, Aerobic bacteria, Sedimentation, Sewage bacteria, Sludge treatment.
Identifiers: *Hydrogen peroxide, *Biochemical treatment, Bulking, Washington(D.C.).

Laboratory tests at the Dupont Experimental Station substantiated by tests at the EPA-DC Pilot Plant in Washington, D.C. revealed that H2O2 offered a solution to filamentous bulking caused by Sphaerotilus growth. The addition of H2O2 eliminated the free-growing filaments while not deteriorating the spherical aerboic floc. The H2O2 also released oxygen which was beneficial in maintaining a purely aerobic environment. Bulking activated sludge units could be brought under control by doses of H2O2 from 20-200 mg/l for less than one to several days. The sludge volume index of the systems was reduced substantially. The H2O2 treated aeration process could then be brought under control by maintaining proper plant operation. (EPA)
W74-07253

REGENERATION OF CHROMATED ALUMINUM DEOXIDIZERS, PHASE I REPORT,
Boeing Commercial Airplane Co., Seattle, Wash.
H. C. Hicks, and R. A. Jarmuth.
Copy Available from GPO Sup Doc as EP1.23:660/2-73-023, $1.95; microfiche from NTIS as PB-231 835, $1.45. Also available from NTIS as PC$5.00. Environmental Protection Agency, Technology Series Report, EPA-660/2-73-023, December 1973. 160 p, 45 fig, 15 tab, 20 ref. EPA Project 12070 HEK.

Descriptors: Chromium, *Electrolysis, Toxicity, Metals, *Water reuse, Filtration, Centrifugation, Volumetric analysis, Recycling, *Waste treatment, *Oxidation, Reclamation, Industrial wastes.
Identifiers: Aluminum deoxidizer reuse, Chromated deoxidizers, *Chromium reoxidation, *Regeneration, Hexavalent chromium, Trivalent chromium, Dissolved metals removal, Diffusion diaphragm, *Metal finishing waste treatment, Electrolytic reoxidation.

In the metal finishing industry highly concentrated hexavalent chromium solutions are used extensively to deoxidize aluminum surfaces prior to anodizing, conversion coatings, prepaint preparation, welding and adhesive bonding. A regeneration process was conceived and tested to reduce the frequency of discarding the spent chromated deoxidizers. The engineering techniques developed in this project involve reoxidation of trivalent chromium to the hexavalent state by electrolysis thru a diaphragm plus removal of undesirable dissolved metals by crystallization and separation. Results of the accomplished work establish that regeneration of chromated aluminum deoxidizers is feasible, practical and economical. (EPA)
W74-07254

COMBINED SEWER OVERFLOW SEMINAR PAPERS.
Edison Water Quality Research Lab., N.J.
Copy Available from GPO Sup Doc as EP1.23:670/2-73-077, $2.20; microfiche from NTIS as PB-231 836, $1.45. Also available from NTIS as PC$5.75. Environmental Protection Agency Report No. EPA-670/2-73-077, November 1973. 216 p.

Descriptors: *Combined sewers, *Overflow, Management, Control systems, *New York, *Pollution abatement, Storm water, Design, Economics, Costs, *Storm runoff, Sewers, *Waste water treatment, Regulation.
Identifiers: Wet-weather flow.

The Environmental Protection Agency in conjunction with the New York State Department of Environmental Conservation conducted three one-day seminars on the problem of wet-weather flow pollution abatement. Many facets of the problem were considered including a brief overview of its magnitude and what the federal government is doing to manage and control this source of pollution. Various management, control, and treatment techniques were described and the most up-to-date information on design and economics was presented. The audience consisted of consulting and municipal engineers from all areas of New York State. This publication is a compilation of the papers presented at the seminar. (See W74-07256 thru W74-07256) (EPA)
W74-07255

STORMFLOW POLLUTION CONTROL IN THE U.S.,
Edison Water Quality Research Lab., N.J.
R. Field, and A. Tafuri.
In: Combined Sewer Overflow Seminar Papers, Environmental Protection Agency Report No. EPA-670/2-73-077, November, 1973. p 1-47, 22 fig.

Descriptors: *Storm water, *Storm runoff, Combined sewers, *Overflow, *Pollution abatement, Water pollution sources, Water quality control, Standards, Discharge(Water), *Waste water treatment, Treatment facilities, Equipment, Methodology, *Federal government.

The problem of storm water discharges and combined sewer overflows is discussed in relation to the Federal Government's involvement. This overview details wet-weather flow pollution as classified in the categories of combined sewer overflows, storm water discharges, and non-sewered runoff. As a result of program research, development, and demonstration projects, it is maintained that sewer separation in most cases is not the logical course of action for pollution abatement. Therefore the following approaches are being ex-

plored: control, treatment, and combinations of the two. These approaches are discussed under the topics of flow regulation, storage, porous pavement, new sewer systems, auxiliary biological treatment, microscreening, flotation, filtration separation, flow measurement, and management models, as well as the necessary equipment and instrumentation involved. In view of the tremendous quantities of pollutants bypassed during rainfall from the combined sewer system, it is not reasonable to debate whether secondary treatment plants should be designed for high BOD or suspended solids removal, since bypassing at regulators during wet-weather flow occurs. Rather, wet-weather standards must be instituted at various regulatory levels. (See also W74-07255) (Sandoski-Franklin)
W74-07256

PREVENTION AND CONTROL OF INFILTRATION AND INFLOW,
American Public Works Association, Chicago, Ill.
R. H. Sullivan.
In: Combined Sewer Overflow Seminar Papers, Environmental Protection Agency Report No. EPA-670/2-73-077, November, 1973. p 49-56.

Descriptors: *Infiltration, Documentation, *Reviews, Surveys, Economic justification, *Water pollution control, *Inflow, Methodology, Instrumentation, Pollution abatement, Combined sewers.

Some of the major findings of an APWA Foundation report bearing the same title are reviewed together with guidelines for the establishment of a survey to determine the nature and extent of infiltration and some of the factors to be used in making an economic analysis of desirable corrective actions. Steps involved in the complete infiltration-inflow analysis are outlined. Detection methods, equipment, and economic justification with respect to controlling pollution are disclosed. (See also W74-07255) (Sandoski-Franklin)
W74-07257

COMBINED SEWER OVERFLOW REGULATOR FACILITIES,
American Public Works Association, Chicago, Ill.
R. H. Sullivan.
In: Combined Sewer Overflow Seminar Papers, Environmental Protection Agency Report No. EPA-670/2-73-077, November, 1973. p 57-63.

Descriptors: *Storm water, Water pollution sources, Sewers, Water quality control, *Waste water treatment, Equipment, *Combined sewers, *Overflow, *Treatment facilities, *Regulation.

Results of investigative programs in such fields as the pollution of stormwater, the extent of combined sewer facilities, the design, operation, and maintenance of combined sewer overflow regulators, and the prevention and correction of excessive infiltration and inflow to sewers show that storm water is polluted whether or not it is carried in separate or combined sewers. Thus, to meet receiving water quality standards, treatment or control facilities may be necessary and therefore such equipment must be examined. Decision guidelines are presented for the consideration of the combined sewer overflow regulator facility as a possible means for pollution abatement. (See also W74-07255) (Sandoski-Franklin)
W74-07258

PRESSURE SEWERS,
New York State Dept. of Environmental Conservation, Alabany. Environmental Quality Research and Development Unit.
I. G. Carcich.
In: Combined Sewer Overflow Seminar Papers, Environmental Protection Agency Report No. EPA-670/2-73-077, November, 1973. p 65-87, 9 fig, 4 tab, 6 ref.

Descriptors: *Plastic pipes, Investigations, *Waste water treatment, *Combined sewers, Treatment facilities, Evaluation, Pumping, Performance, Operation and maintenance, *Sewers.
Identifiers: *Pressure sewers, Grinder pumps.

The pressure sewer concept deals with a wastewater collection system that utilizes a newly developed grinder pump unit and small diameter plastic or metallic piping systems. Results of a 13-month study undertaken to evaluate the functional specifications of the pumping units and to gain operating experience on the mechanical performance, use pattern, operating cost, and maintenance requirements for said units, are reported. A description of the grinder pump unit and the test results are given. Results indicate used plastic pipes and fittings functioned well for the duration of the demonstration project. It is recommended that pressure sewer systems be considered as available engineering technology for use where applicable. (See also W74-07255) (Sandoski-Franklin)
W74-07259

APPLICATION OF MICROSTRAINING TO COMBINED SEWER OVERFLOW,
Crane Co., King of Prussia, Pa. Cochrane Div.
G. E. Glover.
In: Combined Sewer Overflow Seminar Papers, Environmental Protection Agency Report No. EPA-670/2-73-077, November, 1973. p 89-113, 7 fig, 2 tab.

Descriptors: *Combined sewers, *Overflow, Performance, Investigations, Suspended solids, Flow rates, Treatment facilities, Organic matter, Coliforms, *Storm water, *Waste water treatment.
Identifiers: *Microstrainers.

Studies initiated to determine the performance of microstrainers in removing suspended solids are reported. A flow rate of 2.0 cfs/acre was used as the required instantaneous capacity of the treatment facility. A drawing of the microstrainer tested as well as a description of the operational procedure are given. Test results indicate that the microstrainer will reduce suspended solids from 50-700 mg/liter to 40-50 mg/liter at flow rates of 35 to 45 gpm/sq ft of gross submerged screen area (42-54 gpm of unimpeded submerged area). These flow rates have been routinely achieved within an arbitrary limitation of 24 inches of water differential between inlet and outlet liquid levels. The removal of organic and other oxygen demanding material is 25-40 percent confirmed by BOD, COD, and TOC measurements. Microstraining had negligible effect on the coliform content of the storm water. (See also W74-07255) (Sandoski-Franklin)
W74-07260

HIGH-RATE MULTI-MEDIA FILTRATION,
Environmental Protection Agency, New York. Region II.
P. Harvey.
In: Combined Sewer Overflow Seminar Papers, Environmental Protection Agency Report No. EPA-670/2-73-077, November, 1973. p 115-128, 10 fig.

Descriptors: Evaluation, Performance, Application methods, *Filtration, *Combined sewers, *Overflow, Treatment facilities, Screens, Filters, Optimization, *Construction costs, *Operating costs, Tertiary treatment, Automation, Operation and maintenance, Efficiencies, *Ohio, *Waste water treatment.
Identifiers: *Cleveland(Ohio).

To evaluate the applicability and effectiveness of the high rate filtration process in removing contaminants from combined sewer overflows, a testing program was undertaken at Cleveland, Ohio's Southerly Wastewater Treatment Plant, beginning in 1970. The two major process units used in the proposed treatment system were the drum screen followed by the deep bed, dual media filter. The testing program was conducted in two phases: (1) evaluation and selection of system media and filtration rates; and, (2) optimization of the filtration process via coagulants and polyelectrolyte addition prior filtration. Estimated total construction costs of a filtration plant which discharged waste screenings and filter backwash to the municipal treatment system ranged from $830,000 for the 35 mgd capacity to $3.754 million for 200 mgd capacity at a design rate of 24 gpm/sq ft. Annual cost estimates ranged from $97,270 to $388,210. High treatment efficiencies, automated operation, and limited space requirements are the principal advantages of the proposed system. The high rate filtration process was also evaluated elsewhere, in terms of its capacity for polishing secondary effluent. Test data confirmed the applicability of this media to reducing suspended solids, BOD, and phosphate to low residuals. (See also W74-07255) (Sandoski-Franklin)
W74-07261

SCREENING/DISSOLVED-AIR FLOTATION TREATMENT OF COMBINED SEWER OVERFLOWS,
Envirex, Inc., Milwaukee, Wis. Environmental Sciences Div.
M. K. Gupta, and R. W. Agnew.
In: Combined Sewer Overflow Seminar Papers, Environmental Protection Agency Report No. EPA-670/2-73-077, November, 1973. p 129-151, 3 fig, 7 tab, 4 ref.

Descriptors: *Combined sewers, *Overflow, Treatment facilities, *Waste water treatment, *Flotation, Design criteria, Automation, Operation and maintenance, Equipment, Capital costs, Operating costs, Laboratory tests, Pilot plants, Evaluation, Performance, Suspended solids, *Separation techniques, *Wisconsin.
Identifiers: Screening/dissolved-air flotation, *Racine(Wis).

A major portion of the pollutional substances in combined sewer overflows is particulate in nature indicating that an efficient solid/liquid separation process can be expected to provide an effective treatment. Thus an effective and economical separation process was designed, tested, and developed on a full-scale basis. Two full-scale screening/dissolved-air flotation systems have been installed in Racine, Wisconsin for treatment of combined sewer overflows. Design criteria for each of the various elements is tabulated; systems were designed for completely automatic startup, operation, and shutdown. To insure optimum use of the system, a floodgate was installed in one of the overflow sewers to provide approximately 600,000 gallons of in-system storage. In addition, the system has been equipped to be completely self-draining thus enabling use of the system during periods of snowmelt and cold weather. The cost of the Racine system is $30,000 per mgd installed capacity. (See also W74-07255) (Sandoski-Franklin)
W74-07262

HIGH-RATE DISINFECTION OF COMBINED SEWER OVERFLOW,
Crane Co., King of Prussia, Pa. Cochrane Div.
G. E. Glover.
In: Combined Sewer Overflow Seminar Papers, Environmental Protection Agency Report No. EPA-670/2-73-077, November, 1973. p 153-170, 3 fig, 15 ref.

Descriptors: *Disinfection, *Combined sewers, *Overflow, *Waste water treatment, Water pollution control, Flow rates, *Pilot plants, Chlorine, Turbulence, Design criteria, Treatment facilities, Bacteria.
Identifiers: Bacteria kill.

Work on disinfection of combined sewer overflows has been performed in pilot size contact chambers at a constant flow rate. A bacteria kill of 99.99 percent was achieved with chlorine dosages of 10 ppm in 120 seconds under a flow rate of 20 gpm. The chambers were designed to ensure that the hypochlorite was promptly and well mixed with stormwater as well as to ensure a high degree of small eddy turbulence in the passages of the contact chamber. The extraordinarily high kill rate of these chambers is attributed to the turbulence during contact time. The performance of the pilot units, the preliminary design scheme, and the plans of a 92 cfs chamber designed according to this scheme are detailed. The installed cost of such a chamber has been calculated at about $53,000 (in 1969 dollars). The inherent advantage of increased turbulence economically induced in this type of installation of enhance reaction rates makes the system applicable to many situations. (See also W74-07255) (Sandoski-Franklin)
W74-07263

THE SWIRL CONCENTRATOR AS A COMBINED SEWER OVERFLOW REGULATOR,
American Public Works Association, Chicago, Ill.
R. H. Sullivan.
In: Combined Sewer Overflow Seminar Papers, Environmental Protection Agency Report No. EPA-670/2-73-077, November, 1973. p 171-179, 2 fig.

Descriptors: *Combined sewers, *Overflow, *Waste water treatment, Capital costs, Construction materials, Operation and maintenance, Treatment facilities, Automation, Design criteria, Model studies, *Regulation.
Identifiers: *Swirl concentrator.

As a result of laboratory tests and mathematical modeling, significant portions of settleable and floatable solids can be removed from combined sewer overflows using a swirl concentrator. Advantages of this system include low capital cost, absence of primary mechanical parts, and construction with inert material; operation of the facility is automatically induced by the inflowing combined sewage so that operating problems will be infrequent. Consideration of the use of a swirl concentrator as a combined sewer overflow regulator facility requires evaluation of many factors. The following factors are discussed: hydraulic head differential, hydraulic capacity of collector sewer, design flow, dry-weather flow and interceptor sewer capacity, and amount and character of settleable solids. (See also W74-07255) (Sandoski-Franklin)
W74-07264

THE EPA STORMWATER MANAGEMENT MODEL: A CURRENT OVERVIEW,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
W. C. Huber, J. P. Heaney, and H. Sheikh.
In: Combined Sewer Overflow Seminar Papers, Environmental Protection Agency Report No. EPA-670/2-73-077, November, 1973. p 181-216, 21 fig, 6 ref.

Descriptors: Loads(Forces), *Combined sewers, *Storm water, Overflows, *Storm runoff, Urban runoff, *Mathematical models, Computers, *Simulation analysis, *Rainfall-runoff relationships, Drainage, Storage requirements, Model studies, *Pennsylvania.
Identifiers: *Lancaster(Penn).

The problem of loading by combined and separate storm sewer overflows on streams and other receiving waters has led to the development of a comprehensive mathematical computer simulation program that models quantity (flow) and quality (concentrations) during the total urban rainfall-runoff process. The present Storm Water Management Model (SWMM) is descriptive in nature and will model most urban configurations encompassing rainfall, runoff, drainage, storage-treatment, and receiving waters. It does not define nor determine any decisions for the system or consider alternative methods for efficient economic comparisons. An overview of the SWMM is presented by illustrating its use in Lancaster, Pennsylvania. Major revisions to the Model have been made to include urban erosion prediction, modeling of new treatment devices and biological treatment facilities, monitoring of significant pollution sources, flexibility in modeling new areas, new and improved cost functions for treatment and storage options, and a modest hydraulic design capability as well as minor programming changes and slight format revisions. (See also W74-07255) (Sandoski-Franklin)
W74-07265

LAND APPLICATION OF SEWAGE SLUDGE,
Guelph Univ. (Ontario). Dept. of Land Resource Science.
T. E. Bates.
Environment Canada Research Report No. 1, September, 1972. 212 p, 1 tab, 566 ref. 71-4-1.

Descriptors: *Water reuse, *Bibliographies, *Land management, *Reviews, *Sewage sludge, *Farm management, Nitrogen, Nutrients, Application methods, Copper, Zinc, Cadmium, Nickel, Chromium, Lead, Viruses, *Sewage treatment, Sludge disposal, Pathogenic bacteria.

A literature review was undertaken to determine the extent of present knowledge for ecologically safe and agriculturally productive application of sewage sludges to farm lands. It was concluded that sludge is quite variable in solids and nutrient content from one sewage plant to another and also on a daily basis. Nitrogen is likely to control rates of sludge application which should be restricted to those needed for crop production, yet leaching of phosphorus into the groundwater is not expected to be a major problem controlling application rates. Reports indicate that the metals copper, zinc, cadmium, nickel, chromium, and lead are high in some sludges and may be cause for concern. Studies are reported on the survival of human and animal pathogens and viruses whose populations are reduced by anaerobic digestion and eliminated by heat drying. No information was found concerning the land application of sludges resulting from treating sewage with chemicals for the removal of nutrients. Little information is available on times and methods of sludge applications which will prevent or eliminate water contamination by erosion and runoff. (Sandoski-Franklin)
W74-07266

THE EFFECTS OF HOUSEHOLD SANITARY SYSTEMS ON EFFLUENT PHOSPHATE LEVELS,
Windsor Univ. (Ontario). Industrial Research Inst.
P. D. La Valle.
Environment Canada Research Report No. 2, March, 1973. 67 p, 15 fig, 8 tab, 18 ref. 72-5-14.

Descriptors: *Waste water treatment, *Phosphates, Sanitary engineering, *Septic tanks, *Sewers, Urban drainage, Urbanization, *Pollution abatement, Effluents, Canada, Data collections.

An outline is presented of work conducted to assess the variation of phosphate input to urban waterways from residential areas serviced by septic tanks and sanitary systems. Data were collected on the population density of each sample area and the amount of phosphorus in household detergents, as well as lawn and garden fertilizers. For a number of urban watersheds, the presence of household septic tank systems played a major role in determining stream phosphate concentrations accounting for 56-76 percent of the spatial variation in stream total phosphate levels and 61-77 percent of the spatial variation in orthophosphate levels. Rainfall and fertilizer usage inputs were also statistically significant but secondary to septic tank systems. Results suggest that if phosphate pollution abatement is to be practiced, a concerted effort should be made to serve all urban residential units by an integrated sewer system with subsequent phosphate removal at the wastewater treatment plant. Also septic tanks are not an efficient means of keeping excessive quantities of phosphates from local stream systems. (Sandoski-Franklin)
W74-07267

AEROBIC DIGESTION OF ORGANIC SLUDGES CONTAINING INORGANIC PHOSPHORUS PRECIPITATES: PHASE I,
Toronto Univ. (Ontario). Dept. of Civil Engineering.
J. Ganczarczyk, and M. F. D. Hamoda.
Environment Canada, Research Report No. 3, June 1973. 71 p, 7 fig, 22 tab, 65 ref. 72-5-4.

Descriptors: *Waste water treatment, *Sludge digestion, Laboratory tests, *Aerobic treatment, *Activated sludge, Salts, *Phosphorus, Chemical precipitation, Aeration, Nutrients, Organic compounds, Carbons, Suspended solids.
Identifiers: *Aerobic digestion, Total organic carbon, Soluble nutrients, Dewaterability, Settleability, Oxygen uptake, Volatile solids destruction, Ferric salts, Aluminum salts.

Three series of laboratory batch and semi-continuous experiments were carried out at 20C on the aerobic digestion of activated sludges containing aluminum salts or ferric salts used for phosphorus precipitation. Treatment responses measured were digested sludge characteristics, such as volatile solids destruction, oxygen uptake, settleability, and dewaterability, and supernatant characteristics, including total organic carbon, soluble nutrients, and suspended solids. The only variable that was controlled for all experiments was the sludge hydraulic detention time. The aerobic digestion of conventional activated sludge was not affected to any significant degree by the presence of ferric of aluminum precipitates. For both the control and chemically precipitated sludges an aeration period of 10 to 15 days was required for stabilization. Release of soluble organic carbon and nutrients during the aerobic digestion of activated sludges was not altered appreciably in the presence of the chemical precipitates. At the higher chemical dosages there was a reduction in nutrient release in the supernatant. Dewaterability and settling characteristics of control and chemically precipitated digested sludges did not differe significantly. (Sandoski-Franklin)
W74-07268

USE AND PRODUCTION OF IRON SALTS FOR PHOSPHORUS REMOVAL,
Waterloo Univ. (Ontario). Dept. of Chemical Engineering.
D. S. Scott.
Environment Canada Research Report No. 5, June, 1973. 62 p, 12 fig, 10 tab, 9 ref. 72-3-5.

Descriptors: *Salts, *Waste water treatment, *Phosphates, Chemical precipitation, Canada, Sulfates, Estimated costs, Iron compounds.
Identifiers: *Phosphate removal, *Iron sulfate, Sulfuric acid.

The principal objective was an assessment of the supply and probable cost of iron salts for use as phosphate removal chemicals in wastewater treatment. The use of iron salts for the precipitation of phosphate from wastewaters is discussed. Evidence is reviewed which suggests that ferrous and ferric salts behave in an equivalent manner due to rapid oxidation of the former in neutral solutions. A summary is given of the nature, source, composition, and reactivity with dilute sulfuric acid of major iron containing waste materials available in Ontario Canada. The costs of manu-

facture of ferrous and ferric sulfate at different production capacities from a number of these materials has been estimated. Treating costs for phosphate removal using iron sulfate could be as low as 10-20 dollars per million gallons. For almost all circumstances, the use of locally manufactured iron sulfates should be competitive with or cheaper than either alum of imported salts. (Sandoski-Franklin)
W74-07269

WASTE WATER TREATMENT IN COMMERCIAL FISH PROCESSING: REDUCING STICK WATER LOADINGS,
Wisconsin Univ., Madison.
D. A. Stuiber, and J. J. Quigley.
Available from the National Technical Information Service as COM-73-10/58, $3.00 in paper copy, $1.45 in microfiche. University of Wisconsin Sea Grant Advisory Report No. 1, WIS-SG-72-401, November, 1972. 17 p, 5 fig, 4 tab, 4 ref.

Descriptors: *Lake Michigan, *Waste water disposal, Liquid wastes, *Waste water treatment, *Commercial fish, Treatment facilities, Industrial plants, Suspended solids, Laboratory tests, Cost analysis, Coagulation, Design criteria.
Identifiers: Lime coagulation, *Glutaraldehyde coagulation, *Anaerobic-aerobic systems, Fish processing.

A wastewater disposal problem involving the inadequate treatment of wastewater resulting from the processing of alewives for fish meal was investigated. Inplant practice was examined to determine whether process revisions could be made to reduce the amount of lipids, protein, and other suspended solids in the discharge. A further processing step was developed to remove more solids and to increase product recovery. The resulting wastewater discharge was studied for purposes of improving treatment practice. Owing to the complexity of the material in the discharge, an anaerobic treatment stage was required with subsequent design focusing on combination anaerobic-aerobic systems. Laboratory scale studies on both glutaraldehyde and lime coagulation methods were made. Both processes were subjected to cost analysis with generally comparable results. Preliminary analysis conducted on waste water effluent indicated that resulting effluents had comparable chemical oxygen demand and biochemical oxygen demand values. (Sandoski-Franklin)
W74-07270

REMOVAL OF PHOSPHATES FROM WASTEWATERS WITH ELECTRO-CHEMICALLY GENERATED GADOLINIUM IONS,
Los Alamos Scientific Lab., N. Mex.
E. I. Onstott.
Available from the National Technical Information Service as LA UR 73-72 $3.00 in paper copy, $1.45 in microfiche. (1971) 10p, 3 fig, 3 tab, 6 ref (CONF-73 0402).

Descriptors: *Electrochemistry, Chemical precipitation, *Phosphates, Sewage effluents, Anodes, Cathodes, *Waste water treatment, Hydrogen ion concentration, Electrolysis, Zinc, Bicarbonates, *Ion transport.
Identifiers: *Phosphate removal, *Gadolinium.

A method of electroprecipitation of phosphates from secondary sewage effluents with anodically generated GD 3+ was investigated using a gadolinium metal anode and stainless steel cathode. At the anode Gd was oxidized to Gd3+, WHICH PRECIPITATED PHOSPHATES, AND AT THE CATHODE H2 gas was evolved. For electrolysis times in excess of theoretical, removal of soluble orthophosphate was greater than 99 percent to concentrations of about 0.02 mg/liter P; soluble condensed phosphate removal was more than 90 percent to about 0.04 mg/liter P; and removal of soluble organic phosphate was greater than 80 percent to about 0.07 mg/liter P. The electrolytic treatment increased the pH OF PRODUCT FILTRATES AND A FRACTION OF THE BICARBONATE WAS CONVERTED TO CARBONATE DEPENDING ON ELECTROLYSIS TIMES. Some Zn2+ and carbonate, if the concentration of carbonate exceeded 30 mg/liter, were precipitated by this electrolytic treatment. (Sandoski-Franklin)
W74-07271

CYANIDE WASTE TREATMENT UTILIZING CATALYTIC OXIDATION,
Thiokol Chemical Corp., Brigham City, Utah.
P. H. Woolhiser, and D. P. Clark.
Available from the National Technical Information Service as AD-769 293 $3.75 in paper copy, $1.45 in microfiche. Air Force Weapons Laboratory Report No. AFWL-TR-73-37, October, 1933. 82 p, 13 fig, 27 tab, 33 ref. 683M3W10 F29601-72-C-0135.

Descriptors: *Waste water treatment, *Oxidation, Liquid wastes, Effluents, Evaluation, Standards, Effluent streams, Design criteria, Operating costs, Industrial wastes, Treatment facilities.
Identifiers: *Electroplating, Photographic processing, *Catalytic oxidation, *Cyanides.

Two major sources of liquid cyanide wastes are electroplating operations and color photograph processing. Waste streams vary in concentration from under one mg/liter to over 100,000 mg/liter. To meet state effluent standards which range from 0.25 mg/liter to undetectable levels, a system utilizing a proprietary cobalt-based catalyst and chlorine-producing electrolytic cells was evaluated with actual photographic and electroplating wastes. A prototype catalytic oxidation system capable of treating 0.25 gpm of 2000 mg/liter total cyanide waste produced effluent streams containing undetectable amounts of cyanide with copper plating and nickel strip feeds. Treatment of photographic wastes produced an 87 to 94 percent reduction of total cyanide. Effluent cyanate levels were generally under 10 mg/liter for copper solutions and ranged from 4 to 42 mg/liter for nickel strip solutions. The catalytic oxidation system has a strong potential for decreasing the operation costs of cyanide destruction system. System designs are given for two full-scale cyanide waste treatment systems. (Sandoski-Franklin)
W74-07272

PHOSPHORUS REMOVAL TREATABILITY STUDIES AT C.F.B. BORDON, PETAWAWA, TRENTON AND UPLANDS,
Environmental Protection Service, Burlington (Ontario). Wastewater Technology Center.
E. E. Shannon, and R. J. Rush.
Environment Canada Technology Development Report EPS 4-WP-73-5, December, 1973. 34 p, 11 fig, 7 tab, 3 ref.

Descriptors: *Canada, Phosphorus, On-site tests, Efficiencies, Evaluation, *Waste water treatment, *Estimated costs, Environmental effects, *Treatment facilities, Lime.
Identifiers: *Phosphorus removal, Waste water characteristics, Diurnal variations, Treatment methods, Alum, Ferric chloride.

Results of phosphorus removal treatability studies carried out at Canadian Forces Bases Borden, Petawawa, Trenton, and Uplands during 1971 and 1972 are reported. Traditional phosphorus precipitants such as ferric chloride, alum, and lime, were evaluated with respect to phosphorus removal efficiency via standard jar testing procedures. Also the wastewater characteristics and diurnal variations at each Base were determined and discussed. Costs for phosphorus removal at each Base were estimated and recommendations made regarding the type of full-scale system that should be installed. The impact of the phosphorus removal system on the receiving waters was evaluated. (Sandoski-Franklin)
W74-07273

PURIFICATION OF EFFLUENTS AND IMPROVEMENT OF THE TECHNOLOGY IN THE PRODUCTION OF CHLORETONE, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Khimiko-Farmatsevticheskii Institut, Moscow (USSR).
G. A. Frangulyan, I. E. Sokolova, A. A. Lavrukhina, and E. V. Zyuzenko
Khim Farm Zh. Vol 6, No 11, p 51-52. 1972.
Identifiers: *Chloretone, Effluents, Chemical analysis, *Waste water treatment, Water purification, Pollutant identification.

A method for purifying effluents from the production of 1,1,1, trichloro-2-methylpropanol-2 (chloretone) is described. An improvement in chloretone production is discussed. The purification is based on heating effluents with Ca soda to 95-100C. The data from chemical analyses of effluents prior to and after purification are included.—Copyright 1973, Biological Abstracts, Inc.
W74-07285

PLANNING AND OPERATIONAL STUDIES IN THE INTEGRATED USE OF DESALINATION. CASE STUDIES FOR CYPRUS AND JERSEY,
Water Research Association, Marlow (England).
For primary bibliographic entry see Field 3A.
W74-07308

WATER AND EFFLUENT TREATMENT PLANTS - COST CONSIDERATIONS AND CLIENT, CONTRACTOR, CONSULTANT RELATIONSHIPS, THE CONSULTANT'S VIEW,
J. R. Joslin.
Process Biochemistry, Vol 9, No 1, p 10-11, January 1974. 3 fig, 3 ref.

Descriptors: Water resources development, *Waste water treatment, *Treatment facilities, *Costs, *Projects, *Design, *Optimization, Planning, Water quality, Civil engineering, Mathematical models, Systems analysis.
Identifiers: Great Britain.

With the reorganization of local government and the capital intensive water services industry at an advanced stage in England, it is desirable to examine the client-contractor-consultant relationship; the views of each are separately put in this series. This second article deals with the consultant's view. The effect of costs on projects carried out by consulting engineers from the feasibility study to the control of actual expenditure on the contract works is discussed in terms of achieving the economically optimal design consistent with sound engineering practice. As a plan is carried out, the main overall cost factors, i.e., repayment periods, running costs, choice and use of processes, must be assessed in greater detail. An optimization model can be used advantageously to obtain the most cost-effective treatment methods for meeting the desired standards. The control and certifying of actual expenditure is most important. (Bell-Cornell)
W74-07312

LAND DISPOSAL OF WASTEWATER--LITERATURE REVIEW FOR 1973,
New York State Dept. of Environmental Conservation, Albany.
T. J. Tofflemire, and F. E. Van Alstyne.
Technical Paper No 33, February 1974. 10 p, 129 ref.

Descriptors: *Waste water disposal, *Water spreading, *Irrigation, *Waste disposal wells, *Reviews, Bibliographies, Sprinkler irrigation, Sewage disposal, Waste water treatment, Septic tanks, Soil disposal fields.
Identifiers: *Land disposal(Wastes).

cent literature in land disposal or treatment of ste water is reviewed. The most used waste- ter application method was spraying, followed flooding and ridge and furrow. Many municipal stems provide some form of secondary treat- nt before land application. In the United States 1972, land disposal was used by 571 municipali- s and 1300 industries. In addition, there were er 50 million people using septic tanks. The sults of irrigating several crops with sewage ef- ent or with regulating irrigation water were mpared. Significant increases in soil phosphate, dium, soluble salts and pH were found in the wage plots. Possible harmful plant responses th sewage irrigation include nitrogen overload- g, heavy metal accumulation, boron toxicity, d salt accumulation in the soil. (Knapp-USGS)
74-07327

IE IDENTIFICATION OF THE REACTION RODUCTS FORMED BY THE OXIDATION OF QUEOUS AMMONIA WITH POTASSIUM RRATE VI,
hio State Univ., Columbus. Dept. of Chemical ngineering.
W. Buttwin.
vailable from the National Technical Informa- n Service as PB-231 799 $5.50 in paper copy, .45 in microfiche. MSc Thesis, 1972. 38 p, 3 fig, tab, 12 ref, 2 append. OWRR A-031-OHIO (1).

escriptors: *Waste water treatment, *Oxidation, mmonia, Nitrogen, Chemical reactions, Sewage eatment.
entifiers: Potassium ferrate.

n exploratory study was undertaken to deter- ine the feasibility of using potassium ferrate VI oxidize ammonia in the secondary effluent from ter treatment plants. The method shows good otential in that the major oxidation product, ele- ental nitrogen, is also the most desired product nsidering pollution abatement. In the range 001 to 0.01 N NH3, an increase in concentration ferrate increases the percent ammonia moved. Increases in the mole ratio of ferrate to mmonia above 1:1 decrease ammonia removal. In e pH range 8-9, an increase in pH increases am- onia removal. The addition of chloride ion up to 0 ppm has little effect on ammonia removal. Of e ammonia nitrogen oxidized, more than 50% is idized to elemental nitrogen and less than 10% is idized to nitrites. (Knapp-USGS)
74-07333

LANNING AND OPERATION OF URBAN ATER QUALITY MANAGEMENT SYSTEMS,
ornell Univ., Ithaca, N.Y.
. M. Elsahragty.
vailable from the National Technical Informa- on Service as PB-231 831 $5.50 in paper copy, .45 in microfiche. Studies in the Analysis of etropolitan Water Resource Systems, Vol IX, echnical Report No. 80, Water Resources and arine Sciences Center, Cornell University, haca, N.Y. February 1974 44 fig, 98 ref, 2 appen. WRRC-3101(no. 368A) (5) an A-04z-NY(1).

escriptors: *Waste water treatment, *Water uality control, *Linear programming, *Dynamic rogramming, *Simulation analysis, Computer odels, Digital computers, Optimization, Cost nalysis, Municipal wastes, Waste water disposal, Vater management(applied), Methodology, lathematical models, Systems analysis, *Cities.

systems methodology for defining and evaluat- g alternatives for managing urban water quality proposed. This study focuses on the planning nd operation of urban wastewater control ystems. The metropolitan economic-engineering rban water quality system is defined and an ap- roach is adopted for analyzing the complex in- eractions among the physical, technological, so- ial and economic aspects of the urban water anagement problem. Linear programming is util- ized to define the minimum required investment in the wastewater control system. To account for risk, a chance constrained formulation is provided. Dynamic programming is used to obtain the optimal operating policy under deterministic and stochastic conditions. A water quality index was used to obtain this policy. The model relies on data collection systems that provide continuous information on the quality and quantity of both the receiving water and the wastes to be discharged. Digital computer simulation is utilized to predict the values of various measures of effectiveness of the water pollution control system and to check the validity of the mathematical programming solutions. The methodology is applied to a specific urban area. The data needs and computational effort are illustrated, and the possibility of improving the current planning and management procedures is discussed. The study illustrates how the system analysis framework is suitable for planning effective and economically efficient water pollution control programs and for the operation of wastewater control systems. (Bell-Cornell)
W74-07334

SYSTEMS SIMULATION OF THE EFFECT OF TERTIARY TREATMENT FOR CARBON, NITROGEN, AND PHOSPHORUS REMOVAL UPON PRIMARY PRODUCTIVITY, STANDING CROP, AND COMMUNITY STRUCTURE OF AUTOTROPHIC AND HETERTROPHIC COMMUNITIES IN RECEIVING MODEL STREAMS.
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W74-07337

MODULAR WASTEWATER TREATMENT SYSTEM DEMONSTRATION FOR THE TEXTILE MAINTENANCE INDUSTRY,
Linen Supply Association of America. Miami Beach, Fl. and Institute of Industrial Launderers Washington, D.C.
G. Douglas.
Copy Available from GPO Sup Doc as EP1.23:660/2-73-037, $3.45; microfiche from NTIS as PB-231 837 $1.45. Environmental Protection Agency, Technology Series EPA-660/2-73-037, January 1974. 342 p, 32 fig, 109 tab, 20 ref. EPA Project 12120 FYV.

Descriptors: *Waste water treatment, Coagulation, Diatomaceous earth, *Filtration, *Flotation, Industrial wastes, Water costs, Biochemical oxygen demand, Suspended solids, Laundering, Pollution taxes(Charges), Separation techniques, Operating costs, Textiles, *Flocculation.
Identifiers: *Chemical treatment; *Laundry effluent, Municipal sewer ordinances.

An industrial waste survey of the textile maintenance industry was performed to characterize and quantify the pollutants emanating from various types of plants. Bench scale waste treatment tests were performed to design a system for the textile maintenance industry. A wastewater treatment system consisting of chemical treatment and flocculation facilities, dissolved-air flotation for solids-liquid separation, diatomaceous earth filtration for polishing the flotation effluent, and vacuum filtration dewatering of flotation scum was installed at a commercial laundry. Data were obtained on effluent quality, sludge volume, chemical costs and other operating costs for industrial laundry wastewater, linen laundry wastewater, and uniform laundry wastewater. The final effluent of the linen and uniform laundry wastewater treatment met municipal sewer ordinance requirements for grease and heavy metals. Wastewater suspended solids and BOD were also significantly reduced, so that high municipal sewer surcharges would not be imposed. The effluent from the industrial laundry wastewater treatment did not consistently meet municipal sewer ordinance standards. Complete wastewater treatment operating costs were on the order of $0.80/cu m for industrial laundry wastewater, $0.66/cu m for uniform laundry wastewater and $0.40/cu m for linen laundry wastewater. It was concluded that the treatment system had applicability in treating laundry wastewater. (EPA)
W74-07343

ORGANIZATION OF THE COLLECTION AND DECONTAMINATION OF INDUSTRIAL AND DOMESTIC RADIOACTIVE SEWAGE, (IN RUSSIAN),
V. F. Bagretsov, S. I. Zakharov, and S. V. Metal'nikov.
Gig Sanit. Vol 37, No 12, p 91-93. 1972.
Identifiers: Collection, *Industrial wastes, Organization, *Radioactive sewage, Salts, *Sewage, Decontamination, *Waste water treatment, Waste disposal.

The 10-yr experience of the V. I. Lenin Research Institute of Atomic Reactors confirmed the possibility of complete protection of the environment against radioactive pollution by industrial wastes. This is promoted by centralization of the collection, treatment and monitoring of radioactive wastes at the Institute. The radioactive solutions at the Institute are divided into 3 groups according to specific activity and salt content. The first group consists of the saltfree waters of the first circuits of the reactors and holding basins; the second solutions obtained on deactivating the equipment, rooms, floors and waste products of chemical laboratories; the third, sanitary plumbing wastes.--Copyright 1973, Biological Abstracts, Inc.
W74-07362

USER CHARGES AND INDUSTRIAL COST RECOVERY, DENVER SMSA,
Wilbur Smith and Associates, Denver, Colo.
G. H. Aull, Jr., T. F. Jones, and W. G. Stringfellow.
Available from the National Technical Information Service as PB-231 866, $9.00 in paper copy, $1.45 in microfiche. Environmental Protection Agency, Region VIII, Denver, Colorado, January 1974. 120 p, 2 fig, 52 tab, 42 ref. EPA Contract 68-01-1864.

Descriptors: *Pollution taxes(Charges), *Cost allocation, Use rates, Treatment facilities, Water rates, *Colorado, *Industrial water, *Regulation, Grants, Cost sharing, Cost repayment, Administrative agencies, Water pollution control, *Construction costs.
Identifiers: Waste water user charges, Industrial cost recovery, *Denver SMSA.

An investigation was made of the extent to which wastewater user charges, consistent with current federal regulations and guidelines, have been adopted by municipal and special district wastewater agencies within the Denver Standard Metropolitan Statistical Area. Compliance with these guidelines has been established as a prerequisite for award of federal construction grants for wastewater treatment facilities. Three wastewater agencies within the Denver SMSA were selected for more detailed analyses of current user charge schedules. The existing schedules of rates and charges were compared to schedules derived in the study through rational cost allocation and application of model user charge systems developed by Environmental Protection Agency. Volume, strength and flow rates are among the waste characteristics considered in developing cost allocations and revenue structure. Hypothetical examples were also developed to illustrate the possible impact of the industrial cost recovery features of federal regulations and guidelines upon local user charge schedules. A special inquiry was made into the state of eligibility for construction grants of regional wastewater treatment and disposal agencies in the light of revenue methods employed by their direct and indirect subscribers. Possible corrective actions were outlined. Previ-

ous study findings were reaffirmed that a number of wastewater agencies within the Denver SMSA have not established or maintained user characteristic and treatment cost data in a form or to the extent necessary to design equitable user charges, and thus fail to comply with current federal guidelines for eligibility for construction grants. (EPA)
W74-07370

MICROBIAL INDICATORS FOR THE BIOLOGICAL QUALITY OF TREATED WASTEWATER EFFLUENTS,
Dept. of Civil Engineering. Illinois Univ., Urbana.
E. O. Greening.
Available from the National Technical Information Service as PB-231 874, $9.50 in paper copy, $1.45 in microfiche. Environmental Protection Agency Report. EPA 670/2-73-082, May 1974. 118 p, 7 fig, 9 tab, 127 ref. M.S. Thesis, 1971. EPA Project 17060 EYZ. Program Element 1BB043.

Descriptors: *Bioindicators, *Bacteria, Coliforms, *Yeasts, *Chlorination, *Waste water treatment, Viruses, Public health, Water reuse, Activated sludge, Trickling filters, Resistance, Sewage bacteria, E. coli.
Identifiers: Enteric viruses, Chlorine resistance, Pour plates, Acid-fast bacilli.

Due to the relatively low resistance of coliforms to chlorination when compared to resistant enteric pathogens such as viruses and protozoal cysts, a search was initiated for a new chlorine resistant bioindicator. The presently used indicator organisms and the reported chlorine resistance of wastewater organisms are reviewed. Wastewater effluents were chlorinated to a free chlorine residual and plated on various media at different temperatures. Surviving organisms were collected for further study. With this procedure the most chlorine sensitive organisms were eliminated from consideration. Pure cultures of 135 isolates were collected in this manner. A yeast and two different acid-fast bacteria were shown to be resistant to chlorination at levels considered necessary for the inactivation of pathogens, including viruses. One acid-fast bacteria was able to survive 2.0 mg/l free chlorine residual for 67 minutes while the other survived 1.0 mg/l free chlorine for 15 minutes. The yeast showed resistance to 1.0 mg/l free chlorine for 20 minutes. In comparison, a pure culture of Escherichia coli failed to survive following 5 minutes contact with 0.03 mg/l free chlorine. Techniques were investigated for the routine isolation of these organisms. Use of yeast extract-malt extract agar at pH 3.5 was employed for the yeast while acid-fast staining of colonies grown on membrane filters on Middlebrook and Cohn 7H10 agar was found to be useful for the acid-fast bacteria. (EPA)
W74-07372

ROTATING BIOLOGICAL DISK WASTEWATER TREATMENT PROCESS - PILOT PLANT EVALUATION,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Environmental Science.
W. N. Torpey, H. Heukelekian, and A. J. Kaplovsky.
Available from the National Technical Information Service as PB-232 133, $6.00 in paper copy, $1.45 in microfiche. Environmental Protection Agency, Report EPA-670/2-73-027, May 1974. 250 p, 22 fig, 41 tab, 5 ref. EPA Project 17010 EBM. Grant No. WP-01322-02.

Descriptors: *Waste water treatment, *Activated carbon, Absorption, *Nitrification, Pilot plants, *Biochemical oxygen demand, *Oxygenation, Slime, Nutrient removal, *Treatment facilities.
Identifiers: Oxygen enriched atmospheres, *Rotating disks, Surface loading, Illumination, Stage treatment, Nutrient extraction.

The results of operating a 10,000 to 20,000 gal per day staged rotating disk pilot plant have been presented for three modes of operation, namely, (1) the slimes in all stages exposed to ambient atmospheres, (2) the slimes in stage 1 exposed to an atmosphere enriched with oxygen, and (3) the slimes in stages 1 and 3 of a 3-stage operation exposed to atmospheres enriched with oxygen. In the first mode of operation about 30 minutes of contact with the slimes was sufficient to remove 90% of the B.O.D.5 while during the second mode of operation, 18 minutes accomplished the same rate of removal of B.O.D.5. In the third mode of operation, not only was 90% of the B.O.D.5 removed during 18 minutes of contact with the slimes but a substantial portion of the nitrogenous oxygen demand was satisfied. (EPA)
W74-07373

COMBINED SEWER OVERFLOW TREATMENT BY THE ROTATING BIOLOGICAL CONTACTOR PROCESS.
Autotrol Corp., Milwaukee, Wis. Bio-Systems Div.
Available from the National Technical Information Service as PB-231 892, $11.00 in paper copy, $1.45 in microfiche. Environmental Protection Agency, Report EPA-670/2-74-050, June 1974. 136 p, 69 fig, 8 tab, 9 ref. EPA program Element 1BB034. Contract 14-12-24.

Descriptors: *Waste water treatment, Treatment facilities, *Combined sewers, *Overflow, *Biological treatment, Water pollution treatment, Biochemical oxygen demands, Chemical oxygen demand, Solid wastes, *Wisconsin, Pilot plants.
Identifiers: *Biological contactor(Rotating), *Milwaukee(Wisc).

A Rotating Biological Contactor (RBC) was constructed on a bypass of a portion of the combined sewerage in Milwaukee, Wisconsin, to demonstrate the feasibility of treating combined sewer overflows. Prior to actual field testing of this full scale RBC unit, simulated overflow tests were conducted with a bench scale RBC system to establish scale-up criteria for costing out the full scale plant, operating parameters and test conditions for the demonstration facility. Construction of the demonstration plant was completed early in 1969, and a full year of testing was completed in March of 1970. Average dry weather flow through the plant was 35 gallons per minute (gpm). Under actual storm flow conditions, the demonstration plant exhibited system stability up to 14 times dry weather flow conditions. Beyond these conditions, COD treatment effectiveness sharply decreased ranging from no reduction at high flows to 79% reduction at normal dry weather flow. With lessening of these flows, biological treatment recovery was obtainable in 24 to 30 hours. To effectively treat these high overflow loads, sufficient volumetric storage and a solid separation operation should be provided to limit flow rates to controllable RBC treatment levels. (Tobin-EPA)
W74-07374

A COMPARISON OF EFFLUENT CHARACTERISTICS FROM CONVENTIONAL AND OXYGEN BLEACHING SEQUENCES: RESULTS OF A LABORATORY STUDY,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
W. L. Carpenter, W. T. McKean, H. F. Berger, and I. Gellman.
Preprints, 1973 International Pulp Bleaching Conference, June 3-7, 1973, Vancouver, B.C., p 13-19. 10 tab, 3 ref. (Jointly sponsored by TAPPI and CPPA).

Descriptors: *Bleaching wastes, *Waste water treatment, Waste treatment, *Pulp wastes, *Oxygen, *Biodegradation, *Effluents, Water pollution sources, Color, Biochemical oxygen demand, Chemical oxygen demand, Suspended solids, Chlorides, Aerated lagoons, Hardwood, Softwood, Pollution abatement, Pulp and paper industry
Identifiers: *Oxygen bleaching, Bleach plants

Southern kraft softwood and hardwood pulps were bleached by conventional CEHDED and CEDED sequences in comparison with modern OCEDED and OCED sequences (C = chlorine, E = alkaline extraction, D = chlorine dioxide, H = hypochlorite, O = oxygen). The respective bleach effluents were compared with regard to color, chloride and total solids contents, volatile vs fixed solids, BOD, COD, alkalinity, and other characteristics. Allowing for 100% recycle of the oxygen stage, softwood-derived effluents contained 81% less BOD, 67% less COD, 73% less chloride, and 89% less color than those from conventional bleach sequences. For hardwood-derived effluents, the respective decreases were 81% in BOD, 80% in COD, 44% in chlorides, and 92% in color. Reductions in total, volatile, and fixed solids ranged from 40 to 50% for both hard- and softwood pulp effluents. When simulated effluents from each bleaching stage were subjected to biodegradation in aerated stabilization basins, all underwent rapid BOD reductions, viz., 75-97%, during detention times of 1 to 10 days. (Brown-IPC)
W74-07375

OXYGEN BLEACHING -- A FLEXIBLE PROCESS FOR POLLUTION ABATEMENT,
Groupement de la Cellulose, Saint-Gaudens (France). Research Lab.
J. C. Lescot.
Preprints, 1973 International Pulp Bleaching Conference, June 3-7, 1973, Vancouver, B.C., p 61-70. 12 fig, 7 tab, 4 ref. (Jointly sponsored by TAPPI and CPPA).

Descriptors: *Waste water treatment, Pollution abatement, Water pollution control, *Bleaching wastes, *Pulp wastes, *Oxygen, *Effluents, Waste water pollution, *Color, Biochemical oxygen demand, Chemical oxygen demand, Water pollution sources, Pulp and paper industry, Europe, Hardwood, Industrial wastes.
Identifiers: Sapoxal(Oxygen bleach) process, France, Kraft pulp.

The production of fully bleached kraft hardwood pulp at the St. Gaudens mill of La Cellulose d'Aquitaine was scheduled for startup in mid-1973, using the 'Sapoxal' oxygen bleaching process. A preliminary study of factors affecting this operation with and without an oxygen bleaching stage is reported. Various effluent characteristics (notably color, BOD, and COD) were investigated as a function of the pulp's delignification degree (kappa-number) and of soda losses from the pulping-bleaching system. The adoption of the oxygen bleach process is shown to achieve important reductions in the pollution load of the total mill effluent, notably in color (ca. 50%), as well as in BOD (ca. 31%), and in COD (ca. 17%). (Brown-IPC)
W74-07376

WATER REUSE AND RECYCLE IN THE D(C)EDED BLEACH SEQUENCE,
CIP Research Ltd., Hawkesbury (Ontario).
J. A. Histed, and F. M. A. Nicolle.
Preprints, 1973 International Pulp Bleaching Conference, June 3-7, 1973, Vancouver, B.C., p 133-140. 4 fig, 4 tab, 10 ref. (Jointly sponsored by TAPPI and CPPA).

Descriptors: *Bleaching wastes, *Pulp wastes, *Waste water treatment, *Recirculated water, *Water reuse, *Discharge(Water), Chlorine, Temperature, Corrosion, Cooling, Sodium compounds, Chlorination, Chlorides, Chemical oxygen demand, Biochemical oxygen demand, Dissolved solids, Color, Canada, Pulp and paper industry.

entifiers: Chlorine dioxide, Bleaching agents, kaline extraction, Sodium hydroxide, Wash-g(Pulp), Market pulp, Countercurrent washing.

hen western softwood kraft pulps of high kappa-mber (residual lignin content) are bleached by e D(C)EDED sequence (D = chlorine dioxide, E alkaline extraction, C = chlorine), the volume effluents from the acid and alkaline sewers can lowered to 1685 U.S. gal per air-dry ton by ex-nsive recycling of chlorination filtrate and by untercurrent washing of the bleached pulp. In der to maintain the brightness of market pulp at .5 (Elrepho spectrophotometer units), an extra 3% of chlorine dioxide (based on pulp weight) ust be applied in the first chlorination stage. At rmal chlorination temperature (25C), neither the scosity nor the strength of the pulp suffered. A nall loss in both qualities was noted upon treat-ent at 57C, possibly due to slow mixing and non-niform chlorination. In practice, more rapid niform mixing seems advisable, or else the tem-erature must be reduced by cooling the filtrated ed on the first shower of the chlorination asher. Corrosion-resistant materials will be eeded, since chloride concentrations reached 4-5 liter in the chlorination stage, 2.4 g/liter in the rst extraction stage, and 1.7 g/liter in the first lorine dioxide stage. Countercurrent washing d recycling of chlorination filtrate also reduced e effluent's pollution load by 30% for COD, 40% r 5-day BOD, 25% for dissolved solids, and 40% r color. (Brown-IPC)
74-07377

HE EFFLUENT-FREE BLEACHED KRAFT ULP MILL. PART V. THE R4 PROCESS FOR HLORINE DIOXIDE MANUFACTURE TO ECREASE PRODUCTION OF SODIUM ULPHATE,
oronto Univ. (Ontario). Dept. of Chemical En-ineering.
. H. Rapson.
reprints, 1973 International Pulp Bleaching Con-erence, June 3-7, 1973, Vancouver, B.C., p 171-76. 1 tab, 1 diag, 13 ref. (Jointly sponsored by APPI and CPPA).

escriptors: *Waste water treatment, *Bleaching astes, *Pulp wastes, *Chlorination, *Costs, Equipment, Chemical reactions, Pulp and paper ndustry, Effluents, Pollution abatement, Water ollution control, Sodium chloride, Sodium com-ounds, Sulfur compounds, Sulfates, Sodium ulfate, Chemicals, Inorganic compounds.
dentifiers: Chlorine dioxide, Bleach plants, Kraft ills, Chemical recovery, Hydrochloric acid, Sul-uric acid, R4 chlorine dioxide process.

he so-called 'R4' process of chlorine dioxide leach generation has been developed by modifi-ation of the earlier 'R2' and 'R3' processes in rder to decrease (by 50% or more) the amount of Na sulfate by-product obtained in the older rocesses to just the right amount needed by a leached kraft pulp mill per ton of pulp, while roducing any desired volume of chlorine dioxide. his is achieved by replacing up to 50% of the sul-uric acid and all the NaCl in an R2 or R3 generator vith HCl. The Na sulfate (called 'saltcake' in the aper vernacular) is used as cooking liquor nakeup chemical. Any excess is converted by eaction with HCl into sulfuric acid plus NaCl. Details of this economical process are indicated. (Brown-IPC)
W74-07378

THE EFFLUENT-FREE BLEACHED KRAFT PULP MILL. PART IV. THE SALT RECOVERY PROCESS,
Erco Envirotech Ltd., Toronto (Ontario); and Erco Envirotech Ltd., Salt Lake City, Utah.
D. W. Reeve, J. A. Lukes, K. A. French, and W. H. Rapson.
Preprints, 1973 International Pulp Bleaching Conference, June 3-7, 1973, Vancouver, B.C., p 191-197. 3 tab, 2 fig, 13 ref. (Jointly sponsored by TAPPI and CPPA).

Descriptors: *Waste water treatment, *Pollution abatement, *Pulp wastes, *Bleaching wastes, *Sodium chloride, *Water pollution control, Pulp and paper industry, Sodium compounds, Sulfates, Chlorides, Chlorine, Sodium hydroxide, Recycling, Costs, Equipment, Carbonates, Crystallization.
Identifiers: Chemical recovery, Kraft mills, White liquor, Sodium hydroxide, Bleach plants.

The recovery of NaCl from kraft pulp mills is essential for regeneration of pulp bleaching chemicals, for cost reduction of effluent treatment, and for improved environmental protection. In the salt-recovery process described, white liquor is evaporated to a high concentration of NaOH plus Na sulfite, causing crystallization of NaCl and unregenerated pulping chemicals (Na carbonate and sulfate). The recovered NaCl is purified for regeneration of NaOH and Cl. Unregenerated pulping chemicals are removed separately and returned to the mill's chemical recovery cycle. The concentrated white liquor containing all active pulping chemicals may be diluted before addition to the wood chip digester. The new process does not require significant changes in pulp mill operations, yet is adaptable to a wide range of cooking and bleaching conditions. The NaCl concentration is kept at tolerable levels throughout the chemical recovery cycle. The process is unaffected by the composition of the white liquor (kraft cooking liquor). The chemistry, equipment needs, and costs of the salt-recovery process are discussed in some detail. (Brown-IPC)
W74-07379

NEW EFFLUENT PLANT AT COLTHROP BOARD MILLS.
Paper (London), Vol 180, No 4, p 188, 191, Aug 15, 1973. 2 fig.

Descriptors: *Treatment facilities, *Waste water treatment, Water pollution control, *Pulp wastes, *Flocculation, *Biological treatment, Aeration, Suspended solids, Filtration, Filters, Water pollution, Water pollution sources, Water pollution treatment, Pollution abatement, Pulp and paper industry, Europe.
Identifiers: *United Kingdom(Kennet River).

The recently inaugurated effluent treatment plant of Reed Paper and Board Ltd. at Colthrop, England, comprises a Ceca-Wabag contact flocculator and a Davy Paxman rotary vacuum filter. It was designed to treat 68,000 gal/hr of effluent containing 300 to 6000 ppm of solids, so as to reduce this content to below 40 ppm sometimes to as low as 20 ppm. The sedimented water is next aerated and subjected to biological treatment before being returned to the Kennet River. (Witt-IPC)
W74-07380

MECHANICAL WASTE WATER CLARIFICATION AND BIOLOGICAL-CHEMICAL WASTE WATER PURIFICATION USING THE ATTISHOLZ AND RUTHNER SYSTEM (MECHANISCHE ABWASSERKLAERUNG UND BIOLOGISCH-CHEMISCHE ABWASSERREINIGUNG NACH SYSTEM ATTISHOLZ UND RUTHNER),
W. Lutz.
Wochenblatt fuer Papierfabrikation, Vol 101, No 8, p 275-276, 278-281, April 30, 1973. 4 fig, 2 tab.

Descriptors: Treatment facilities, *Waste water treatment, *Biological treatment, *Pulp wastes, *Activated sludge, Chemical precipitation, *Coagulation, *Flocculation, *Sludge treatment, Pulp and paper industry, Polyelectrolytes, Industrial wastes, Effluents, Water pollution treatment, Pollution abatement, Water pollution control, Sedimentation, Waste treatment.
Identifiers: Clarifiers, Ruthner clarifier, Attisholz waste treatment process.

The operating principles and effluent-purifying characteristics (including costs) of the Ruthner clarifier and of the Attisholz biological treatment process are described, with particular reference to the processing of pulp, paper, and paperboard mill waste waters. The Ruthner clarifier is a contact system for sludge sedimentation, using synthetic polyelectrolytes as flocculation aids. The Attisholz process is a modified activated sludge system adapted specifically to the characteristics of paper industry effluents. Experimental and industrial-scale data are given on the joint use of the Ruthner-Attisholz system in various fine-paper, paperboard, wood fiberboard, and sulfite pulp mills. (Speckhard-IPC)
W74-07381

POSSIBILITIES OF EFFLUENT CLARIFICATION (MOEGLICHKEITEN DER ABWASSERKLAERUNG),
Technische Universitaet, Darmstadt (West Germany). Wasser- und Abwasserforschungsstelle.
H. L. Dalpke.
Wochenblatt fuer Papierfabrikation, Vol 101, No 8, p 252-255, discussion p 263-264, April 30, 1973. 2 fig, 1 tab, 2 ref.

Descriptors: *Waste water treatment, *Pulp wastes, Biological treatment, Treatment facilities, Europe, Pulp and paper industry, Aerated lagoons, Activated sludge, Trickling filters, *Costs, Capital costs, Operating costs, Economic efficiency, *Reviews.
Identifiers: *Germany.

A general review is presented of various approaches to waste water purification available to the pulp and paper industry. The status of effluent treatment technology is surveyed, including primary chemi-mechanical and secondary biological stages. The latter include aerated lagooning, activated sludge treatment, and use of trickling filters. Cost data, emphasizing German economic conditions, are also included. (Speckhard-IPC)
W74-07382

USE OF AMBERLITE XAD-4 FOR EXTRACTION AND RECOVERY OF CHLORINATED INSECTICIDES AND POLYCHLORINATED BIPHENYLS FROM WATER,
Bristol Univ. (England). Dept. of Inorganic Chemistry.
P. R. Musty, and G. Nickless.
Journal of Chromatography, Vol 89, No 2, p 185-190, Feb 27, 1974. 7 tab, 9 ref.

Descriptors: *Waste water treatment, *Chlorinated hydrocarbon pesticides, Water analysis, *Polychlorinated biphenyls, Gas chromatography, Chromatography, Resins, *Insecticides, DDD, DDE, DDT, Endrin, Dieldrin, Aldrin, Separation techniques, Analytical techniques, *Pollutant identification.
Identifiers: BHC(Benzene hexachloride-hexachlorocyclohexane), Lindane, Chemical recovery, *Amberlite XAD.

Amberlite XAD macroreticular resinous adsorbents were used to extract and recover both chlorinated insecticides (alpha- and beta-BHC, lindane, aldrin, dieldrin, endrin, p,p'-DDD, o,p'- and p,p'-DDT, and p,p'-DDE) and PCB's from water. One liter of tap water was doped at the ppb level and the resin-adsorbed insecticides were eluted with diethyl ether/hexane. When determined by electron capture gas chromatography, aldrin and p,p'-DDE were the only insecticides not quantitatively recovered. Recovery of PCB's was ca. 76%. (Brown-IPC)
W74-07383

REDUCTION OF THE VOLUME OF POLLUTANTS DISCHARGED AND OF FRESH WATER CONSUMPTION (SOKRASHCHENIE SBROSA

ZAGRYAZNENII I UMEN'SHENIE RASKHODA SVEZHEI VODY),
Vsesoyuznyi-Nauchnyi Planovii Otdel Bumazhnoi Promyshlennost (USSR).
L. I. Luzina.
Bumazhnaya Promyshlennost', No 9, p 7-8, Sept 1973. 1 fig.

Descriptors: *Water conservation, *Water reuse, *Recirculated water, *Pulp wastes, *Waste water treatment, Fresh water, Water consumption(Except consumptive use), Effluents, Pulp and paper industry, Filters, Water quality control, Monitoring, Discharge(Water), Condensers, Treatment facilities, Waste treatment, Industrial water, Industrial wastes.
Identifiers: Kraft mills, Chemical recovery, Board(Paperboard) mills, Washers(Pulp-thickening), Black liquor, Pulp washing, USSR.

A new Soviet process for the manufacture of high-yield unbleached kraft pulp from mixed softwoods and hardwoods with efficient recycling of treated effluent waters is described; the process is said to reduce freshwater consumption from 29.7 to 9.8 cu m and effluent volumes from 36.1 to 15 cu m per ton of pulp produced. Preliminary studies of the unbleached pulp manufacturing system, intended for boxboard production, focused on improvements of pulp washing conditions for efficient separation of black liquor, and on minimization of alkali and organic compound losses from the system. The new process features four double-chamber pulp-washing filters; a two-stage recovery of black liquor entrained with digester relief (blow gases); surface condensers in lieu of barometric condensers; partial reuse of purified effluents in various mill departments (wood preparation room, evaporator plant); automatic water quality control for cooling of bearings and other hydraulic functions; and monitoring of water consumption and effluent discharges in all mill departments. (Stapinski-IPC)
W74-07384

ON SOME SPECIAL PROBLEMS OF SULFITE PULP WASTE WATER PURIFICATION (ZU EINIGEN SPEZIELLEN PROBLEMEN DER SULFITZELLSTOFF-ABWASSERREINIGUNG),
Institut fuer Zellstoff und Papier, Heidenau, (East Germany).
H. Schmidt, and G. Weigt.
Zellstoff und Papier, Vol 22, No 9, p 263-269, Sept 1973. 7 fig, 6 tab, 20 ref.

Descriptors: *Sulfite liquors, *Bleaching wastes, *Pulp wastes, *Biological treatment, *Waste water treatment, Waste treatment, Water pollution control, Chlorination, Biochemical oxygen demand, Chemical oxygen demand, Color, Effluents, Activated sludge, Microorganisms, Bacteria, Organic loading, Kinetics, Biodegradation, Chemical reactions, Inhibition.
Identifiers: Sulfite pulp industry, Spent sulfite liquors, Evaporator condensates.

The characteristics (notably BOD load) of spent sulfite pulping liquors are outlined, and experiments are reported on the purification of spent bleaching liquors (especially from sulfite mills) by precipitation, flocculation, and/or ion-exchange adsorption. These processes are recommended where color and COD as well as BOD are to be reduced. Where the achievable BOD reductions are adequate, concentrated spent sulfite pulping liquor can be mixed with dilute spent pulp chlorination liquor and treated jointly in an activation basin for improved removals of BOD and COD. Manometric studies indicated that biodegradation kinetics often follow an initial semilogarithmic and subsequent linear course, suggesting an inhibitory effect. This can frequently be eliminated by inoculating the effluent with adapted microorganisms, thereby lowering the specific sludge loading. Some rate constants indicate particularly rapid oxygen consumption of evaporator condensates, compared to other sulfite mill effluents. (Ward-IPC)
W74-07386

MICROBIOLOGICAL PURIFICATION OF HYDROGEN SULFIDE-CONTAINING KRAFT MILL EFFLUENTS (MIKROBIOLOGICHESKAYA OCHISTKA SEROVODORODNYKH STOCHNYKH VOD SUL'FATNO-TSELLYULOZNOGO PROIZVODSTVA),
N. I. Tkachenko, and L. B. Pomerants.
Khimiya i Tekhnologiya Tsellyulozy i Bumagi – Trudy Leningradskogo Tekhnologicheskogo Instituta Tsellyulozno-Bumazhnoi Promyshlennosti, No 28, p 108-112, 1972. 2 fig, 1 tab, 14 ref.

Descriptors: *Biological treatment, *Waste water treatment, *Pulp wastes, Sulfur, *Hydrogen sulfide, *Sulfur bacteria, Sulfides, Bacteria, Oxidation, Biodegradation, Sulfates, Effluents, Waste treatment, Industrial wastes, Nutrients, *Filters.
Identifiers: Kraft mills.

A process for the purification of kraft mill effluents, such as digester relief condensates, containing hydrogen sulfide has been developed; it makes use of biological filters. Laboratory-prepared solutions of hydrogen sulfide were supplemented with the necessary nutrients and oxidized in model bio-filters. Thiobacillus thioparus was found to play the dominant role in the oxidation of hydrogen sulfide to elementary sulfur. Comparative analyses of the untreated and treated effluents showed a gradual reduction of hydrogen sulfide concentration accompanied by an increase in sulfate concentration and accumulation of sulfur. The sulfur was retained on the biofilter during the initial phase of filter formation. It could be readily recovered for reuse by washing the bacterial film mechanically. (Stapinski-IPC)
W74-07387

STUDY OF THE ADAPTATION OF AN ACTIVATED SLUDGE TO THE PURIFICATION OF AN INDUSTRIAL EFFLUENT (ETUDE DE L'ADAPTATION D'UNE BOUE ACTIVEE A L'EPURATION D'UN EFFLUENT INDUSTRIEL),
Centre de Recherches du Service de Sante des Armees, Lyon (France). Division de Microbiologie.
P. Le Ral, J. Buatois, J. Peny, and R. Fontanges.
Tribune CEBEDEAU, Vol 26, No 351, p 78-89, Feb 1973. 2 fig, 11 tab, 39 ref.

Descriptors: *Biodegradation, *Activated sludge, Pollutants, *Phenols, *Sulfur compounds, *Industrial wastes, *Oil wastes, Oil industry, Oil pollution, Bacteria, Enzymes, Biochemical oxygen demand, Chemical oxygen demand, Sulfur bacteria, Organic compounds, Hydrocarbons, *Waste water treatment.
Identifiers: Dimethyl sulfoxide, Petroleum refining industry, Aerobacter aerogenes.

The recent introduction of dimethyl sulfoxide (DMSO) into the petroleum refining industry as a solvent for the extractive distillation of aromatic hydrocarbons prompted a pilot-plant study of the biodegradation of DMSO in the presence of phenol, which is also a pollutant in petroleum industry effluents, by activated sludge. The latter was obtained from a petroleum refinery and adapted in the laboratory to media containing phenol as a carbon source. In media containing phenol alone, the sludge achieved nearly 100% BOD reduction, 70% COD reduction, and 90% phenol degradation. The presence of DMSO lowered these efficiencies to 78%, 48%, and 63%, respectively. Inoculation of the mixed substrate with Aerobacter aerogenes (Strain Lo 1314, capable of degrading DMSO) improved the biodegradation process, but not to the levels attained in the absence of DMSO. The degradation of DMSO did not exceed 4-5% in the presence or absence of phenol. Analyses of the activated sludge showed a gradual drop in the number of bacterial species, the presence of a dominant species, and the development of a specialized enzyme system
(Stapinski-IPC)
W74-07389

SOME EQUIPMENT USED IN FIBRE RECOVERY AND EFFLUENT TREATMENT OPERATIONS.
Paper (London), Vol 179, No 6, p 294, 296, 299-300, March 21, 1973. 8 fig.

Descriptors: *Treatment facilities, *Waste water treatment, *Pulp wastes, *Equipment, *Sludge treatment, *Filters, Dissolved solids, Dewatering, Industrial wastes, Waste treatment, Pulp and paper industry, Liquid wastes, Waste water(Pollution), Water pollution control.
Identifiers: Fiber recovery, Fines(Fine fibers), Screw presses.

The operation, some constructional features, and relative advantages of the following effluent-treatment units are described: a fluid-bed incinerator for sludge disposal; the Floatwash Fractionator made by Fractionator AB, Sweden, for recovering reuseable fine fibers from primary paper mill effluents; the Brassert Strainer, a pressurized filter for mechanical solids removal from aqueous and other liquid wastes; the Confac filtration system; the Jones Pressmaster, an automatic vertical screw press for liquid-solids separations; and the Beloit-Jones Polydisk Filter. (Witt-IPC)
W74-07390

HOW POLYACRYLAMIDES CAN HELP EFFLUENT PROBLEMS,
Allied Colloids Ltd., Bradford (England).
B. D. Fisher.
Paper (London), Vol 179, No 7, p 364-366, 368, April 4, 1973. 1 ref.

Descriptors: *Waste water treatment, *Polyelectrolytes, *Flotation, Sedimentation, *Flocculation, *Coagulation, *Pulp wastes, Chemicals, Chemical precipitation, Pulp and paper industry, Effluents, Industrial wastes, Pollution abatement, Water pollution control, Polymers.
Identifiers: Savealls, Paper machines, Polyacrylamide.

Polyacrylamides can serve in the paper industry as aids to the improved retention of fine fibers and fillers on the paper-machine wire (so as to reduce the effluent's pollution load). They can also improve the efficiency of various flotation- or sedimentation-type savealls when used as flocculants or coagulation aids. Laboratory techniques for evaluation of polyacrylamide preparations, their mechanism of action, and beneficial effects on effluent treatment processes are reviewed. (Witt-IPC)
W74-07391

ENVIRONMENTAL PROTECTION TECHNIQUES TO BE APPLIED IN A BLEACHED KRAFT PULP MILL IN SWEDEN,
Munksjo A.B., Jonkoping (Sweden).
U. Albertsson, and S. Bergkvist.
Tappi, Vol 56, No 12, p 135-138, Dec. 1973. 6 fig, 1 tab.

Descriptors: Pulp and paper industry, Europe, *Pulp wastes, *Bleaching wastes, *Pollution abatement, *Closed conduits, Industrial wastes, Water pollution, Evaporation, Oxygen, Effluents, Discharge frequency, Waste disposal, Lignins.
Identifiers: Closed systems, Kraft mills, White liquor(Kraft cooking liquor), Continuous digesters, Washing(Pulp), Oxygen bleaching, *Sweden.

An environmental protection project sponsored during 1970-1973 by the Swedish Pulp and Paper Association to provide a basis for near-future antipollution investments has already yielded results that will be put to work in the kraft mill of Munk-

AB. at Aspa, which was scheduled for startup the end of 1973. Pulping of wood in this mill is rformed in a completely closed cooking liquor stem, including a continuous digester with so- lled 'Hi-Heat' washing of cooked chips, plus reening, oxygen bleaching, and bleached pulp ashing equipment. The most heavily polluted ndensate is treated in a stripper column between o evaporation stages. A special system is under nstruction for controlled handling of temporary fluent discharges. The mill's total lignin scharge is estimated at one-half that of a conven- nal kraft pulp mill. (Brown-IPC)
74-07392

ODEGRADATION OF RESIN ACID SODIUM LTS,
rest Service (USDA), Pineville, La. Southern rest Experiment Station.
W. Hemingway, and H. Greaves.
ppi, Vol 56, No 12, p 189-192, Dec 1973. 5 fig, 17 .

escriptors: *Waste water treatment, iodegradation, *Resins, *Salts, *Sodium com- unds, Water pollution sources, Sulfite liquors, ulp wastes, Microorganisms, *Activated sludge, acteria, Temperature, Incubation, Hydrogen n concentration, Sewage.
entifiers: Spent sulfite liquor, Resin acids, Resin aps, Palustric acid, Abietic acid, Pimaric acid.

e Na salts of resin acids were readily degraded microflora from two types of river water and om an activated sewage sludge. A lag phase with tle or no salt degradation but with rapid bacterial velopment was observed, which was greatly ex- nded by a decrease of incubation temperature. fter this lag phase, the salts were rapidly decom- sed with either of the three natural inocula. The a salts of levopimaric, palustric, and hydroabietic acids were most rapidly degraded, llowed by abietic and neoabietic acid salts. maric and isopimaric acid salts were the most re- stant to biodegradation. Addition of 10% of a eutralized spent bisulfite pulping liquor did not fect cell growth or resin salt degradation, but the ddition of acidic spent sulfite liquor restricted egradation by activated sludge until the pH had sen to 7.3. (Brown-IPC)
74-07393

ATER REUSE AND RECYCLE IN KRAFT LEACHERIES,
IP Research Ltd., Hawkesbury (Ontario).
A. Histed, and F. M. A. Nicolle.
ulp and Paper Magazine of Canada, Vol 74, No 2, p 80-91, Technical Paper T386, Dec 1973. 15 g, 10 tab, 19 ref.

escriptors: *Bleaching wastes, *Pulp wastes, Waste water disposal, Discharge(Water), Pulp nd paper industry, United States, Canada, North merica, Effluents, Water releases, *Water reuse, ecirculated water, *Waste water treatment, Industrial wastes.
dentifiers: Washing(Pulp), Bleached pulps, Coun- rcurrent washing.

survey published Sept. 1970 by the Alkaline ulping Committee of the Canadian Pulp and aper Association's Technical Section showed hat effluent volumes leaving Canadian kraft mill leacheries ranged from 12,700 to 57,000 U.S. gal er ton of pulp. Methods of reducing these olumes were to be investigated in a study roposed to the Committee on Pollution Abate- ent Research (CPAR), Environment Canada. A urvey of current bleached pulp washing practices n North America indicated that three countercur- ent methods predominate in CEDED-sequence lants (C = chlorination, E = alklaine extraction, = chlorine dioxide), namely, direct, split-flow, nd jump-stage washing. The direct procedure roduced the least effluent, as low as 8100 gal per ir-dry ton. Laboratory studies showed that this can be further decreased to ca. 1600 gal/a.d. ton, without adverse effects on the quality of the bleached pulps. (Brown-IPC)
W74-07394

EFFLUENT - FIBRE RECOVERY - WATER SAVINGS; CASE HISTORY OF A RECENT PLANT INSTALLATION,
Paperboard, Machinery Services Ltd., Leatherhead (England).
K. D. Blundell.
Paper (London), Vol 179, No 5, p 232, 234-236, 239, March 7, 1973. 6 fig, 1 tab.

Descriptors: *Treatment facilities, *Pulp wastes, Foreign countries, Europe, *Waste water treatment, Water pollution control, Pollution abatement, Flocculation, Suspended folids, Fibers(Plant), Filters, *Filtration.
Identifiers: *United Kingdom(Northern Ireland), Fines recovery, Site selection, Clariflocculator(Dorr-Oliver).

The effluent-treatment facilities recently installed at the Lurgan Boxmaking Co. in Lurgan, Northern Ireland, comprise a Radcliffe filter unit for recovering fine fibers and a Dorr-Oliver Clariflocculator. Considerations leading to the selection and location of this installation are outlined, and various stages in the implementation of this waste-treatment project are reviewed. A flow diagram of the plant is included. (Witt-IPC)
W74-07395

UTILIZATION OF WHITE WATER IN BOARD MILLS (ISPOL'ZOVANIE OBOROTNOI VODY NA KARTONNYKH FABRIKAKH),
Ukrainskii Nauchno-Issledovatelskii Institut Bumagi, Kiev (USSR).
N. I. Dubitskaya, and A. G. Galenko.
Bumazhnaya Promyshlennost', No 9, p 9-10, Sept. 1973. 1 fig.

Descriptors: Water conservation, Treatment facilities, Recirculated water, *Waste water treatment, *Water reuse, *Pulp wastes, *Chlorination, *Coagulation, Suspended solids, Biochemical oxygen demand, Color, Biological treatment, Closed conduits, Pulp and paper industry, Europe, Aluminum, Industrial water, Industrial wastes, Polyelectrolytes.
Identifiers: Board mills(Paperboard mills), Board machines, *White water, Clarifiers, Aluminum sulfate, Polyacrylamide, Coagulants, *USSR.

A schematic description is given of a new water-recycling and reuse system for a paperboard mill to be added to an existing integrated pulp and paper mill at Zhidachev and a similar system to be installed at a board mill in Rostok, USSR. The Zhidachev board machine will produce 140,000 yearly tons of board made from waste paper plus a bleached chemical pulp facing. Effluent from this machine plus an older board mill will be treated first with chlorine for color removal, then coagulated with alum and polyacrylamide, and passed to contact clarifiers. The treatment should remove 100% of the color, 50% of the 5-day BOD, and 94-98% of suspended solids, so that the clarified water can be recycled and substituted for 40 cu m of the 70 cu m of fresh water needed per ton of board produced. Effluents from an existing paper mill and two pulp mills will be treated separately from the board machine white waters by mechanical and biological methods. A completely closed board-machine water circuit is contemplated as the next phase of this water economy drive. (Stapinski-IPC)
W74-07397

PILOT APPLICATION OF THE ROTATING BIOLOGICAL SURFACE CONCEPT FOR SECONDARY TREATMENT OF INSULATING BOARD MILL EFFLUENTS,
Boise Cascade Corp., Portland, Oreg.
D. J. Bennett, T. Needham, and R. E. Summer.
Tappi, Vol 56, No 12, p 182-187, Dec 1973. 7 fig, 6 tab, 10 ref.

Descriptors: *Pulp wastes, *Biological treatment, *Canada, Biochemical oxygen demand, Toxicity, Pollution abatement, Regulation, Effluents, Suspended solids, *Waste water treatment, Water pollution treatment, Water pollution control.
Identifiers: *Rotating biological surface, Groundwood mills, Mechanical pulping, Insulating board(Fiberboard), Board Mills.

The rotating biological surface (RBS) process was evaluated on a pilot scale as a potential method for the biological treatment of aqueous effluents from an insulating board (fiberboard) mill, which are typical of discharges resulting from the mechanical (groundwood) process of pulp manufacture. Reductions in BOD and total suspended solids were comparable to those reported for established secondary treatment schemes. The RBS-treated effluent's toxicity was reduced to a level complying with Canadian federal antipollution regulations. (Brown-IPC)
W74-07398

A PRACTICAL AND TROUBLE-FREE SEWER SPILL MONITOR,
Prince Albert Pulp Co. Ltd. (Saskatchewan).
W. B. Barnes.
Canadian Pulp and Paper Association, Technical Section, Proceedings, No 2, p D74-D76, Oct 1973. 8 fig.

Descriptors: *Waste water treatment, *Pulp wastes, *Instrumentation, *Monitoring, Discharge frequency, *Sewers, *Canada, Pulp and paper industry, Waste disposal, Industrial wastes, Overflow, Effluents, Pollution abatement, Equipment.
Identifiers: Tanks(Sewage collection), Recording instruments.

Effluent control regulations at Prince Albert Pulp Co. Ltd. in Saskatchewan are being aided by a nearly maintenance-free liquor spill recorder for pulp mill sewers in conjunction with three spill-collection tanks for catching overflows in the digester, chemical recovery, and evaporator areas. (Brown-IPC)
W74-07404

A REVIEW OF COLOUR REDUCTION TECHNOLOGY IN PULP AND PAPER MILL EFFLUENTS,
Beak (T. W.) Consultants Ltd., Montreal (Quebec).
M. A. Tyler, and A. D. Fitzgerald.
Canadian Pulp and Paper Association, Technical Section, Proceedings, p D116-125, 1972. 10 fig, 2 tab, 8 ref.

Descriptors: *Pulp wastes, *Bleaching wastes, *Color, *Waste water treatment, Water pollution control, Water quality control, Economic efficiency, *Costs, Lime, *Activated carbon, *Coagulation, Aluminum, Chlorine, Oxygen, Chlorination, Effluents, Adsorption, Operating costs, Capital costs, Sludge treatment, Dewatering, Reviews.
Identifiers: Aluminum sulfate, Oxygen bleaching.

Over 60 literature reports on effluent treatment for color removal were studied to assess the status of practices in the pulp and paper industry. Lime treatment seems to be the best established method, achieving 65% color removal from bleached kraft effluents at a capital cost of $1 to 1.5 million and operating costs of $1.0-1.5 per ton of pulp. Coagulation with alum gives similar results at similar costs, but requires improved systems for handling the sludge formed which is difficult to dewater. Adsorption on activated carbon accomplishes complete color removal but at high operating costs. Switching from chlorine to oxygen bleaching of kraft pulp would reduce effluent color by 60-65% and save ca. $2 per ton of

pulp in chemical costs. Capital costs for such a conversion are estimated at $2 million. (Brown-IPC)
W74-07406

POLLUTION CONTROL BY RECYCLING EFFLUENT,
Kimberly-Clark of Canada Ltd., Huntsville (Ontario).
R. F. Gropp.
Canadian Pulp and Paper Association, Technical Section, Proceedings, No 1, p D8-D11, Aug 1973. 4 fig, 2 ref.

Descriptors: Treatment facilities, *Pulp wastes, *Canada, *Flocculation, *Coagulation, Chemical precipitation, *Filtration, Lime, Magnesium hydroxide, *Waste water treatment, Waste water disposal, Water pollution control, Recirculated water, *Water reuse, Discharge(Water), Sewers, Pulp and paper industry, Solid wastes, Suspended solids, Industrial wastes, Waste treatment, *Recycling.
Identifiers: Tissue papers, Savealls, White water, Screen rejects, Stock pulp chests.

At Huntsville, Ontario, a tissue mill has been designed to meet stringent effluent quality regulations. A high proportion of the white water (paper machine waste water) is treated in a large disk-type saveall, using magnesium hydroxide as primary flocculant, and is then recycled to the tissue paper manufacturing process. A smaller portion is bled from the system, subjected to primary clarification, then passed through polishing basins and percolation beds before discharge to the relatively small river. Stock chests are designed for minimum fiber loss during paper grade changes. Screen rejects are thickened and treated as garbage, rather than flushed to U-drains. A flowchart of the water treatment cycle is given, along with a chemical description of Kimberly-Clark's patented lime process for precipitation of magnesium hydroxide. (Brown-IPC)
W74-07407

POLLUTION CONTROL THROUGH TRAINING, EDUCATION, AND RIGOROUS FOLLOW-UP,
Rolland Paper Co. Ltd., St. Jerome (Quebec).
For primary bibliographic entry see Field 5G.
W74-07408

WATER REUSE IN PROTEIN FEED PROCESS UTILIZING LUMBER MILL WASTES,
Arizona Univ., Tucson.
D. H. White, and D. T. Simmons.
In: Proceedings of the National Conference on Complete Water Reuse (sponsored by the American Institute of Chemical Engineers and the U.S. Environmental Protection Agency), April 23-27, 1973. p 488-496 (1973). 11 fig, 2 tab, 12 ref.

Descriptors: *Water reuse, *Industrial water, *Saw mills, *Moisture availability, *Wood wastes, *Hydrolysis, *Fermentation, *Proteins, Feeds, Waste disposal, Solid wastes, Air pollution, Incineration, Water circulation, Cooling water, Cooling towers, Water consumption(Except consumptive use), Freshwater, Yeasts, Economic feasibility, United States, Moisture content.
Identifiers: Hydrolysis industry, Wood hydrolysis, Sawmill residues.

About 40 million tons of sawmill residues are produced annually in the U.S.A., of which 70% originate in the West and South where economic conditions may favor the development of a billion-dollar hydrolysis-fermentation industry for production of synthetic feed protein via yeast cultivation. This would greatly alleviate the need for wood waste disposal by incineration (and the attendant air pollution problems). Although the hydrolysis industry consumes large volumes of water, most of this can be recycled. In theory, the wood's natural moisture content could supply more water than would be needed for sawmill steam generation, but cooling towers may require some freshwater intake. (Brown-IPC)
W74-07409

AN OVERVIEW OF WATER REUSE POTENTIAL IN PULP AND PAPER MANUFACTURING,
Wapora, Inc., Washington, D.C.
H. W. Gehm.
In: Proceedings of the National Conference on Complete Water Reuse (sponsored by the American Institute of Chemical Engineers and the U.S. Environmental Protection Agency), April 23-27, 1973. p 458-462 (1973). 33 ref.

Descriptors: *Water consumption, *Industrial water, *Pollution abatement, *Recycled water, *Water reuse, Pulp and paper industry, *Pulp wastes, *Waste water treatment, Waste treatment, Effluents, Discharge(Water), Bleaching wastes, Water resources, Water management(Applied), United States.
Identifiers: Kraft mills, Resource sharing, Integrated corporations, Multiproduct enterprises.

The U.S. pulp and paper industry has made considerable progress in recycling its process waters, especially in kraft pulp and paper mills and bleach plants. Although further reductions in water usage and effluent volumes are being researched and developed, the limits of this approach are near. Future advances will more likely concentrate on external treatments for water reclamation. Several mills of a complex (integrated) enterprise manufacturing different products may have to share the available water resources, e.g., by reusing treated water from one operation in another in which quality requirements are less stringent. Centralized water and effluent treatment for such complex corporations is an attractive alternative solution. (Brown-IPC)
W74-07410

THE PULP AND PAPER INDUSTRY AND THE ENVIRONMENT,
British Paper and Board Makers' Association, London (England).
J. S. Evans.
International Conference on Plastics and Paper, London, May 22-23 1973, Paper No. 4.2, 2 p, Plastics Institute, London.

Descriptors: *Europe, *Pulp and paper industry, *Pulp wastes, *Water pollution control, *Costs, Capital costs, Operating costs, Pollution abatement, Water quality control, Water quality standards, Legislation, Regulation, Economics, Industrial water, Water consumption(Except consumptive use), Water resources, Water management, Effluents, Toxicity, Biodegradation, Waste water disposal, Waste disposal, Fresh water, Treatment facilities.
Identifiers: OECD Nations.

Total water consumption by the pulp and paper industries of all OECD countries was estimated at 21,842,000,000 cu m in 1970. Modern technology can design new mills requiring only 10-20% of this water quantity. Since the elimination of Hg and other toxic components from the papermaking process, most effluent constituents do not differ radically from natural materials (lignin, carbohydrates, and organic acids) and are fairly readily biodegraded. Their treatment is largely a matter of economics. Legislation on water pollution control follows two different approaches. In Finland, Spain, Sweden, and Switzerland, the basic principle is to maintain or restore natural water quality. Other countries compromise between various end-uses of water resources, including industrial development and waste disposal. In the U.K., the paper industry uses ca. 287,000,000 gal/day of freshwater. Between 1965 and 1970, British paper and board manufacturers have spent 6.5 million pound sterling on effluent-treatment facili plus 6.2 million pound sterling on operating co Capital investments in 1971/72 ran to 1.8 mil pounds, and the investment needed to meet legislative standards during 1973-1977 are j jected at 17.5 million pound sterling. (Brown-IP W74-07411

EVALUATION OF CURRENT TECHNIQU FOR NUTRIENT REMOVAL FROM WAST WATERS,
Mississippi State Univ., State College. Dept. Civil Engineering.
A. Shindala.
Water Resources Bulletin, Vol 8, No 5, p 987-9 October, 1972. 32 ref. OWRR A-043-Miss(2).

Descriptors: *Waste water treatment, Sal water, *Drainage water, *Nutrient remov *Nitrogen compounds, *Phosphorus compoun Denitrification, Water treatment, Water qual control, Water pollution treatment, Eutrophi tion.

A comprehensive evaluation of current techniqu for removal of nitrogen and phosphorus was co ducted. Extensive searchings of the literatu demonstrated that the technology is available provide effective nutrient removal at a reasona cost. Current methods for phosphorus removal i clude biological treatment, chemical precipitatio and ion exchange. Nitrogen removal process i cludes biological denitrification, ammo stripping, and ion exchange. (Skogerboe-Colora State)
W74-07441

AN EXPLANATORY WORK ON THE OXID TION OF AMMONIA BY POTASSIUM FE RATE (VI),
Ohio State Univ., Columbus. Dept. of Chemic Engineering.
A. W. Strong.
Available from the National Technical Informa tion Service as PB-231 873; $5.25 in paper cop $1.45 in microfiche. M Sc Thesis, 1973. 38 p, fig, 13 tab, 15 ref, append. OWRR A-031-OHIO(2

Descriptors: *Waste water treatment, *Oxidation *Ammonia, Nitrogen, Chemical reactions, Sewag treatment.
Identifiers: *Potassium ferrate.

Ferrate (VI) not only can be used to oxidize th ammonia but can also oxidize organic compounds serve as a bactericide, and could coagulat phosphates with the ferric hydroxide formed dur ing reaction. The rate of conversion of ammoni was substantially increased with increasing tem perature in the range studies. There was little con version of ammonia below a pH of 7. Reaction run without buffer took longer than those run with buffers. The approach used for ammonia removal did not prove practical. The only means by which it could become useful would be through either the use of a catalyst to promote ammonia reaction or through the continuous addition of ferrate (VI) to hold a constant concentration level. Sulfate ion did not effect the decomposition rate of ferrate (VI). (Knapp-USGS)
W74-07454

PRODUCTION FUNCTION THEORY FOR USE IN OPTIMAL PLANNING DECISIONS,
Kentucky Univ., Lexington.
J. R. Marsden, D. E. Pingry, and A. Whinston.
In: Proceedings of the Midwest AIDS Conference, April 21-22, 1972, Cincinnati, Ohio, 1972. 4 p, 2 ref. OWRR A-024-IND(3).

Descriptors: *Planning, *Waste water treatment, *Decision making, *Optimum development plans, Capital, Optimization, Variable costs.
Identifiers: *Production functions.

The approach considered uses engineering relationships within the context of economic analysis attempting to derive theoretical analytic production and cost functions. Given as complete specification of the production process, a production frontier of maximal output levels obtainable from differing input combinations is derivable. This production frontier forms the basis for the development of a 'production function' for the process. No information is contained in the production function that is not available directly from the full specification of the production process. The production function is thus treated as a convenient intermediate step in the determination of a general 'least-total-cost' relationship. This relationship can well serve the basis for optimum future planning decisions. (Wiersma-Purdue)
W74-07460

APPLICATION OF A LARGE SCALE NON-LINEAR PROGRAMMING PROBLEM TO POLLUTION CONTROL,
California Univ., Los Angeles.
G. W. Graves, D. E. Pingry, and A. Whinston.
In: AFIPS Conference Proceedings, Vol 39, p 123-134, 1971. 2 fig, 2 tab, 11 ref. OWRR B-020-IND(23).

Descriptors: *Water pollution treatment, *Pollution abatement, *Water quality control, *Flow augmentation, Algoriths, River basin development, *Dissolved oxygen, Mathematical studies, Water quality standards.
Identifiers: *Non-linear programming, By-pass piping, White river basin.

The procedure used in constructing the river basin model is to divide the river into small sections and place constraints on the water quality at the end of these sections. In all cases, the water quality criteria used is the level of dissolved oxygen concentration. The level of dissolved oxygen at the end of the river sections is calculated using the Streeter-Phelps equations or some later variation. Cost functions are then estimated and a mathematical programming problem of the following form is solved: Minimize: The total cost of pollution abatement structures, Subject to: Water quality in each section of the river better than some given set of quality goals. A model of a river basin of the form suggested is presented. Simultaneously considered are the following treatment methods: (1) Flow augmentation, (2) By-pass piping, and (3) Treatment plant (regional and at polluter). Also shown is that linear constraints, consistent with the linear programming technique, are not appropriate when these treatment alternatives are considered. Therefore, a nonlinear programming algorithm is used. Some details of the algorithm are discussed and the model applied to the White River Basin in Indiana. (Wiersma-Purdue)
W74-07461

APPLICATION OF NONLINEAR PROGRAMMING TO WATER QUALITY CONTROL,
Kentucky Univ., Lexington.
J. R. Marsden, D. E. Pingry, and A. Whinston.
Water, Air, and Soil Pollution, Vol 2, p 155-169, 1973. 3 fig, 5 tab, 6 ref. OWRR A-024-IND(7).

Descriptors: *Water quality control, *Optimization, *Model studies, *Water pollution treatment, *Water pollution control, Mathematical models, Economics, Flow augmentation, Cooling towers, Thermal, Water temperature, Biochemical oxygen demand.
Identifiers: By-pass piping, Regional treatment plants, Planning model, West Fork White River.

Planning the design of an efficient waste treatment system can be aided through the use of mathematical models and optimization theory. This point of view is illustrated by formulating a model and applying it to a specific river basin. While the models give useful insights, limitations remain inherent in the models. Suggestions and comments are made for resolving some of the resulting economic questions.
W74-07462

UTILIZATION OF FIBROUS WASTES AS SOURCES OF NUTRIENTS,
North Carolina State Univ., Raleigh. Dept. of Animal Science.
J. M. Leatherwood.
Available from the National Technical Information Service as PB-223 625, $3.00 in paper copy, $1.45 in microfiche. Environmental Protection Agency, Report EPA-670/2-73-090, 1973. 16 p, 4 tab, 3 ref. EPA EP-00274.

Descriptors: *Waste water treatment, *Nutrients, *Cellulose, Fermentation, Anaerobic bacteria, Biodegradation, Hydrolysis, Feeds, Enzymes, Biological treatment, Fungi.
Identifiers: *Ruminococcus albus, *Trichoderma viride.

To develop a biological system for conversion of natural cellulosic wastes to products utilizable as animal nutrients, Trichoderma viride, one of the most potent cellulolytic fungi, was introduced to long-term incubations of cotton linters with culture filtrates of T. viride resulting in the degradation of about one-half of the cellulose. An experiment was designed to yield nutrients from newsprint digested by enzymes in T. viride culture in a natural silo-type of anaerobic fermentation. The newsprint was unprinted and had been shredded in a hammer mill equipped with a large mesh screen. Cellulolytic activity was determined in 0.1 ml of the supernatant liquid of both the cultures prior to addition to the fermenter and the liquid samples and product collected from the fermenter. Cultures of T. viride varied in the amount of cellulolytic activity in the supernatant liquid. Sequential addition of cultures and newsprint approximately on a three-week interval was accepted as the best alternative plan. Subsequently 200 ml samples of fermenter liquid were collected for analyses. Soluble carbohydrates and proteins did not accumulate in the fermenter liquid as had been anticipated. (Jones-Wisconsin)
W74-07472

SELECTION AND OPERATION OF SMALL WASTEWATER TREATMENT FACILITIES - TRAINING MANUAL.
Environmental Protection Agency, Cincinnati, Ohio. Office of Water Program Operations.
Available from the National Technical Information Service as PB-224 266, $4.25 in paper copy, $1.45 in microfiche. Report No. EPA-430/1-73-005, April 1973. 137 p, 59 fig, 29 tab, 76 ref, 6 plates.

Descriptors: *Waste water treatment, *Treatment facilities, *Training, *Education, Operation and maintenance, Sewage treatment, Aquatic environment, Water pollution effects, Municipal wastes, Industrial wastes, Technology, Septic tanks, Settling basins, Monitoring, Eutrophication, Sampling, Coagulation, Activated carbon, Filtration, Water quality.
Identifiers: *Small waste flows.

Comprehensive information is presented on small wastewater treatment facilities which will be of great value as an adjunct to classroom presentations. The reference outlines have been selected and developed with a goal of providing the student with a fund of the best available current knowledge pertinent to the subject. All sewage treatment is accomplished by application of the natural phenomena of biological, physical, and chemical processes, which are described. Subjects covered include the freshwater environment, effects of pollution on aquatic life, water pollution by domestic wastes, and sources and effects of industrial wastes. Treatment methods for small flows include septic tanks, small treatment systems (package plants), advanced waste treatment plants for small waste flows, sewage lagoons, and sewage lagoon operation and maintenance. Surveillance and operations controls include general needs, reports and control measurements, control tests and sampling for operating wastewater treatment plants, sampling in water quality studies, and operational inspections. (Auen-Wisconsin)
W74-07485

MOINA SP. (CLADOCERA: MOINIDAE) IN A SEWAGE PLANT, WELLINGTON, REFERRED TO MOINA TENUICORNIS SARS, 1896 (NOTE),
Wellington City Corp. (New Zealand). Works Dept.
For primary bibliographic entry see Field 5A.
W74-07569

5E. Ultimate Disposal Of Wastes

GEOLOGIC ASPECTS OF WASTE SOLIDS AND MARINE WASTE DEPOSITS, NEW YORK METROPOLITAN REGION,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 5B.
W74-07171

LAND DISPOSAL OF WASTEWATER--LITERATURE REVIEW FOR 1973,
New York State Dept. of Environmental Conservation, Albany.
For primary bibliographic entry see Field 5D.
W74-07327

ORGANIZATION OF THE COLLECTION AND DECONTAMINATION OF INDUSTRIAL AND DOMESTIC RADIOACTIVE SEWAGE, (IN RUSSIAN),
For primary bibliographic entry see Field 5D.
W74-07362

WATER REUSE AND RECYCLE IN THE D(C)EDED BLEACH SEQUENCE,
CIP Research Ltd., Hawkesbury (Ontario).
For primary bibliographic entry see Field 5D.
W74-07377

LAND DISPOSAL OF WASTE GASES: III. SORPTION PATTERNS FROM BURIED GAS INJECTION PIPES,
Arizona Agricultural Experiment Station, Phoenix.
For primary bibliographic entry see Field 5B.
W74-07422

5F. Water Treatment and Quality Alteration

WATER TREATMENT APPARATUS,
For primary bibliographic entry see Field 5D.
W74-07196

METHOD OF AND APPARATUS FOR THE PURIFICATION OF WATER CONTAINING ORGANIC CONTAMINANTS,
Laboratorium fuer Adsorptionstechnik, G.m.b.H., Frankfurt am Main (West Germany). (assignee).
For primary bibliographic entry see Field 5D.
W74-07199

OZONE IN WATER AND WASTE WATER TREATMENT, A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 5D.

W74-07251

HYGIENIC FEATURES OF SILICATE ANTICORROSION COATINGS FOR WATER RESERVOIRS, (IN RUSSIAN),
Sanitarno-Gigienicheskii Meditsinskii Institut, Leningrad (USSR).
A. G. Ilichkina.
Gig Sanit. Vol 37, No 2, p 35-38. 1972. (English summary).
Identifiers: *Anti-corrosion coatings, Chlorine, Corrosion, Reservoirs, Silicates, *Potable water, *Public health, *Water treatment, Water pollution treatment, Water quality standards.

Anticorrosion coatings had a negative effect on drinking water quality. When reservoir walls coated with SNZhS (average modular Na liquid glass) and ZhS-80 (brand name of liquid glass) were disinfected with chloramin at a dose of 20 mg Cl/l and washed twice with water in the course of 2 days, the quality of the drinking water met the requirements of the 'Drinking Water' standard. VKZhS (highly modular K liquid glass) was unfit for use, because after its contact with Cl the Fe of the coating passed into the water and produced flocculation which persisted even after filtration of water.--Copyright 1973, Biological Abstracts, Inc.
W74-07364

HYGIENIC EVALUATION OF MEANS OF ENRICHMENT WITH SALTS AND DECONTAMINATION OF DEMINERALIZED WATER, (IN RUSSIAN),
Kiev Research Inst. of General Communal Hygiene (USSR).
D. P. Pogosov, N. I. Omel'Yanets, L. V. Girgor'eva, I. N. Medvedev, and N. V. Mironets.
Gig Sanit. Vol 37, No 8, p 19-22. 1972. (English summary).
Identifiers: Salts, Water pollution, *Potable water, *Public health, *Decontamination, *Demineralization, *Water treatment.

The anionite AB-17-8 micron C and the mineralizer M-16 are recommended for use as reagents for enrichment with salts of demineralized water for its short-term use for drinking purposes. The asbestos-Ag sterilizer requires further improvement, since its present output of Ag ions is low and unstable.--Copyright 1973, Biological Abstracts, Inc.
W74-07365

5G. Water Quality Control

A STUDY OF POTENTIAL INSTITUTIONAL ARRANGEMENTS FOR WATER QUALITY AND WATER RESOURCES (QUANTITY) PLANNING AND MANAGEMENT,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 6B.
W74-07051

ECOLOGY AND PRODUCTIVITY OF STRIP-MINE AREAS IN MERCER COUNTY, PENNSYLVANIA,
Grove City Coll., Pa. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W74-07055

COAL-ENERGY DEVELOPMENT IN THE NORTHERN GREAT PLAINS.
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 6D.
W74-07056

ECONOMIC STUDY OF THE EFFECT OF MUNICIPAL SEWER SURCHARGES ON INDUSTRIAL WASTES AND WATER USAGE,
Clemson Univ., S.C. Dept. of Economics.
R. D. Elliott.
Water Resources Research, Vol 9, No 5, p 1121-1131, October, 1973. 5 fig, 3 tab, 9 ref.

Descriptors: *Regression analysis, *Non-structural alternatives, *Industrial wastes, *Industrial water, Wastes, Biochemical oxygen demand, Suspended solids, *Pollution taxes(Charges).
Identifiers: *Surcharges(Industrial wastes).

In an effort to control the discharge of industrial wastes, many cities have levied surcharges on industrial wastes having a strength greater than some specified minimum level of biochemical oxygen demand (BOD) or suspended solids (SS). Cities can better evaluate such surcharges by knowing (1) the effect of surcharges on the quantity of waste discharged by firms into municipal systems and (2) the effect of surcharges on the quantity of water demanded by firms from municipal systems. Regression equations, based on data from 34 cities using surcharges, indicate a negative relationship between amount and prices. A surcharge of $27.00/1000 lbs. of BOD would cause a 45% reduction in the pounds of BOD per $1000 value added discharged by industry and 42% reduction in industrial water consumption per $1000 value added. At this average surcharge, a 10% increase in the surcharge would result in an 8% decrease in wastes and a 6% decrease in water usage. Results also indicate that both industrial water usage and waste loads have increased directly with wage rates in the recent past. (Hoffman-North Carolina)
W74-07057

SANITARY SERVICES IN TENNESSEE, 1972.
Tennessee State Planning Office, Nashville.
For primary bibliographic entry see Field 5D.
W74-07060

PROCEDURES AND PROGRAMS TO ASSIST IN THE ENVIRONMENTAL IMPACT STATEMENT PROCESS,
California Univ., Berkeley. Inst. of Urban and Regional Development.
For primary bibliographic entry see Field 6B.
W74-07061

POLLUTION, PRODUCTION, AND COMPENSATION,
Oak Ridge National Lab., Tenn.
C. H. Patrick.
Available from the National Technical Information Service as CONF-73-0423-3, $3.00 in paper copy, $1.45 in microfiche. (1973). 15 p.

Descriptors: *Theoretical analysis, *Air pollution, *Water pollution, *Pollutants, *Cost allocation, Pollution abatement, Abatement, Industrial production, Industrial wastes, Costs, Cost sharing, Coal mines, Cost repayment.
Identifiers: Pollution, *External diseconomies, Coal industry.

The relationship between pollution and production is defined, and the effects of pollution limitation on production and the question of consumption are theoretically examined. Analysis shows that while individuals select desirable and undesirable results of activities to maximize their personal preference function, pollution problems arise when private economic activities impose costs upon a third person who does not share direct benefits of the activities. External diseconomies thus exist when social costs exceed private costs. Pollution, as a by-product of one firm, imposes higher costs on a second firm hence reducing its output. Therefore, prices of the two do not optimally allocate scarce resources as they would without pollution. Compensation is considered from the standpoint of the industry's ability to compensate firms affected by pollution restrictions. The coal industry is concerned that production will be cut as a result of pollution restrictions so this theoretical framework is applied to determine possible alternative levels at which coal could be produced with restrictions. Factors considered include demand and who determines output restrictions-the coal industry or government. (Grden-North Carolina)
W74-07064

WALLOWA LAKE BASIN COMPREHENSIVE PLAN.
Stevens, Thompson and Runyan, Inc., Portland, Oreg.
For primary bibliographic entry see Field 5D.
W74-07065

BACKGROUND SURVEY. SURFACE DRAINAGE PROGRAM, MADISON, SAINT CLAIR, MONROE AND RANDOLPH COUNTIES, ILLINOIS.
Southwestern Illinois Metropolitan Area Planning Commission, Collinsville.
For primary bibliographic entry see Field 4A.
W74-07066

WATER QUALITY MANAGEMENT ELEMENT FOR THE KENTUCKY RIVER AREA DEVELOPMENT DISTRICT COMPREHENSIVE WATER AND SEWER PROGRAM.
Mayes, Sudderth and Etheredge, Inc., Lexington, Ky.
For primary bibliographic entry see Field 5D.
W74-07077

PROGRAM DEVELOPMENT PLAN FOR THE MESA-NEW YORK BIGHT REGIONAL PROJECT.
Westinghouse Oceanic Div., Annapolis, Md.
For primary bibliographic entry see Field 6B.
W74-07078

POLLUTION AND INDUSTRY: PROS, CONS OF GROWING FIGHT.
U.S. News and World Report, Vol 71, p 60-63, November 22, 1971.

Descriptors: *Economic impact, *Legal aspects, *Water pollution sources, *Industrial wastes, *Pollution control, Legislation, Industrial effluents, Employment, Federal government, Water quality, Industrial plants, Production, Electric powerplants, Nuclear powerplants, Waste disposal, Waste treatment, Regulations, Standards, Water policy, Development, Costs, Public utilities, Waste water treatment, Environment, Ecology, Government finance, Water law, Judicial decisions.

Many people are losing jobs when plants shut down because companies are unable or unwilling to pay the cost of pollution-control equipment. American factories and powerplants are still belching poisonous gases, dust and wastes. While Congress is moving to enact tough, biting pollution control legislation, the administration is complaining of the 'useless hardships that are being thrust upon industry and workers by that process.' 160 iron foundries have stopped operation within the past three years as well as 59 other plants attributed primarily to environmental pressures. Then, Secretary of Commerce, Maurice Stans, said somewhere between $5 and $10 billion in public and private construction is being held up by environmental actions. Also, the Atomic Energy Commission (AEC) was ordered in court to broaden its consideration of environmental factors in licensing nuclear powerplants, affecting more then 100 plants operating or under construction. Because of these stricter regulations and environmental standards, higher cost will be passed on to consumers, either in rates or in taxes. One en-

onmentalist suggested a change in pricing elec-city from that in which the big consumer gets a wer rate to a social policy of reduced consump-n. (Silber-Florida)
74-07112

ATURAL RESOURCES--WASTE CONTROL.
r primary bibliographic entry see Field 6E.
74-07116

ETALLIC MINERAL MINING OPERATIONS, CQUISITION OF SURFACE LANDS FOR ATER QUALITY CONTROL).
r primary bibliographic entry see Field 6E.
74-07119

HE INTERLAKE AFFAIR,
sinessmen for the Public Interest, Washington, C.
Polikoff.
ashington Monthly, Vol 3, No 1, p 7-16, March 71.

escriptors: *Lake Michigan, *Industrial wastes, Vater pollution sources, *Legal aspects, *Water w, Judicial decisions, Chemical wastes, Waste-ater discharge, Oily wastes, Solid wastes, Pollu-nts, Contaminants(Water), Legislation, Naviga-e waters, Administrative agencies, Federal vernment, Water policy, Water pollution, Waste mp, Public health, Impaired water quality, Pol-tant identification, Water pollution effects.

June, 1968, a steelworker, crossing the Little alumet River on his way to work saw a pipe, ex-nding from the steelplant, spewing black scharge into the river. He telephoned the U.S. oast Guard to report what he saw. So began the ght to save Lake Michigan. The steel company is terlake, Inc. Interlake prides itself on being a ader in the fight against pollution. The Coast uard was responsible for the enforcing the 1899 efuse Act which prohibits dumping of refuse in avigable waters. Analysis of the discharge owed the oil and mill scale were spewing from e outfall. Discharging either substance violated e Refuse Act. Interlake, after unsuccessfully eading for dismissal, changed its plea to nolo ontendere and entered affidavits stating that the roblem had been corrected by structural im-rovements and that the company was in the midst a $30 million pollution abatement program. espite this the court found Interlake guilty and ned it the minimum $500. Interlake has continued olluting the water in the same manner and with e same pollutants. The ultimate outcome was in-icated in a letter by then Attorney General John itchell that the Justice Department was not going 'vigorously enforce' the Refuse Act as Con-ress had mandated. (Silber-Florida)
74-07120

AUNDRY DETERGENTS AND ENVIRONMEN-AL QUALITY,
ndiana Univ., Bloomington. Poplars Research nd Conference Center.
or primary bibliographic entry see Field 5C.
74-07122

OLLUTION SANCTIONS--NEW ALTERNA-IVES TO CIVIL LIABILITY,
ood and Agriculture Organization of the United lations, Rome (Italy). Environment Law.
. H. Sand.
ournal of Business Law, p 147-154, April 1973. 45 ef.

escriptors: *Civil law, *Penalties(Legal), Pollution abatement, Constraints, Pollution axes(Charges), Damages, Third party effects, osts, Contracts.
dentifiers: *Tort liability, Japan, Germany, weden.

While liability suits are used most frequently to deal with pollution, they are not the only nor necessarily best solution. Pollution sanctions attempt to serve a number of goals: equitable distribution of losses, including external diseconomies; effective reparation of the damages done at minimum overhead costs and prevention of future damages. Alternative remedies examined include emission charges, abatement agreements and criminal sanctions. To determine the best method or combination of methods that could lead to some desired outcome, it is also essential to improve the comparative research methodology being used to examine these alternatives. Existing methods must be improved to assure comparisons of alternatives and to assure that combinations of sanctions are evaluated. It must be also recognized that unilateral changes in pollution sanctions create second-best problems if other legal entities do not coordinate their own sanctions. Thus research must also consider alternatives which encompass international as well as national pollution sanctions or substituted performance by international agencies where states fail to take the required action. (Schroeder-Wisconsin)
W74-07123

AN ECONOMIC ANALYSIS OF SELECTED AGRICULTURAL USES OF WARM WATER IN THE PACIFIC NORTHWEST RESULTING FROM ELECTRIC POWER GENERATION,
Washington State Univ., Pullman. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3C.
W74-07125

WATER RESOURCES SEMINAR SERIES NO. 2.
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W74-07133

HAWAII'S STATEWIDE LAND CLASSIFICATION PROVES ADAPTABILITY AS LAND USE AND ENVIRONMENTAL CONCERNS CHANGE,
Hawaii State Land Study Bureau, Honolulu.
For primary bibliographic entry see Field 4A.
W74-07138

POSSIBLE IMPACT OF COSTS OF SELECTED POLLUTION CONTROL EQUIPMENT ON THE ELECTRIC UTILITY INDUSTRY AND CERTAIN POWER INTENSIVE CONSUMER INDUSTRIES. EXECUTIVE SUMMARY.
National Economic Research Associates, Inc., New York.
Available from the National Technical Information Service as PB207168 $3.00 in paper copy, $1.45 in microfiche. Council on Environmental Quality, Washington, D.C. January 1972. 11p.

Descriptors: *Economic impact, *Pollution abatement, *Costs, *Electric power industry, Industries, Regulation, Thermal pollution, Air pollution, Cooling towers, Equipment, Water pollution control, Employment.
Identifiers: Retrofitting.

A summarized study considers the impacts of pollution controls on the electric utility industry. A brief examination is first made of the demand-supply relationships in the industry, characteristics peculiar to electrical generation, sale and use of electricity, and regulating aspects of the industry. Because the industry is extensively regulated, cost impacts of any changes in technology will not quickly penetrate the market. A number of assumptions are made to estimate the costs of pollution control techniques and their impacts on society. Techniques examined include the burning of low sulfur coal and wet limestone scrubbers to control air pollution and mechanical draft cooling towers to control thermal pollution. Assumptions are made as to which alternative technique each generating plant will use, to the period over which the investment will be made and to operating and capital costs under each technique EPA cost estimates. Under these assumptions the price of electricity may rise by 7% by 1976. There would not, however, appear to be any significant dislocation as a result either in the electrical generating industry of industry in general. Even with some dislocation in the six most energy intensive industries employment impacts will be minimal. (Schroeder-Wisconsin)
W74-07140

METHOD OF AND APPARATUS FOR THE RECOVERY OF OIL FROM WATER,
Col-Mont Corp., Butte, Mont. (assignee).
C. O. Bunn.
U.S. Patent No 3,783,129, 8 p, 6 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 918, No 1, p 419, January 1, 1974.

Descriptors: *Patents, *Pollution abatement, *Oil spills, *Oil pollution, Water pollution control, Water quality control, Equipment, Skimming, *Separation techniques, *Distillation.

A recovery vessel is directed through an area of oil spillage where oil and water are directed into special openings in the vessel. The oil and water are directed over and through a bed of matrix material carried by a conveyor. The oil is sorbed by the matrix material and the cleaned water gravitates through the conveyor to the water sump below the conveyor. The separation of the oil from the matrix material can be accomplished by distillation equipment housed within the vessel. The matrix is composed of finely divided coal and polyethylene and a sufficient amount of water and/or an organic solvent to facilitate the intimate mixing of coal and polyethylene. The organic solvent is used to reduce the temperature required to cause the plastic to develop the required binding characteristic which forms the porous matrix. (Sinha - OEIS)
W74-07201

ATTENUATION OF WATER WAVES AND CONTROL AND UTILIZATION OF WAVE-INDUCED WATER MOVEMENTS,
FMC Corp., San Jose, Calif. (assignee).
For primary bibliographic entry see Field 8B.
W74-07204

SAFETY DEVICE AGAINST LEAKAGE FROM SHIPS, ESPECIALLY TANKERS,
Svenska Entreprenad A.B. Sentab, Stockholm. (assignee).
A. L. Backstrom.
U.S. Patent No 3,785,321, 3 p, 11 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 918, No 3, p 1014, January 15, 1974.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Leakage, *Pollution abatement, *Water pollution control, Water quality control, Ships.
Identifiers: Tankers, Gravity separation.

A ship such as a tanker for the transport of oil and oil products, is provided with a safety device to prevent leakage of the product being stored or transported. The safety device comprises a shield which is flexible and extends along the ship's hull in spaced relation so as to define vertically extending narrow spaces at the inner side of the hull. The narrow spaces open in the bottom region of the ship and shall contain a liquid having the same or a higher density than the transported product. As an example the product may rest on a bed of water at the ship's bottom, water also being present in the said narrow spaces. If, for instance, due to a collision a hole is formed in the ship's hull, the liquid level in the actual narrow spaces will be adapted after the sea level whereby the level of the product in the cargo space takes a balanced position in

which leakage of the product is prevented. As an alternative to water the transported product proper may be contained in the narrow spaces in which case a small leakage may occur if the hull of the ship becomes damaged. (Sinha - OEIS)
W74-07205

OIL RECLAIMING DEVICE FOR REMOVING OIL FROM THE SURFACE OF WATER,
Craftmaster, Inc., Williamsport, Pa. (assignee).
R. P. Smith, Jr.
U.S. Patent No 3,785,496, 3 p, 4 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 918, No 3, p 1058, January 15, 1974.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Pollution abatement, Water quality control, Water pollution control, *Skimming, *Separation techniques, Equipment.

An apparatus for removing oil slicks from the surface of the water includes two independently pivotable booms connected together to form a V. A paddle wheel is connected to the two booms across the open end of the V for skimming the oil off the surface of the water and forcing the oil towards the apex of the V. A sump is located at the apex of the V for collecting the oil forced to the apex of the V by the paddle wheel. A flexible stabilizer bar is connected between the two booms for stabilizing the booms and limiting the maximum amount that the booms may pivot with respect to each other. (Sinha - OEIS)
W74-07206

CONTAINING AND REMOVING OIL SPILLS ON WATER,
Phillips Petroleum Co., Bartlesville, Okla. (assignee).
A. C. Pitchford.
U.S. Patent No 3,785,972, 2 p, 1 tab, 3 ref; Official Gazette of the United States Patent Office, Vol 918, No 3, p 1173, January 15, 1974.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Pollution abatement, Water pollution control, Water quality control, *Separation techniques, *Skimming.

A method is described to contain and then remove oil spills from the surface of a body of water by raising the liquification temperature of the oil to 50-80 deg F above the temperature of the Water. A mixture of wax and a volatile, inflammable substance is applied to the oil spill in sufficient amount to provide on ignition the amount of heat necessary to fuse the wax. The solidified mass may then be removed from the surface. The inflammable substance is selected from hydrocarbons in the kerosene boiling range. Waxes suitable for use include any low temperature melting wax such as the paraffinic waxes, naturally occuring ozocerite, carnauba wax, C12 to C25 alcohols and fatty acids such as stearic or palmitic. Additions of wax in the order of 5 to 50 percent by weight of the oil are effective. A range of 10 to 15 percent by weight of wax added to the oil should be used. (Sinha - OEIS)
W74-07208

METHOD AND APPARATUS FOR COLLECTING A FLOATING LIQUID,
W. P. Kirk, and D. W. Reynolds.
U.S. Patent No 3,788,079, 5 p, 9 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 918, No 5, p 1743, January 29, 1974.

Descriptors: *Patents, *Oil spills, *Pollution abatement, *Oil pollution, Water quality control, Water pollution control, Equipment, *Separation techniques.

Methods and equipment are described for rapid deployment of a recovery membrane sheet and for subsequently closing or collapsing the sheet to concentrate the oil or unwanted floating liquid into a compact mass. The sheet with weighted periphery is delivered to the site in a compact, folded condition. The edges of the sheet fall and submerge into the surface, confining a quantity of the oil or other unwanted liquid. Further submergence of the peripheral edges is then accompanied by radially inward movements to concentrate the confined substance into a compact mass. The compact mass is retained for subsequent pumping into a receiver vessel. (Sinha-OEIS)
W74-07215

METHOD FOR THE ELIMINATION AND POSSIBLE RECOVERY OF THE FLOATING POLLUTING SUBSTANCES, MINERAL OILS IN PARTICULAR, FROM SHEETS OF WATER AND BOAT FITTED TO THIS AIM,
A. L. deAngelis.
U. S. Patent No 3,788,481, 3 p, 5 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 918, No 5, p 1850, January 29, 1974.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Pollution abatement, Water pollution control, Water quality control, Boats, *Separation techniques, Skimming.

A boat is furnished with one or more chambers having openings to admit water with floating oil layers. Within the chamber where it is sheltered from the action of wind or waves separation takes place. A funnel is submerged at an adjustable distance from the liquid to be removed. A pump sucks the liquid from the funnel(s) and conveys it to a tank where it is decanted. The separated water is discharged into the sea, while the oil is conveyed to another tank for temporary storage. The funnel(s) is connected with a float, the device moves vertically according to the greater or minor boat draft. Vertical slides are arranged at the sides of the funnel to facilitate the proper running of the device lateral shift. (Sinha-OEIS)
W74-07220

METHOD OF REMOVING OIL SPILLS,
Anheuser-Busch, Inc., St. Louis, Mo. Assignee.
J. Teng, J. M. Lucas, and R. E. Pyler.
U. S. Patent No 3,788,984, 3 p, 1 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 918, No 5, p 1972, January 29, 1974.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Pollution abatement, Water quality control, Water pollution control, Sawdust, Adsorption, *Separation techniques.
Identifiers: Carbohydrate fatty acid ester, Cellulose acetate, Cottonseed hulls, Cellulose ester.

A method is described for removing spilled oil from water surfaces without further injuring the environment. A carbohydrate fatty acid ester in powder, fibrous, or granule form is applied to the oil covered surface. The preferred ingredient is cellulose acetate. The additive is non-toxic, biodegradable, water insoluble, and is not degraded by the acids in petroleum fuels. The additive is sprinkled on the surface of the oil coated water and after absorbing many times its weight in oil is easily removed. The picked up oil is easily removed from the cellulose acetate and up to 95% recovery of spilled oil is possible. The cellulose acetate also can be reused. Cottonseed hulls and sawdust as the starting cellulose material are desirable because of low cost and the enhanced oil absorbing character of the resulting acetate. (Sinha-OEIS)
W74-07222

APPARATUS FOR REMOVING SURFACE POLLUTANTS FROM WATER AND OTHER LIQUIDS,
Societe Grenobloise d'Etudes et d'Applications Hydrauliques (France). Assignee.
B. Valibouse, and J. Pichon.
U. S. Patent No 3,789,988, 5 p, 9 fig, 5 ref, Official Gazette of the United States Patent Office, Vol 919, No 1, p 159, February 5, 1974.

Descriptors: *Patents, *Flotsam, *Oil pollution, *Oil spills, *Pollution abatement, Water pollution control, Water quality control, Equipment, *Separation techniques.

Surface pollutants are collected by utilizing the effect of the relative speed of displacement of water and the floating pollutant. These are led into one or more cyclone chambers through a tangential inlet so as to cause within the chamber, a rotation which creates a whirlpool area in which the lighter pollutant is concentrated. The pollutant is extracted through a fixed pipe whose axis is coincident with that of the cyclone chamber. The centrifuged water, freed of the pollutants is removed through the tip of the cyclone chamber. The equipment may be towed or pushed by a ship, or mounted on or built into a ship or a floating carrier, or placed in a stable position in a river. (Sinha-OEIS)
W74-07223

COMBINED SEWER OVERFLOW SEMINAR PAPERS.
Edison Water Quality Research Lab., N.J.
For primary bibliographic entry see Field 5D.
W74-07255

STORMFLOW POLLUTION CONTROL IN THE U.S.,
Edison Water Quality Research Lab., N.J.
For primary bibliographic entry see Field 5D.
W74-07256

THE EFFECTS OF HOUSEHOLD SANITARY SYSTEMS ON EFFLUENT PHOSPHATE LEVELS,
Windsor Univ. (Ontario). Industrial Research Inst.
For primary bibliographic entry see Field 5D.
W74-07267

PETROLEUM REFINERY EFFLUENT REGULATIONS AND GUIDELINES.
Environment Canada Environmental Protection Service Regulations, Codes and Protocols Report EPS 1-WP-74-1 January, 1974. 29 p. (Text also in French).

Descriptors: *Oil pollution, *Water quality standards, *Regulation, Liquid wastes, Effluents, *Oil industry, Oil wastes, Toxicity, *Canada, Quality control, Oil, Phenols, Sulfides, Hydrogen ion concentration, Suspended load, Ammonia, Cooling water.

As of November 1973, regulations respecting deleterious substances in liquid effluents from petroleum refineries were annexed to the Canadian Fisheries Act. Specific substances included under these regulations include oil and grease, phenols, sulfide, ammonia nitrogen, total suspended matter, and any substance capable of altering the pH of liquid effluent or once-through cooling water. Simultaneously issued by the Department of the Environment were guidelines respecting acute toxicity of liquid effluents from petroleum refineries and the quality of liquid effluents from existing petroleum refineries. Explanatory notes regarding the regulations and both guideline criteria are included. (Sandoski-Franklin)
W74-07274

STREAM POLLUTION.
For primary bibliographic entry see Field 6E.
W74-07275

NITARY DISTRICTS FOR SEWAGE SPOSAL.
r primary bibliographic entry see Field 6E.
74-07276

EST VIRGINIA WATER DEVELOPMENT THORITY.
r primary bibliographic entry see Field 6E.
74-07277

ASSIFICATION OF WATER AND WATER ANDARDS.
r primary bibliographic entry see Field 6E.
74-07281

W AFFECTING THE QUALITY OF THE ARINE ENVIRONMENT,
A. Clingan, Jr.
ami Law Review, Vol 26, No 1, p 223-254, 1971.
148 ref.

escriptors: *Water quality control, *Oceans, egislation, *International law, Legal aspects, astes, Oil pollution, Heat, Nutrients, Sediments, deral government, Federal Water Pollution ntrol Act, Rivers and Harbors Act, State vernments, Florida, Minnesota, Maine, Water nagement(Applied).

e author reviews some of the current ap-oaches to the solution of water pollution oblems, particularly as they affect the oceans, in der to create a more coherent understanding of e adequacies and shortcomings of present legal medies. In order to show the great breadth of the oblems involved in the study of marine pollution e oceans are examined as a depository of waste, rticularly in terms of oil, toxic substances, heat, trients, and sediments. The discussion of na-onal regulation of marine pollution is an examina-on of several major enactments, including the ational Environmental Policy Act, the Federal ater Pollution Control Act (as amended), and the ivers and Harbors Act of 1899. In addition the ovisions of certain pieces of typical state legisla-on in Florida, Minnesota, and Maine are ex-mined to shed light on the operation of federal w. The impacts of international agreements on tional law, both in general and in terms of ocean mping, are discussed. (Widman-Florida)
74-07282

NITED STATES V. POT-NETS, INC. VIOLATION OF RIVERS AND HARBORS CT),
or primary bibliographic entry see Field 6E.
74-07287

ROTECTION OF THE ENVIRONMENT.
or primary bibliographic entry see Field 6E.
74-07289

NITED STATES V. IRA S. BUSHEY AND ONS, INC. (INJUNCTION AGAINST OIL PILLS).
or primary bibliographic entry see Field 6E.
74-07291

HE BITTERSWEET WATERS OF THE OWER COLORADO,
or primary bibliographic entry see Field 3F.
74-07292

ATIONAL POLLUTANT DISCHARGE LIMINATION SYSTEM.
or primary bibliographic entry see Field 6E.
74-07293

AGANA SMALL BOAT HARBOR, AGANA, GUAM (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Honolulu, Hawaii. Pacific Ocean Div.
For primary bibliographic entry see Field 4A.
W74-07294

SIMULATION--A TOOL FOR WATER RESOURCE MANAGEMENT,
Hydrocomp, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 6A.
W74-07300

REGIONAL WATER QUALITY MANAGEMENT BY THE GENERALIZED REDUCED GRADIENT METHOD,
Kansas State Univ., Manhattan. Inst. for Systems Design and Optimization.
For primary bibliographic entry see Field 5B.
W74-07311

ENVIRONMENTAL IMPACT ANALYSIS: AN EXAMINATION OF THREE METHODOLOGIES,
Wisconsin Univ., Madison. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6G.
W74-07339

AN OIL RECOVERY SYSTEM UTILIZING POLYURETHANE FOAM--A FEASIBILITY STUDY,
Shell Development Co., Houston, Tex. Pipline Research and Development Lab.
R. A. Cochran, J. P. Fraser, D. P. Hemphill, J. P. Oxenham, and P. R. Scott.
Copy Available from GPO Sup Doc as EP1.23:670/2-73-084, $2.35; microfiche from NTIS as PB-231 838 $1.45. Environmental Protection Agency, Technology Series Report No. EPA 670/2-73-084, October 1973. 199 p, 97 fig, 45 tab, 3 ref. EPA Project 15080 HES 68-01-0067.

Descriptors: *Oil pollution, *Oil spills, Water pollution, Incineration, Water pollution control, Separation techniques, Pollution abatement.
Identifiers: *Sorbents, *Oil skimmer, *Polyurethane foam, *Oil spill recovery, Hay blower, Chain-Link belts, Recycled sorbent.

A system has been developed for recovering spilled oil from water surfaces under a wide variety of environmental conditions and for all types of oils. The system is designed to recover oil at rates up to 9,000 gal./hr. This system is based on the use of polyurethane foam, foamed on the job site, as a sorbent for the spilled oil. The foam is recirculated to increase efficiency and to lower unit costs. Equipment needed includes collection booms, an open-mesh chain-link belt for harvesting the oil-soaked sorbent, and a roller-wringer to remove oil and water from the foam. The foam is initially comminuted and distributed onto the water by means of a hay blower (mulcher), and recycled foam is distributed by an open-throat centrifugal blower. Recovered oil and water are transported to shore in large fabric bags for further treatment prior to disposal. Used foam is disposed of by incineration. (EPA)
W74-07341

IN-PLANT, CONTINUOUS HOT-GAS BLANCHING OF SPINACH,
National Canners Association, Berkeley, Calif. Western Research Lab.
For primary bibliographic entry see Field 3E.
W74-07368

USER CHARGES AND INDUSTRIAL COST RECOVERY, DENVER SMSA,
Wilbur Smith and Associates, Denver, Colo.
For primary bibliographic entry see Field 5D.
W74-07370

DEVELOPMENT OF A DECISION ROOM FOR ENVIRONNTAL STUDIES, (FEASIBILITY STUDY),
Datametric C'OR H, McLean, Va.
For primary bibliographic entry see Field 6G.
W74-07371

RESIDUALS IN MANUFACTURE OF PAPER,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 5B.
W74-07399

POLLUTION CONTROL THROUGH TRAINING, EDUCATION, AND RIGOROUS FOLLOW-UP,
Rolland Paper Co. Ltd., St. Jerome (Quebec).
R. Duquette.
Canadian Pulp and Paper Association, Technical Section, Proceedings, No 2, p D41-43, Oct 1973. 6 fig.

Descriptors: *Pulp wastes, Sewerage, Waste water disposal, Pulp and paper industry, *Canada, *Training, *Education, Employee relations, Leadership, *Personnel management, *Water pollution control, *Pollution abatement, Planning, Industrial wastes, Effluents, Discharge(Water), Discharge frequency.
Identifiers: Rolland Paper Co.(St. Jerome-P.Q.).

The importance of the human factor in meeting water pollution abatement goals is illustrated by the results achieved at Rolland Paper Co. Ltd., St. Jerome, Quebec. Mill employees are given oral and printed instructions on the operation and function of the recovery system. Production data and sewer losses are posted daily and cumulatively. Comparisons of program results vs. goals are sent as reminders to all levels of responsible supervision. (Brown-IPC)
W74-07408

THE PULP AND PAPER INDUSTRY AND THE ENVIRONMENT,
British Paper and Board Makers' Association, London (England).
For primary bibliographic entry see Field 5D.
W74-07411

LOSSES OF INORGANIC NITROGEN FROM AQUATIC SYSTEMS,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W74-07426

EFFECTIVENESS OF TWO NITRIFICATION INHIBITORS FOR ANHYDROUS AMMONIA UNDER IRRIGATED AND DRYLAND CONDITIONS,
Agricultural Research Service, Pullman, Wash. Soil and Water Conservation Research Div.
V. L. Cochran, R. I. Papendick, and W. M. Woody.
Agronomy Journal, Vol 65, No 4, p 649-653, July-August, 1973. 5 fig, 15 ref.

Descriptors: *Nitrogen, *Nitrification, *Leaching, Ammonia, Nitrogen cycle, Nitrogen fixation, Wheat.

Potassium azide and 2-chlor-6-(trichloromethyl) pyridine were evaluated as nitrification inhibitors for anhydrous NH3 field applied on irrigated and nonirrigated Ritzville silt loam and on nonirrigated Naff silt loam in eastern Washington. Formulations of KN3, N-Serve in liquid NH3, or NH3 alone were applied to fallow soil in midsummer at a rate of 90 kg N/ha. Irrigations were 15 cm of water sprinkler applied 1 day or 2 weeks after fer-

tilizer application, and 10 to 15 cm of water each time at 4, 8, and 13 weeks after NH3 application. The NH3 retention zone was sampled for NH+4 and NO-3 periodically through December for the Naff soil and through February for the Ritzville soil. Both KN3 and N-Serve effectively inhibited nitrification of the applied NH3 on nonirrigated Ritzville soil when temperature and soil moisture were favorable for rapid nitrification. However, KN3 was completely ineffective following irrigation or, for the Naff soil, after rainwater penetrated below the retention zone 2 weeks after N application. (Skogerboe-Colorado State)
W74-07436

SHALLOW DRAIN PERFORMANCE IN A HEAVY SOIL,
Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
For primary bibliographic entry see Field 4A.
W74-07442

NITRATE CONCENTRATIONS IN THE UNSATURATED ZONE BENEATH IRRIGATED FIELDS IN SOUTHERN CALIFORNIA,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
P. F. Pratt, and D. C. Adriano.
Soil Science Society of America Proceedings, Vol 37, No 2, p 321-322, March-April, 1973. 1 fig, 1 tab, 5 ref.

Descriptors: *Drainage, *Nutrient removal, Nitrogen, Leaching, Denitrification, Crop response, Crop production, *California, *Nitrates.

Nitrate concentrations in the drainage water of the unsaturated zone beneath the soil-root zone were predicted from data for N inputs, N removal in harvested crops, and the drainage volume. Ratios of these predicted values to measured values were related to the volatilization losses or unaccounted-for inputs expressed as a fraction of the excess N defined as the N input minus N removal in harvested crops. Volatilization losses or unaccounted-for inputs were calculated as known inputs minus removal in harvested crops minus that removed from the soil-root system by leaching. (Skogerboe-Colorado State)
W74-07445

APPLICATION OF A LARGE SCALE NONLINEAR PROGRAMMING PROBLEM TO POLLUTION CONTROL,
California Univ., Los Angeles.
For primary bibliographic entry see Field 5D.
W74-07461

APPLICATION OF NONLINEAR PROGRAMMING TO WATER QUALITY CONTROL,
Kentucky Univ., Lexington.
For primary bibliographic entry see Field 5D.
W74-07462

MORE HEAT THAN LIGHT: THERMAL POLLUTION VERSUS HEAT ENERGY UTILIZATION,
Snessard L. Holland Law Center, Gainesville, Fla.
For primary bibliographic entry see Field 5B.
W74-07465

HERBIVOROUS FISH FOR AQUATIC PLANT CONTROL,
Waterways Experiment Station., Vicksburg, Miss.
For primary bibliographic entry see Field 4A.
W74-07470

RESPONSE OF AQUATIC WEEDS TO LASER RADIATION,
Athens Coll., Ala. Dept. of Biology.
R. W. Couch.

Available from the National Technical Information Service as AD-754 590, $3.00 in paper copy, $1.45 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Miss. Aquatic Plant Control Program, Technical Report 2, December 1972. 50 p, 17 fig, 8 tab, 34 ref. DACW01-69-C-0020-P00005.

Descriptors: *Aquatic weed control, *Radiation, Water hyacinth, Mortality, Aquatic plants, Plant growth, Alligatorweed.
Identifiers: *Laser radiation, Duckweed, Water lettuce, Water chestnut.

Results of experiments initiated to determine effect of carbon dioxide-laser energy (10.6 microns) on aquatic weeds, principally water hyacinths, are reported. Growth of water hyacinths and duckweed was inhibited. Irradiation levels as low as 0.3 J/sq cm significantly reduced water hyacinth growth when irradiating individual plants. Under group irradiations, where there was more crowding, shading, etc., radiation levels of the magnitude of 20-50 J/sq cm may be necessary to reduce growth significantly. Carbon dioxide-laser radiation of 10 J/sq cm significantly reduced duckweed growth. Laser energy seems to interfere with normal photosynthetic pigment production in water hyacinths. This interference may be via a mechanism that overloads the photoactivation system responsible for stimulating development of plastids from proplastids. The proper design for a field-study involving the effects of carbon dioxide-laser radiation on water hyacinths has been achieved. Neither alligator weed growth nor water chestnut was measurably inhibited by laser radiation. Inhibition by insect larvae rendered laser effects on water lettuce growth inconclusive. A neodymium laser (1.06 microns wavelength) possibly has potential for inhibiting water hyacinth growth. (Jones-Wisconsin)
W74-07475

BIOLOGICAL INVESTIGATIONS OF NOXIOUS COELENTERATES AND CTENOPHORES IN COASTAL NORTH CAROLINA,
North Carolina Univ., Morehead City. Inst. of Marine Sciences.
For primary bibliographic entry see Field 2L.
W74-07479

INVESTIGATION OF THE BIOLOGY AND CONTROL OF NOXIOUS COELENTERATES OCCURRING IN THE COASTAL WATERS OF PUERTO RICO,
Puerto Rico Univ., Mayaguez. Dept. of Marine Sciences.
For primary bibliographic entry see Field 2L.
W74-07480

DISEASES OF POND FISHES,
For primary bibliographic entry see Field 8I.
W74-07481

SELECTION AND OPERATION OF SMALL WASTEWATER TREATMENT FACILITIES - TRAINING MANUAL.
Environmental Protection Agency, Cincinnati, Ohio. Office of Water Program Operations.
For primary bibliographic entry see Field 5D.
W74-07485

LAWS AND REGULATIONS OF POLLUTION AND NAVIGATION IN PACIFIC NORTHWEST ESTUARIES,
Coast Guard, Portland, Oreg.
R. F. Malm.
In: Proceedings 2nd Annual Technical Conference on Estuaries of the Pacific Northwest, March 16-17, 1972. Oregon State Univ., Corvallis (Engineering Experiment Station Circular No 44), p 87-92 (1972).

Descriptors: *Coasts, Law enforcement, *Regulation, *Legislation, Navigation, *Pacific Northwest U.S., Estuaries, Safety, Environment, Water quality control, Boating, Harbors, Water pollution sources
Identifiers: Coast Guard.

The Coast Guard operates within five operational program areas directly related to law enforcement responsibilities. The field level execution of these programs is carried out by shore and floating units. The Coast Guard establishes, maintains, and operates aids to maritime navigation to facilitate navigation and prevent disasters, collisions, and wrecks. Merchant marine safety regulations provide for inspection of merchant vessels, approval of vessel plans and equipment, licensing and certification of merchant marine officers and seamen, documentation of United States' vessels, and containment and holding of hazardous goods in maritime transportation. Laws and regulations aimed at reducing accidents, injuries, and fatalities and improving the environmental quality related to the operation of pleasure craft are enforced. It also enforces laws and regulations designed to safeguard vessels, harbors, ports, and waterfront facilities. The detection, prevention, abatement, and elimination of pollution in the marine environment is the purpose of the laws and regulations enforced within the scope of the marine environmental protection. Protection is provided for large spills but most of the activity is directed towards the multitude of small daily spills. (See also W74-07491) (Jones-Wisconsin)
W74-07499

A NOTE ON THE USE OF SPECTRAL ANALYSIS TO DETECT LEADS AND LAGS IN ANNUAL CYCLES OF WATER QUALITY,
Colorado Univ., Boulder. Dept. of Economics.
For primary bibliographic entry see Field 7C.
W74-07522

ENVIRONMENTAL QUALITY AND ITS EVALUATION,
Rutgers-The State Univ., New Brunswick, N.J. Water Resources Research Inst.
W. Whipple, Jr.
National Science Foundation, RANN Program, January 1974, 42 p, 9 fig, 79 ref.

Descriptors: *Environment, *Environmental effects, *Ecology, *Social aspects, *Biology, Ecosystems, *Economics, Value, Recreation, Welfare(Economics), Water quality, Utilities, Evaluation, Social values.
Identifiers: *Environmental quality, Anthropology.

A state-of-the-art analysis is presented of the many approaches to evaluating environmental quality, with particular reference to water-related environments. Besides the usual engineering, economic, and systems analysis methodology, consideration is given to a wide spectrum of related methodology and concepts, including biological, anthropological, religious, aesthetic, philosophic and general literary writings. A number of approaches are shown to be basically inadequate or logically without merit. It is concluded that the categorization of environmental quality as 'recreation' or 'aesthetic values' is altogether too narrow. Men and especially children have a basic need for contact with natural environment, which need is based upon genetic characteristics. Although there are many different approaches and different points of view regarding environmental quality, the problem of evaluating it is not an insuperable one. Many of the relevant parameters are possible of description and some of them are evaluable in money terms. As regards others, physical standards can be set for achieving given social objectives, such as providing bathing facilities or nature trail walks for a given population. The main objective is that of providing (or maintaining) an outdoor environment suitable for all

enjoyment and psychic health; and other objectives, with their varied expressions, rrogates or supplements, rather than alterna- The basic environmental objective is not a prical imperative but is subject to tradeoffs other social goals and with marginal mic advantages, on terms which are capable termination, although just beginning to be n.
07533

RMINATION OF OIL CONCENTRATION SIZE DISTRIBUTION IN SHIP BALLAST ERS. METHOD AND REPRESENTATIVE LTS,
nautics Inc., Laurel, Md.
rimary bibliographic entry see Field 5B.
07564

VERY OF ARSENIC BY DRY ASHING M ANIMAL TISSUE FORTIFIED WITH NOARSENICALS OR ARSENIC TRIOX-

ry Labs., Charles City, Iowa, Pharmaceuti- velopment and Analysis Dept.
rimary bibliographic entry see Field 5A.
07573

TERIA-ASSIMILABLE ORGANIC COM-NDS, PHOSPHATE, AND ENHANCED WTH OF BACTERIA-ASSOCIATED BLUE-EN ALGAE,
nnati Univ., Ohio. Tanners' Council Lab.
rimary bibliographic entry see Field 5C.
07587

WATER RESOURCES LANNING

Techniques Of Planning

OURCE MANAGEMENT DECISIONS: EX-NALITIES AND PUBLIC POLICY,
on State Univ., Corvallis. Dept. of Agricul- Economics.
Castle.
Multi-disciplinary Study of Water Quality ionships. A Case Study of Yaquina Bay, on, Oregon Agricultural Experiment Station, al Report 348, February 1972. p 105-116, 1 WP-00107.

riptors: *Decision making, *Water pollution ol, *Economic impact, Regional economics, nization, Recreation, Direct benefits, In- t benefits, Sport fishing.
ifiers: *Yaquina Bay(Ore.).

urce quality management cannot be entrusted ivate decision making as it is a problem for c policy. The Yaquina Bay, Oregon study des a classic illustration of public policy is- in the pollution problem. The construct of ng policy on the basis of impact on 'net na- l benefit' leads to the development of the n-wide firm' and permits the choices of poli- that will maximize the economic return from esources of the area. The value of this tool is it provides for the judgement of private and c decisions and for the use of such institu- l devices as taxes and subsidies. One of the es of uncertainty of concern in the decision ext relates to the changes that will eventually r with the passage of time; some decisions are ersible or can be reversed only at very high In the case study estimates of economic ac- es affected by the paper mill measurements made only of those activities where a direct al relationship was evident. Variables in- ed are direct and indirect benefits of recrea- direct benefits of the paper mill, indirect fits resulting from industrial activity which causes pollution, and cost of pollution control. (See also W74-07142) (Auen-Wisconsin)
W74-07148

A COMPUTER SIMULATION MODEL FOR FLOOD PLAIN DEVELOPMENT. PART II: MODEL DESCRIPTION AND APPLICATIONS,
INTASA, Menlo Park, Calif.
N. V. Arvanitidis, J. Rosing, D. P. Petropoulos, C. H. Jolissaint, and J. L. Poage.
Available from the National Technical Information Service as AD-765 499; $9.75 in paper copy, $1.45 in microfiche. Final report IWR 73-1, Army Engineer Institute for Water Resources, November 1972. 155 p, 32 fig, 40 tab, 22 ref. DACW07-72-C-0012.

Descriptors: *Flood plains, Management, *Simulation analysis, *Computer models, Economic efficiency, Benefits, *Flood protection, *Land use, Evaluation, Alternative planning, Optimization, Flood damage, Economic rent, Costs, Systems analysis.
Identifiers: *Connecticut River Basin, Allocation models.

Presented is a computer simulation model for the evaluation of national economic efficiency benefits of various levels of flood protection and alternative land use plans. A description of the model, referred to as SIMULATOR, and the results of its application to Reach 13 of the Connecticut River Basin are given. The model has three major components: (1) calculation of flood damages and economic rent components; (2) allocation of land use requirements; and (3) benefit calculation based on locational advantage and damage reduction. The main components describing locational advantages are differences in flood damages, fixed area development cost, site development cost, transportation cost, amenity values and social environment effect. The land use allocation model provides a completely independent optimization procedure. In the SIMULATOR, implicit assumptions are kept to a minimum; data collection efforts are reduced by using results from sensitivity studies. The study area and dummy location are defined so as to limit the scope. Results show that damage reduction benefits to existing and future activities from additional protection through upstream reservoirs account for 80% of total benefits. (See also W73-02944) (Bell-Cornell)
W74-07296

INTERDISCIPLINARY MODELING IN THE ANALYSIS OF THE SALINITY PROBLEMS OF THE SAFFORD VALLEY,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 5B.
W74-07297

NONLINEAR PROGRAMMING IN RIVER BASIN MODELING,
Calgary Univ. (Alberta). Faculty of Business.
For primary bibliographic entry see Field 5B.
W74-07298

FLOOD PROOFING DECISIONS WITH UNCERTAIN EVENTS,
Massachusetts Univ., Amherst. Dept. of Agricultural and Food Economics.
C. E. Willis, and P. Alkiku.
Water Resources Bulletin, Vol 10, No 2, p 295-303, April 1974. 1 fig, 1 tab, 5 ref.

Descriptors: *Floodproofing, *Economic efficiency, *Alternative planning, *Constraints, *Risks, Flood damage, Estimating, *Benefits, Costs, Probability, Historic floods, Computers, Connecticut River, Mathematical models, Systems analysis.
Identifiers: Net benefits, Partial equilibrium framework, Means, Variances, Flood depth, Density functions, Standard deviation.

Adding flood proofing to other structural and nonstructural flood damage reduction measures widens the choice among existing alternatives for decision makers and consequently enables the possibility of improved expected net benefits from an overall flood damage reduction scheme. But planners are interested in more than just expected values of net benefits; the inherent riskiness (uncertainty) of various alternative plans must be considered as well. By focusing on a constrained (economic) efficiency criterion, a partial equilibrium framework is developed for purposes of estimating means and variances of a measure of net benefits from flood proofing. Both benefits (damage reductions) and flood proofing costs are assumed linear in terms of flood depth, where depth is stochastic with probabilities assigned to various states in accordance with historical data. In addition to treating flood depth in a probabilistic manner, the parameters of the linear benefit and cost functions are assigned density functions permitting the uncertainty to be reflected in the magnitude of the calculated standard deviation. The model is applied to selected communities in the Connecticut River Basin and sample computer results are provided. (Bell-Cornell)
W74-07299

SIMULATION--A TOOL FOR WATER RESOURCE MANAGEMENT,
Hydrocomp, Inc., Palo Alto, Calif.
A. Donigian, Jr., and W. H. Waggy.
Water Resources Bulletin, Vol 10, No 2, p 229-244, April 1974. 12 fig, 12 ref.

Descriptors: *Water quality, *Planning, *Management, *Simulation analysis, *Frequency analysis, Project planning, Damages, *Computer models, Evaluation, Economic efficiency, Digital computers, Probability, Methodology, Optimum development plans, Benefits, Systems analysis.
Identifiers: Economic analysis, Probabilistic analysis.

Water resource projects must be evaluated in economic terms in order to maximize the efficient utilization of the resources available for water resource management. A knowledge of the frequency of occurrence of the events being studied is necessary to fully make use of the advantages of economic evaluation in planning. (Frequency analysis, used widely in flood control and water supply, is here adapted to water quality planning.) Mathematical simulation for project evaluation and management is presented; the process involves the grouping of mathematical expressions into a computer model which duplicates the essential behavior of the water resource system. Presented is the Hydrocomp Simulation Program (HSP), a sophisticated model, for use on digital computers to simulate hydrologic and water quality processes in natural and man-made systems. In the methodology presented, the continuous, dynamic model develops frequency curves for various water quality criteria; damage-frequency curves are derived. The procedure estimates expected damages from the frequency distribution of adverse water quality events. The basic theory of probabilistic (frequency) analysis and the method of economic evaluation are presented, followed by a description of the HSP. Results from the Denver Regional Water Quality Management Study are discussed as an example of the use of frequency analysis for economic evaluation of water quality management. (Bell-Cornell)
W74-07300

IPSWICH RIVER BASIN MODEL STUDY,
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 6D.
W74-07302

OPTIMUM DESIGN HEIGHT OF COFFERDAMS,
Imperial Government of Iran, Tehran. Plan Organization.
For primary bibliographic entry see Field 8A.
W74-07304

A MODEL OF IRRIGATED AGRICULTURE AND REGIONAL DEVELOPMENT IN SOUTHERN ARGENTINA: THE RIO NEGRO BASIN,
Resources for the Future, Inc., Washington, D.C.
D. A. Fitchett.
The Annals of Regional Science, Vol 8, No 1, p 14-34, February 1974. 1 fig, 7 tab, 10 ref.

Descriptors: Agriculture, *Irrigation efficiency, *Linear programming, *Alternative planning, *River basins, *Economic impact, Optimization, Investment, Discount rates, Costs, Water demand, Mathematical models, Systems analysis.
Identifiers: *Argentina(Rio Negro basin), Economic expansion.

Linear programming is used to investigate some of the characteristics of alternative rates of expansion of the irrigated agricultural economy of the Rio Negro basin in southern Argentina over a twenty-year period. While essentially a demand-led model, expansion rates can be imposed and the economic impact of such suboptimizing behavior then compared to the optimal outcomes. Presented is a multiperiod linear programming model in which both farm and social infrastructure investments in a given period have an impact on both output and physical and human resource availabilities in subsequent periods. These activities give rise to time streams of costs and returns which are discounted at alternative discount rates to observe the behavior of the model under differing assumptions as to the proper rate. An analysis of the outcomes of model application indicates that the higher rates of expansion of irrigated agriculture in the basin are excessive and an economically optimal rate would be relatively modest. An attempt is made to relate this outcome to approximate overall labor force and population levels in the Rio Negro basin in the next two decades. (Bell-Cornell)
W74-07306

PLANNING AND OPERATIONAL STUDIES IN THE INTEGRATED USE OF DESALINATION. CASE STUDIES FOR CYPRUS AND JERSEY,
Water Research Association, Marlow (England).
For primary bibliographic entry see Field 3A.
W74-07308

CAPITAL COST MINIMIZATION OF DRAINAGE NETWORKS,
Duke Univ., Durham, N.C. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W74-07309

A SYSTEMS ANALYSIS OF WATER QUALITY SURVEY DESIGN,
Clemson Univ., S.C. Coll. of Engineering.
For primary bibliographic entry see Field 5B.
W74-07310

REGIONAL WATER QUALITY MANAGEMENT BY THE GENERALIZED REDUCED GRADIENT METHOD,
Kansas State Univ., Manhattan. Inst. for Systems Design and Optimization.
For primary bibliographic entry see Field 5B.
W74-07311

WATER AND EFFLUENT TREATMENT PLANTS - COST CONSIDERATIONS AND CLIENT, CONTRACTOR, CONSULTANT RELATIONSHIPS, THE CONSULTANT'S VIEW,
For primary bibliographic entry see Field 5D.
W74-07312

PLANNING AND OPERATION OF URBAN WATER QUALITY MANAGEMENT SYSTEMS,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 5D.
W74-07334

NETWORK APPROACH TO MANAGEMENT OF CONJUNCTIVELY OPERATED GROUND WATER - SURFACE WATER SYSTEMS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W74-07335

PARAMETER IDENTIFICATION IN FIELD PROBLEMS,
California Univ., Santa Barbara. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 7C.
W74-07428

PRODUCTION FUNCTION THEORY FOR USE IN OPTIMAL PLANNING DECISIONS,
Kentucky Univ., Lexington.
For primary bibliographic entry see Field 5D.
W74-07460

APPLICATION OF A LARGE SCALE NON-LINEAR PROGRAMMING PROBLEM TO POLLUTION CONTROL,
California Univ., Los Angeles.
For primary bibliographic entry see Field 5D.
W74-07461

APPLICATION OF NONLINEAR PROGRAMMING TO WATER QUALITY CONTROL,
Kentucky Univ., Lexington.
For primary bibliographic entry see Field 5D.
W74-07462

ENVIRONMENTAL PLANNING: AN ECONOMIC ANALYSIS. APPLICATIONS FOR THE COASTAL ZONE,
Clemson Univ., South Carolina. Dept. of Agricultural Economics and Rural Sociology.
For primary bibliographic entry see Field 6B.
W74-07534

6B. Evaluation Process

A STUDY OF POTENTIAL INSTITUTIONAL ARRANGEMENTS FOR WATER QUALITY AND WATER RESOURCES (QUANTITY) PLANNING AND MANAGEMENT,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
L. B. Dworsky.
Available from the National Technical Information Service as PB-231 557, $10.75 in paper copy, $1.45 in microfiche. Technical Report No. 83, March 1974. 533 p. OWRR C-1196(No 1963) (3). 14-01-0001-1963.

Descriptors: *Institutions, *Water quality control, *Hudson River, River Basin Commissions, Behavior, Political aspects, Water management(Applied), *Water policy, *New York, *Planning, *Management, Water supply.

Potential arrangements for water quality-quantity management institutions to meet future needs are examined. Part 1 describes specifications for water quality and integrating water quality - quantity planning. Part 2 proposes factors (25) for evaluating water management institutions; t the history and describes nine types of in tions, examines eight case studies (Missouri Columbia interagency committees, New Eng River Basin Commission, Hudson River V Commission, new concepts for River Basin ganization, Water Quality Management strate for the Holston River Basin and the Great La and Multistate Regionalism) Conclusions t that institutional development has grown ide out of the nation's experience; and suggest beginning of a focus on selected institutions P describes the Hudson River Basin, examines tempts, management institution designs, pres papers clarifying Hudson Basin problems, concludes with no specific organizational plan rather ideas to help reach a useful decision. P proposes synoptic and incremental w resources planning processes as the method choice, reviews the ideas used to strengthen Corps of Engineers role in water quality plann and assesses the value of ideas developed by research project in relation to PL 92-500, Federal Water Pollution Control Act.
W74-07051

COAL-ENERGY DEVELOPMENT IN T NORTHERN GREAT PLAINS.
Wyoming Univ., Laramie. Water Resour Research Inst.
For primary bibliographic entry see Field 6D.
W74-07056

DETERMINANTS OF USE OF WATER-BAS RECREATIONAL FACILITIES,
George Washington Univ., Washington, D Dept. of Economics.
M. A. Holman, and J. T. Bennett.
Water Resources Research, Vol 9, No 5, p 12 1218, October 1973. 3 tab, 10 ref.

Descriptors: *Recreation demand, Reservo *Motivation, *Regression analysis, Econometri Forecasting, Use rates, Recreation, Planni *Texas.
Identifiers: *Reservoir usage, *Dallas-Fort Wo Metropolitan Area.

An econometric model is developed to explain relationships between the use of various facilit at outdoor recreation sites and 15 variables t measure use characteristics of those areas. Eig reservoirs operated by the U.S. Army Corps Engineers in the Dallas-Fort Worth metropolit area were used in the case study. Fifteen separa regressions were computed with each of the me sures of use as the dependent variable. The ste wise regression procedure entered the indepe dent variables one by one in the order of their co tribution to the dependent variable. The variabl were grouped into classes. A relative ranking the importance of each class was based on t number of times the variables in that class enter the regression and the level of significance. order of decreasing importance, the relati rankings were: distance; season (time of year a weekend/weekday); fees; population, a measu of demand potential; facilities provided at the sit and quality of the reservoir environment, as me sured by the degree of commercializatio (Hoffman-North Carolina)
W74-07058

TECHNOLOGY TRANSFER IN THE MARIN ENVIRONMENT OF LONG ISLAND,
Center for the Environment and Man, Inc., Har ford, Conn.
W. V. McGuinness, Jr., R. Pitchai, and G. M. Northrop.
Available from the National Technical Inform tion Service as COM-73-11889, $3.50 in pape copy, $1.45 in microfiche. CEM Report 4133-47 prepared for the Marine Resources Council, Na sau-Suffolk Regional Planning Board, Hauppaug N.Y. February 1973. 48 p, 3 fig, 6 tab, 4 append.

ors: Research and development, ement, *Research priorities, *Water nent(Applied), Coasts, Technology, engineering, Shore protection, Adminis- *New York, Comprehensive planning, En- ntal control, Environment, Environmental Dredging, Channel improvement, Waste sposal, Waste water treatment, Water pol- Vater quality, Wetlands.
rs: *Coastal zone management, logy transfer, *Long Island(NY), Nassau , Suffolk Co.(NY), Coastal protection.

taken by the Regional Marine Resources to improve the relevancy of research to ion of high-priority coastal zone manage- blems in Nassau and Suffolk Counties of and, New York, are described. Focus is arine environment of the two-county area million inhabitants which swells to as 10 million during the summer. Eventually ision must be made (1) for increased nent of the environment - including its so- nomic and natural components - or (2) for ng primary dependence upon a more lais- pattern. The Council and the Center for ronment and Man, Inc. (CEM) combined o create public, governmental, and institu- vareness of high-priority problems, assess -of-the-art of research, recommend addi- search, and propose tentative guidelines ing problems. These purposes require a of technology from the researcher to ent officials, the public, and planners. elected four high-priority management s, (1) integrating water treatment and ter disposal; (2) coastal protection and tion; (3) dredging and spoil disposal; and ands, to which technology transfers are . This transfer can be attained by adopting y-oriented research program, making the community aware of policy formulators' r information, making policy formulators f findings from the research community, ding these three into a systematic interplay eline reformulations, relevant research ment, and prompt incorporation of findings into policies and plans. (Grden- arolina)
959

DURES AND PROGRAMS TO ASSIST IN ENVIRONMENTAL IMPACT STATE- PROCESS,
ia Univ., Berkeley. Inst. of Urban and Re- evelopment.
ensen, and M. L. Moss.
le from the National Technical Informa- rvice as COM-73-11033, $3.00 in paper .45 in microfiche. April 1973. 38 p, 56 ref, d. NOAA SG 04-3-158-22, 04-3-158-45.

tors: *Federal project policy, Environ- Project planning, *Environmental effects, em, Management, Feasibility studies, Pro- rposes, Project post-evaluation, Decision Future planning, Environmental control, e, Regional planning, Resources develop-

ers: *National Environmental Policy Act, nmental Impact Statements, Impact as- t, Impact identification, Land use , Ecological effects.

ironmental impact statement, required by ional Environmental Policy Act and state nsiders environmental concerns in plan- and project proposals. Whether this tool ill its potential depends on the develop- procedures to prepare and review the im- tement. Impact assessment is a three-stage (1) identifying environmental, social, and ic conditions possibly changed by the pro- predicting the intensity and spatial dimen- the changes and (3) evaluating costs and of the conditional changes. Assessment s are discussed in relation to these stages. Impacts to be considered and methods of impact identification, including networks, matrices, and project-type checklists, are presented. The degree and dimension of change is difficult to predict due to insufficient information, failure to use existing data, and lack of predictive methods. Questionable projects should be rejected when environmental effects cannot accurately be predicted. Methods for evaluation include aggregate vs. discrete measurement, public review, plan compliance-conflict, cost-benefit analysis, and cost-approval monitoring. Present assessment procedures must be analyzed continuously and new methods sought out and tested. (Grden-North Carolina)
W74-07061

URBAN IMPACTS OF RURAL RESOURCE DEVELOPMENT EXPENDITURES IN THE INTERLAKE AREA OF MANITOBA,
Manitoba Univ., Winnepeg. Agassiz Centre for Water Studies.
J. A. MacMillan, and C-M. Lu.
Research Report No. 7, 1973. 80 p, 4 fig, 24 tab, 6 append.

Descriptors: *Canada, *Economic impact, *Income distribution, *Input-output analysis, *Regional economics, Regional development, Industrial production, Public services, Productivity, Economic prediction, Resource allocation, Farm management, Regional analysis, Resource development, Rural areas, Marketing, Drainage, Land clearing.
Identifiers: Interlake Area(Manitoba-Canada), *Rural development, Trade center development, Economic activity, Resource development alternatives.

Future development of small areas such as the Interlake Area of Manitoba, Canada, is determined by the volume of export sales by area businessmen. The objective of the Interlake Area development plan is to improve income levels and job opportunities. Measurements of flows of economic activity among rural trade areas, trade centers, and metropolitan centers outside the area are therefore needed. If rural trade center development is a priority, alternative strategies must be assessed, including rural resource development programs (drainage, land clearing, and farm management training), upgrading public services such as education, and incentives to industrial location. Alternative methods for assessing strategies and providing estimates for resource development and public service programs are developed. Job and income impacts of resource development alternatives have been determined by input-output tables and employment-output functions. Farm management training has the greatest annual impact on income per unit of government expenditures, followed by land clearing, drainage, and educational expenditures. The methodology does not measure price or efficiency effects of the programs, since the focus is on geographical distribution of short-run program impacts. (Grden-North Carolina)
W74-07068

A FRAMEWORK FOR ECONOMIC PLANNING OF WATERSHED DRAINAGE,
Manitoba Univ., Winnepeg. Agassiz Centre for Water Studies.
For primary bibliographic entry see Field 4A.
W74-07069

PUBLIC INVESTMENT CRITERIA: APPLICATION TO A PROJECT IN THE SOURIS RIVER BASIN,
Manitoba Univ., Winnepeg. Agassiz Centre for Water Studies.
E. A. Gardiner.
Research Report No. 8, 1973. 65 p, 5 fig, 22 tab.

Descriptors: *Canada, Economic justification, *Irrigation efficiency, Irrigation effects, *Water utilization, *Land use, *Regional planning, Irrigation districts, Irrigation programs, Irrigation, Economic efficiency, Benefits, Costs, *Investment, Economic feasibility, Economic impact, Economic justification, Cost-benefit analysis, Direct benefits, Employment opportunities, Land resources, Project planning, Resources allocation.
Identifiers: Manitoba(Canada), Coulter-Patterson Project(Manitoba-Canada), *Souris River Basin(Manitoba-Canada), Public investment, Income redistribution.

Public investment criteria are applied to the Coulter-Patterson Project, an irrigation project proposed for southwestern Manitoba's Souris River Basin. Although efficient in that irrigation benefits exceed project construction, operating, and maintenance costs, it is not an effective instrument for an income redistribution objective. It distributes benefits more in favor of wealthy farmers than poorer ones. From the regional view, all direct irrigation benefits accrue to the local region. However, secondary benefits are temporary. In addition, water used in the project must be considered just as if it was a purchased input, since there is an opportunity cost for the large amount of water used in irrigation that can no longer be used elsewhere. Data deficiencies handicapped the study; regional data on net farm income, information about the unemployment situation of the region, and development of regional multipliers are needed. While the study evaluates the income redistribution objective, a multiple-objective framework must exist to approximate trade-offs between objectives and to complement the revenue-expenditure picture. (Grden-North Carolina)
W74-07070

PLANNING AND DEVELOPING WATERFRONT PROPERTY,
Rick Engineering Co., San Diego, Calif.
W. B. Rick.
Urban Land Institute, Washington, D.C. Technical Bulletin 49. June, 1964. 24 p, 4 photo.

Descriptors: *Marinas, *Urbanization, *Harbors, Recreation, *Recreation facilities, *Boating, California, Florida, Economic feasibility, Value, Land use, Planning, Coordination, Financing, Operating costs, Operation and maintenance, Property values.
Identifiers: *Waterfront development, Waterfront property, Real estate, Residential development, Land value, Intergovernmental coordination, Ft. Lauderdale(Fla), San Diego(Calif), Boca Raton(Fla), Newport(Calif), Commercial operation.

Waterfront facilities involve a fixed location with high capital investment in a rapidly changing market situation. Tides, currents, and other water hazards complicate development. Because of the size of the projects and high cost level most recreational waterfront development is assisted or underwritten by government, especially the federal government. River and harbor development is generally viewed from a broad benefit to cost ratio. The role of private capital ranges from leasing and operating on prepared public-owned waterfront to dredging and developing water and land communities. Waterfront real estate not adversely affected by industry or the elements commands premium prices, especially when suitable for recreation use. Selected examples of waterfront development reviewed include Lake San Marcos, a new community developed on 1500 acres of semi-arid lands in San Diego County, California around a formerly unkempt reservoir, Royal Palm Yacht and Country Club, a residential, recreational development just south of Boca Raton, Fla., Newport Shores, a Newport, Calif., residential development of 435 homes on 40 acres on the old Santa Ana River, Bahia Mar Yachting Center, a complete marina development at Ft. Lauderdale, Fla., and Islandia, a marina on Mis-

sion Bay, San Diego, Calif. Commercial marina operation is also examined in detail. (Edwards-North Carolina)
W74-07072

PROGRAM DEVELOPMENT PLAN FOR THE MESA-NEW YORK BIGHT REGIONAL PROJECT.
Westinghouse Oceanic Div., Annapolis, Md.
Available from the National Technical Information Service as COM-73-10756; $6.00 in paper copy, $1.45 in microfiche. Final Report prepared for Office of Marine Resources, September 1, 1972. 358 p, 8 fig, 12 tab, 116 ref, 8 append. 2-35461.

Descriptors: *Regional analysis, *Optimum development plans, Water resources development, Management, Environment, *Environmental control, *Model studies, New York, Projects, Habitats, Water treatment, Environmental effects, Ecosystems, Ecology, Systems analysis, Regional development, Research and development, Marine animals, Marine biology, Marine plants, Oceans, Aquatic life, Marine geology, Research priorities, Methodology.
Identifiers: *New York Bight, Marine Ecosystem Analysis Project(MESA), *Program development plan, Regional planning, Technical integration.

The New York Bight is a coastal zone region where past decisions have had undesirable impacts on the marine environment, but where pressing needs forced decisions regardless of availability of complete data. Both scientific and administrative mechanisms are required to direct action. The Marine Ecosystem Analysis (MESA) Program is developing a plan for such decision-making. An initial conceptual model ecological data, continually updated, is used. With this model, further data requirements can be identified. Specific technical goals for the five-year period include provision of an environmental data base, systematic analysis of the source and fate of pollutants, development of procedural models, and establishment of regionalized monitoring systems. Results must be oriented to issues pressing for action, so technical integration, user-directed orientation, organizational participation, and adequate feedback will enhance project utility. As the project unfolds, benefits derived will include deepened understanding of the ecosystem, development of mechanism for airing and resolving issues, development of a comprehensive and interdisciplinary mechanism to acquire data, improved access to data, and improved coordination of public and private resources to meet common goals. (Grden-North Carolina)
W74-07078

MEASURES TO REDUCE WATER CONSUMPTION IN SOUTHEASTERN NEW YORK.
New York State Temporary Commission on the Water Supply Needs of Southeastern New York, Albany.
For primary bibliographic entry see Field 6D.
W74-07079

PROPOSED WATER SUPPLY PROJECTS FOR SOUTHEASTERN NEW YORK.
New York State Temporary Commission on the Water Supply Needs of Southeastern New York, Albany.
For primary bibliographic entry see Field 6D.
W74-07080

STUDY DESIGN. SURFACE DRAINAGE PROGRAM, MADISON, ST. CLAIR, MONROE AND RANDOLPH COUNTIES, ILLINOIS.
Southwestern Illinois Metropolitan Area Planning Commission, Collinsville.
For primary bibliographic entry see Field 4A.
W74-07083

POPULATION, LAND USE AND LIVESTOCK COMPOSITION IN INDIA AND ITS ARID ZONE,
Central Arid Zone Research Inst., Jodhpur (India).
For primary bibliographic entry see Field 3F.
W74-07105

ARIZONA STATE LAKE IMPROVEMENT FUND PLAN.
Arizona Outdoor Recreation Coordinating Commission, Phoenix.
1973. 90 p, 27 tab, 6 ref.

Descriptors: *Lakes, *Arizona, *Safety, *Recreation facilities, *Boating regulations, Boats, Boating, Water sports, Artificial lakes, Planning, Project planning, Taxes, Water resources development.

The Arizona Outdoor Recreation Coordinating Commission was required by law to determine boating needs in Arizona, and to be of guidance in the granting of funds derived from motorboat fuel taxes and the lieu tax paid annually by boat owners into the State Lake Improvement Fund. Based on allocations for various safety projects, boat-oriented recreation improvements, and lake construction, the plan presented identifies the most urgent need as one to make boating waters safer. Immediate priorities include construction of first-aid stations on each major lake, provision of patrol boats for boating law enforcement agencies, and development of additional areas in the water-short southern part of the State where the second highest registration of boats in the State exists. In making recommendations for allocation of funds, factors considered included description of spatial distribution of Arizona's registered watercraft, patterns of participation in boating activities on a statewide basis, an inventory of related facilities at the most preferred boating waters, an estimate of preference for boating-related facilities, and an estimate of the growth of registered watercraft in Arizona in the decade 1970-1980. These general factors, serving as a matrix for the plan, can be used to determine a project priority system for rating proposed State Lake Improvement Fund projects. (Paylore-Arizona)
W74-07108

BETHANY RESERVOIR RECREATION DEVELOPMENT PLAN.
California State Dept. of Water Resources, Sacramento.
Bulletin No 117-12, December 1970. 15 p, 1 fig, 3 tab.

Descriptors: *Recreation demand, *Reservoirs, *Recreation facilities, *Cost-benefit analysis, California, Water sports, Boat-launching ramps, Fishing, Camp sites, Reservoir operation, Capital costs, Operating costs, Replacement costs.
Identifiers: *Bethany Reservoir(Calif.), Recreation development plans.

A recreational development plan for Bethany Reservoir, located in the northeastern hills of Alameda County, California is examined. The reservoir, completed in 1967, presently serves as a forebay for the South Bay Pumping Plant and Aqueduct, and is a regulating reservoir for the California Aqueduct. Recreational facilities proposed for construction during the 1975-1981 period include a boat launching ramp, 40 picnic units, 40 camping units, 2 boat-in areas, 2 fishing access sites, a sandy beach, additional roads, parking facilities, water supply, sanitary and electrical facilities. Estimated capital cost is $800,000 (excluding land) with replacement costs estimated at 3.5% of annual capital costs and operating and maintenance costs assumed to about 30 cents per recreational day. The facilities are expected to provide 25,000 annual recreational days starting in 1976 and increase to a maximum of 70,000 by 1981. Total recreational benefits were determined by multiplying $1.72--a unit value which considers the variety and quality of the recreational experien and the aesthetics of the site--times the daily e mated use. The present value of the stream recreational benefits from this proposed develo ment for the 50-year analysis period was estima to be $1,885,000. (Schroeder-Wisconsin)
W74-07127

LAKE PERRIS RECREATION DEVELOPME PLAN.
California State Dept. of Water Resources, Sac mento.
Bulletin No 117-1, October 1972. 11 p, 1 fig, 2 ta

Descriptors: *Cost-benefit analysis, *Recreat facilities, *Reservoirs, California, Boat-launch ramps, Recreation demand, Multi-purpose p jects, Camp sites, Capital costs, Operating co Replacement costs.
Identifiers: *Lake Perris(Calif), Recreati development plans.

A proposed reservoir, Lake Perris, to meet wa supply requirements and recreation demand California is described. The lake, located 18 mi southeast of Riverside, will represent southernmost reservoir in the State Water Proj and will provide both water supplies and recr tional activities. Included in the development pl are riding and hiking trails, boat launching fac ties, a waste disposal systems, camping and pic units, beaches, and trailer parking facilit Minimum use facilities which include b launching, beaches, car packing, and minim sanitation are expected to be completed by 1 and will accommodate 650,000 recreation-d users annually. By 1980 completed facilit should provide for 2,995,000 recreation-day us annually. Capital costs to complete the propos development are estimated at $38,820,0 Benefits for each general recreation-day use assumed equal to $2.10. Unit benefits for war water fishing and trout fishing are set at $2.10 a $2.50, respectively, per angler day. Using a year life, 5% interest rates, the present value the project's stream of benefits and costs--exc sive of concessionaire costs, are estimated to $133,825,000 and $64,737,000, respectively, imp ing a benefit-cost ratio of 2.1 to 1.0. (Schroed Wisconsin)
W74-07128

NORTH COASTAL AREA ACTION PROGRA A STUDY OF THE MCKINLEYVILL TRINIDAD AREA: PUBLIC HEARING CO MENTS.
California State Dept. of Water Resources, Sac mento.
Bulletin No 105-2, December 1970. 28 p.

Descriptors: *Social participation, *Water supp *Decision making, *Distribution systems, Calif nia, Costs, Fish management, Wildlife conserv tion, Recreation, Reservoirs, Investment, Div sion.
Identifiers: *McKinleyville-Trinidad(Cali *Public hearings.

Comments at public hearings on the recommen tions resulting from the initial investigation possible water supplies for the McKinleyvil Trinidad area are summarized. Various Califor state agencies, and the U.S. Army Corps of E gineers generally concurred with the recommen tions which suggested that the McKinleyvil Trinidad area be annexed to the Humboldt B Municipal Water District. At the same time the respective agencies suggested that the initial w dlife studies were limited, the need for inter water supply measures was over emphasize trailer and campsite areas were being develop and would need water by 1973-74, and sep systems were a health hazard to some domes wells, requiring tighter control of groundwa development and an improved public wa supply. Humboldt County officials stressed t

ed for the project, the responsibility of govern-ent to provide water, the need for more public volvement in the issue, a concern with present ater related health hazards, and a concern with e project's cost. They also indicated that future ater needs were underestimated in the initial re-rt. Some technical questions were raised by ivate citizens, but a majority of this group en-rsed the report's recommendations. The Davis-runsky Act, a state program providing financial sistance for local water projects, was also ex-ained. (Slattery-Wisconsin)
74-07129

ILVERWOOD LAKE RECREATION EVELOPMENT PLAN.
alifornia State Dept. of Water Resources, Sacra-ento.
ulletin No 117-10, July 1970. 1 fig, 1 tab.

escriptors: *Recreation facilities, *Reservoirs, ost-benefit analysis, Camp sites, Multiple-pur-se projects, Waste disposal, Boat-launching mps, Fishing, Hunting, Tourism, Access routes, esthetics, Wildlife, California, Capital costs, perating costs.
dentifiers: *Silverwood Lake(Calif.).

he recreational development plan for the roposed Silverwood Lake in the San Bernardino ational Forest, California are described. The ke will have an area of about 1000 acres of water rface and will be one of the four major reser-oirs of the State Water Project; it will provide for ower generation, water regulation, recreation, nd a fish and wildlife habitat. Out of 5300 acres to e acquired for the project 2400 will be developed r recreational use. Of that sum, 400 acres will be tensively developed for picnicking, camping, orseback riding, and the like. Hunting may also e permitted. The development plan includes wil-life enhancement, fishing, camping and pic-icking sites, boat-in areas, hiking, and riding ails and a waste disposal system. The estimated 6,000,000 facilities are expected to generate verage use of 2,250,000 recreation days annually. ased on a 50 year period at 5% interest, the resent value of the stream of benefit from the ites is estimated at $94,423,000. The resulting enefit cost ratio is between 4.0-1.0. The proposed acilities were to be constructed to ensure that the ecreational areas can be utilized by 1973. Schroeder-Wisconsin)
W74-07130

AND USE IN CALIFORNIA.
alifornia State Dept. of Water Resources, Sacra-nento.
ulletin No 176, December 1971. 16p, 26 maps.

escriptors: *Surveys, *Land use, *Land classifi-cation, Land development, California, Mapping, rbanization, Irrigation, Recreation, Water esources, Soil classification, Agriculture, Com-prehensive planning.

he California Department of Water Resources ecognized in the late 1940's the need for land use ata in any water planning attempt and has con-sequently conducted two kinds of surveys. The first, land use, records the nature and extent of present water related land development. This sur-vey is typically accomplished through aerial photography and field inspection. An index of land use surveys conducted during the 1950-1970 period is presented. Land classification surveys are also made to determine the location and extent of land with physical characteristics suitable for specific kinds of development. Such a survey involves field examination of soil characteristics and land features. The nature of land characteristics is such that data are useful in determining possible future growth of both irrigated agriculture and urban development. An index of land classification sur-veys is provided. (Schroeder-Wisconsin)
W74-07131

NORTH COASTAL AREA ACTION PROGRAM: A STUDY OF THE SMITH RIVER BASIN AND PLAIN.
California State Dept. of Water Resources, Sacramento.
Bulletin No 105-3, December 1970. 36p, 2 fig., 4 tab.

Descriptors: *Water resources development, *Water supply, *Planning, California, Future planning(Projected) River basin development, Wells, Groundwater, Water pollution, Land use, Water requirements, Agriculture, Lumbering, Urbanization, Coastal plains, Recreation.
Identifiers: *Smith River(Calif.), *Del Norte County(Calif.), Crescent City(Calif.).

Existing and future water problems and potential development in the Smith River Basin of northern California are discussed. Present regional water requirements are being met through groundwater pumping and direct diversion from the unregulated streamflow. Projected water demand by 2020 for agricultural and urban uses of 13,200 and 5,500 acre-feet can also be accommodated by potential increases uses of ground and surface water supplies. As a result, a proposed Rowdy Creek dam and reservoir for the region cannot be economically justified. The Bertsch Tract, 2-1/2 miles southeast of Crescent City and within the basin presently faces serious water problems which include low well yields and contamination; these problems can best be alleviated through an extension of the Crescent City water system. A threat is posed to water quality from septic systems of existing and proposed developments surrounding Lakes Earl and Talawa in the basin. Periodic testing should be required to check diminished water quality in the lakes and in water supplies. Recurrent flood damage should be alleviated by floodplain management instead of levees and reservoirs and balanced land use planning. (Schroeder-Wisconsin)
W74-07132

WATER RESOURCES SEMINAR SERIES NO. 2.
Hawaii Univ., Honolulu. Water Resources Research Center.
December 1972. 88p, 23 fig, 9 tab, 38 ref,

Descriptors: *Hawaii, *Water resources development, Water law, Hydrogeology, Land classification, Land use, Regional economics, Zoning, Tunneling, Water supply, Groundwater barriers, Economic efficiency, Drilling, Aquifer characteristics, Water transfer, Sugar cane, Water pollution effects, Water pollution control, Grading, Geology, Water wells.

The papers presented at this seminar examine current thought in water and land resource development and its applicability to Hawaii. 'The economics of water transfer' considers problems of pricing, equity, efficiency and regional development. 'The hydrogeology of carbonate and volcanic rocks' were investigated in connection with the probability of obtaining specified well yields at given investment levels. Increasing the water supply in Hawaii through angle drilling of groundwater barriers is also probed; this method has a 10:1 advantage over tunneling and conserves substantial amounts of water. Two papers discuss the economic and ecological impact of sugar mill wastes on the Hamuka Coast. Improved water management, soil recovery, and harvesting techniques are suggested as means to ameleorate the existing problem. The increased demand for scarce land is the subject of another paper. A statewide land survey is examined and its utility in solving urban and regional development problems considered. Changes in grading regulations are also examined; these regulations attempt to reduce the potential damages of landslides and now may reflect greater environmental and aesthetic considerations. The potential advantages of research approaches found by the Illinois State Water Survey are evaluated. (Schroeder-Wisconsin)
W74-07133

CURRENT THINKING IN WATER RESOURCES RESEARCH AND THEIR APPLICABILITY TO HAWAII CONDITIONS,
Illinois State Water Survey, Urbana.
W. C. Ackermann.
In: Hawaii Univ., Honolulu, Water Resources Research Center, Water Resources Seminar Series No. 2, December 1972, p 55-56,

Descriptors: *Hawaii, *Water resources, Water policy, *Planning.
Identifiers: Oahu(Hawaii).

A paper presented at the seminar discussing the current evolution of thinking in water resources research is summarized. Planners in Hawaii face increasing demands on their limited resource base, rising problems resulting from waste siltation, insecticides, and the like, and rising public concern as a result of changing societal values. In particular, Hawaii's economy, which is highly dependent upon the groundwater system, faces challenges from a number of sources including seawater intrusion and contamination. In meeting this challenge, Hawaii has developed an integrated program of research, monitoring, planning and development, a partial result of aid provided under the 1964 Water Resources Research Act. In order to continue to meet this challenge, however, a greater level of integration between disciplines needs to be developed. The translation of environmental problems into forms which can be handled by engineers and decision makers represents one of the central tasks. (See also W74-07133) (Schroeder-Wisconsin)
W74-07135

RESEARCH ACTIVITIES OF THE ILLINOIS STATE WATER SURVEY,
Illinois State Water Survey, Urbana.
W. C. Ackermann.
In: Hawaii Univ., Honolulu, Water Resources Research Center, Water Resources Seminar Series No. 2, December 1972, p 59-60,

Descriptors: *Research and development, Meteorology, Water chemistry, Water quality, Waste treatment, Hydrology, Sampling, Sanitary Engineering, Administration, *Illinois.

A contribution to the seminar which examined current activities of the Illinois State Water Survey is summarized. The Survey, established in 1895 by the Trustees of the University of Illinois, had as its early objective the examination of potable water within Illinois. The Survey's responsibilities have continued to evolve, resulting in a variety of programs presently being conducted within each of its five sections. Within the Atmospheric Section, research is currently being conducted in areas which include the measurement of precipitation, cloud growth, and hail studies; and the effects of cloud seeding and urban-industrial activity upon weather conditions. The Chemistry Section has conducted extensive studies in water quality improvement, corrosion in pipe systems, encrustation, institutional management of water standards as well as analysis of water samples submitted by the public. The Hydrology Section is engaged in a number of studies covering stream flow and geomorphological studies, groundwater mapping, urban hydrological studies, and analytical model building to be used in ground water management studies. The Hydraulic Section's studies presently center on waste treatment problems. The major task currently before the Water Quality and Sanitary Engineering Section is the examination of water quality of the Illinois River. (See also W74-07133) (Schroeder-Wisconsin)
W74-07136

HAWAII'S STATEWIDE LAND CLASSIFICATION PROVES ADAPTABILITY AS LAND USE AND ENVIRONMENTAL CONCERNS CHANGE,
Hawaii State Land Study Bureau, Honolulu.
For primary bibliographic entry see Field 4A.

W74-07138

POSSIBLE IMPACT OF COSTS OF SELECTED POLLUTION CONTROL EQUIPMENT ON THE ELECTRIC UTILITY INDUSTRY AND CERTAIN POWER INTENSIVE CONSUMER INDUSTRIES. EXECUTIVE SUMMARY.
National Economic Research Associates, Inc., New York.
For primary bibliographic entry see Field 5G.
W74-07140

MULTI-DISCIPLINARY STUDY OF WATER QUALITY RELATIONSHIPS: A CASE STUDY OF YAQUINA BAY, OREGON,
Oregon State Univ., Corvallis. Dept. of Economics.
H. H. Stoovener, J. B. Stevens, H. F. Horton, A. Sokoloski, and L. P. Parrish.
Available from the National Technical Information Service as COM7210902 $3.00 in paper copy, $1.45 in microfiche. Oregon Agricultural Experiment Station, Corvallis, Special Report 348, February 1972. 135 p, 7 fig, 35 tab, 63 ref. WP-00107.

Descriptors: *Water quality, *Input-output analysis, *Decision making, *Fisheries, Regression analysis, Bays, Recreational demand, Salmon, Clams, Bottom fish, Demand, Direct benefits, Indirect benefits, Water pollution effects, Institutions, Institutional constraints, Oregon, Pacific Coast region, Bioassays, Pulp wastes, Sport fishing.
Identifiers: Yaquina Bay(Ore.).

Toledo, Oregon lies on the Yaquina Bay. While the town's income comes primarily from lumber, the Bay's economy relies on both manufacturing and tourism. Effluent from a kraft mill constructed in 1958 posed a threat to the Bay's tourist income. Estimated demand curves for bottomfish, salmon and clams yielded direct yearly benefits of over $22,000 to the Bay prior to the mill. Indirect benefits found using input-output tables accounted for over $317,000 a year. Bioassays were conducted to determine the effect of the effluent through its effect on angling success, angling success being an element determining recreational demand. Direct disposal of effluent into the ocean, into the Bay at Toledo, or into the Bay at McLean Point produced differing effects on demand through angling success. Disposal into the ocean, the actual method chosen by the mill, was found to produce the greatest direct and indirect benefits of the three alternatives. Examination of existing institutions and community decision processes is also necessary to determine which plan should and can be implemented. Existing laws may prevent implementation of some solutions and may not provide agencies with the capacity to implement others. Community concern with benefit distribution may also cause rejection of possible solutions. (See W74-07143 thru W74-07148) (Schroeder-Wisconsin)
W74-07142

THE DEMAND FOR SPORT FISHING AT YAQUINA BAY,
Oregon State Univ., Corvallis. Dept. of Economics.
J. B. Stevens.
In: Multi-disciplinary Study of Water Quality Relationships. A Case Study of Yaquina Bay, Oregon, Oregon Agricultural Experiment Station, Corvallis, Special Report 348, February 1972. p 5-12, 2 tab. WP-00107.

Descriptors: *Recreational demand, *Sport fishing, *Cost-benefit analysis, Salmon, Clams, Bottomfish, Direct benefits, Oregon, Pacific Coast region, Elasticity of demand, Methodology.
Identifiers: *Pollution control, *Demand function, Yaquina Bay(Ore.).

One of the inherent difficulties in choosing between alternative pollution control systems is in valuing the benefits and costs arising from each. Many of these effects are not valued in the market. A model to estimate the demand function for one of these effects, sports fishing, is illustrated for Yaquina Bay, Oregon. An exponential demand function is estimated for bottomfish, salmon and clams, with transfer costs of angling effort per angler day as a proxy for price, family income of the angler, and distance from angler's home to the fishery representing the independent variables in a multiple regression analysis. Data were collected through field and mail survey. The net economic value of sports fishing is found by maximizing the net rent which anglers would pay from the estimated demand function and is found to equal $15,366, $5,383, and $1,998 gross revenue from bottomfish, salmon and clams, respectively. Income elasticities of -0.24, +1.38, and -0.8 are also found. The discussion is concluded with a brief consideration of the criticism of the chosen methodology. (See also W74-07142) (Schroeder-Wisconsin)
W74-07143

THE IMPACT OF SPORT ANGLING ON THE YAQUINA BAY ECONOMY,
Oregon State Univ., Corvallis. Dept. of Economics.
H. H. Stoevener.
In: Multi-disciplinary Study of Water Quality Relationships. A Case Study of Yaquina Bay, Oregon, Oregon Agricultural Experiment Station, Corvallis, Special Report 348, February 1972. p 13-28, 7 tab. WP-00107.

Descriptors: *Indirect benefit, *Input-output analysis, *Sport fishing, Recreational demand, Pacific Coast region, Oregon.
Identifiers: Yaquina Bay(Ore.).

In addition to benefits received by recreationists from sport fishing, benefits arise from the expenditures which recreationists make in the local area. These benefits may be significant in local decision making, and a method should be devised to measure their effects. An input-output framework is used to illustrate the measurement of secondary benefits arising from sports fishing in Yaquina Bay, Oregon. Recreationists' expenditures for fishing were obtained through interviews and postcard surveys. These same surveys also allocated total expenditures by business sectors. The input-output framework defines the interrelationship of the business sectors and the effects on the local economy of the exogenous changes in demand. The overall effect upon the local economy of the exogenous demand of recreationists is estimated at $317,000 a year or nearly twice their $154,550 expenditures. Of this total, nearly $59,380 came to households. (See also W74-07142) (Schroeder-Wisconsin)
W74-07144

AN ECONOMIC EVALUATION OF ALTERNATIVE LEVELS OF WATER QUALITY: THE ROLE OF WATER QUALITY IN RELATION TO ECONOMIC BENEFITS,
Oregon State Univ., Corvallis. Dept. of Agricultural Economics.
J. B. Stevens.
In: Multi-disciplinary Study of Water Quality Relationships. A Case Study of Yaquina Bay, Oregon, Oregon Agricultural Experiment Station, Special Report 348, February 1972. p 65-90, 2 fig, 7 tab. WP-00107.

Descriptors: *Estuarine fisheries, *Water pollution control, *Waste disposal, *Economic impact, Sport fishing, Pulp wastes, Alternate planning, Direct benefits, Indirect benefits, Comparative benefits.
Identifiers: *Yaquina Bay(Ore.).

An approach to estimate economic effects of different levels of water quality is related to fishing effort and fishing success, measures differences in income elasticities and is applied to types of fishing and kraft mill waste disposal alternatives for Yaquina Bay, Oregon. The quality variable was identified for sport angling and linked to the biological production function, making the possibility of determining the primary and secondary benefits of water pollution control apparent. The changes in angler effort due to water pollution, to changes in value of the fishery (primary benefits) and changes in incomes generated in the local economy (secondary benefits) are related empirically by a bio-economic model. The sport fishery was divided into three categories (bottomfish, salmon, and clams) and the biological effects on the fish population were estimated for each waste disposal alternative. Time series and cross-section estimation procedures and results were compared and long-run estimates chosen to estimate water pollution control benefits. The most appropriate estimates of success elasticities appear to be cross-section estimates of success elasticities for clam and bottomfish and long-run time series estimates for salmon fisheries. The largest benefit, $7,550 per year, would result from disposing pulp mill effluent in the ocean. (See also W74-07142) (Auen-Wisconsin)
W74-07146

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WATER USES AND WATER DEVELOPMENT IN FALL CREEK--POSSIBLE CONFLICTS,
Cornell Univ., Ithaca, N.Y. Dept. of Conservation.
L. S. Hamilton.
New York Water Resources and Marine Sciences Center, Ithaca, Publication No. 31, March 1970. 1 fig.

Descriptors: *Water utilization, *Planning, Streams, Water supply, Irrigation, Floods, Recreation, Social impact, Environment, Dams, *New York, *Water demand.
Identifiers: *Fall Creek(N.Y.), Cayuga Lake Basin(N.Y.).

Diversified water uses and projected development of Fall Creek, a 30-mile stream which flows into Cayuga Lake at Ithaca, New York are examined. The Fall Creek watershed consists of some 127 sq miles and is predominantly rural; about 40% is woodland, 35% in pasture, and 25% cropland and contains three small lakes. Fall Creek is utilized for a number of purposes. Cornell University consumes as much as 3.5 million gallons per day, its consumption increasing 5% yearly. The New York Electric and Gas Corporation and Ithaca Gun Company also utilize the stream water for cooling; it is also used for irrigation water. Surveys indicate, however, that expansion in irrigation acreage in the future will be limited. High water quality has made the creek particularly attractive for aesthetic, recreational, and scientific purposes. An examination of projected demands for water suggests that supplies may be inadequate. However, future management of the stream must explicitly consider impacts on this unique water resource or any attempts to meet future demand lest valuable and fragile elements be irreversibly destroyed. (Schroeder-Wisconsin)
W74-07149

UTILITY ANALYSIS IN THE VALUATION OF EXTRA-MARKET BENEFITS WITH PARTICULAR REFERENCE TO WATER-BASED RECREATION,
Oregon State Univ., Corvallis. Water Resources Research Inst. and Massachusetts Univ., Amherst. Water Resources Research Center.
J. A. Sinden.
Available from the National Technical Information Service as PB231701 $4.75 in paper copy, $1.45 in microfiche. WRRI-17, March 1973. 124p, 14 fig, 28 tab, 48 ref, 4 append. OWRR B-017-MASS (2).

escriptors: *Recreation demand, *Value, Analysis, *Benefits, Methodology, Psychological spects, Evaluation, Regression analysis, Rivers, eservoirs, Fishing, Camping, Boating, esthetics.
dentifiers: *Utility analysis, Taste preferences, xtra-market benefits, Scenic quality, Indifference mapping.

he travel-cost method used to value extra-market enefits implicitly assumes that all users have identical tastes. An alternative approach is suggested which uses a photo-choice game to yield stimates of users' preferences in valuating these enefits. Data showing the utility of this approach collected from 189 reservoir and adjacent esource users in the Cascade Mountains of regon and includes estimates of tastes and socioconomic characteristics. Tastes were measured s the willingness of user to expend additional time r money using one of the choices in the photohoice game to obtain cardinal estimates of references. Modified demand functions were stimated for ten activities with distance as a roxy for price, and tastes as the independent varibles. Benefits under this method equal the area nder the demand curve. Alternatively, it is suggested that benefits from each of these activities an be determined using indifference curve analyis. Utility maps were generated using the Ramsey nethod of utility estimation. Demand curves were enerated from the indifference curve and benefits alculated. Finally, indifference curves are used to stimate option demand. Option demand curves an be used to value benefits which can arise from otential future activities. (Schroeder-Wisconsin)
W74-07150

PROBLEMS IN RECREATIONAL USE OF RESERVOIRS (PROBLEMY REKREATSIONNOGO ISPOL' ZOVANIYA VODOKHRANILISHCH),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
A. B. Avakyan, and V. B. Yakovleva.
Vodnyye Resursy, No 5, p 41-54, 1973. 2 tab, 29 ref.

Descriptors: *Reservoirs, *Reservoir operation, *Recreation, *Recreation demand, *Recreation facilities, Tourism, Economics, Costs, Foreign projects, Foreign research.
Identifiers: *USSR.

The value of recreation as an important component of reservoirs in the USSR is examined, and the reservoir-based recreation industry is compared with that of rivers and lakes. Present recreational use of reservoirs on the Middle and Lower Volga is analyzed, and foreign experience in the use of reservoirs for recreational activity is noted. Special attention is given to the recreational use of reservoirs for water supply. Reservoirs are classified on the basis of their potential recreational use, and scientific and practical problems in increasing recreation benefits of reservoirs are examined. To handle reservoir facilities for recreational use to satisfy the ever-growing demands of the working class, a special All-Union and Republic ministry must be established to coordinate finances, scientific investigations, and the design, construction, and operation of recreational facilities, and to introduce cost accounting to all facets of recreational services rendered to the public, excluding treatment at sanatoriums and health resorts. (Josefson-USGS)
W74-07193

A COMPUTER SIMULATION MODEL FOR FLOOD PLAIN DEVELOPMENT. PART II: MODEL DESCRIPTION AND APPLICATIONS,
INTASA, Menlo Park, Calif.
For primary bibliographic entry see Field 6A.
W74-07296

SIMULATION--A TOOL FOR WATER RESOURCE MANAGEMENT,
Hydrocomp, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 6A.
W74-07300

ECONOMIC EVALUATION AND DETERMINATION OF PLANT CAPACITY AND DAM HEIGHT,
Public Power Corp., Athens (Greece).
For primary bibliographic entry see Field 8A.
W74-07305

COST SHARING FOR RECREATION: EFFICIENCY AND EQUITY,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Economics.
W. L. Miller, and B. A. Scherr.
Land Economics, Vol 50, No 1, p 58-65, February 1974. 1 tab, 10 ref.

Descriptors: Water resources development, Projects, *Cost sharing, *Economic efficiency, *Equity, *Linear programming, *Recreation, Optimization, Watersheds(Basins), Benefits, Costs, Distribution, Design, Methodology, Design, Systems analysis, Mathematical models, *Indiana.
Identifiers: *West Boggs Creek Watershed(Ind), Purpose scale, Facility mix, Income classes, Geographic location.

Improving cost-sharing procedures would enable society to better allocate its resources to achieve desired social goals. The impact is analyzed of changing the cost-share rules on the efficiency and equity of the recreational purpose of a water resource development project. The relation of efficiency and equity is examined by determining the impact of various cost-share rules on the selection of the economically optimum recreation purpose scale and facility mix. The impact of various cost-sharing policies is examined in terms of the distribution of recreation benefits and costs among different geographic locations and different income classes. In the methodology, each project plan involves at least two groups, the federal and the nonfederal. A socially optimum plan refers to the design which maximizes net national benefits. The model developed in this study is designed for application to the West Boggs Creek Watershed in southern Indiana. A general form of linear programming has been utilized to develop the optimum aggregate design for the recreation purpose in the watershed project. The model determines the efficiency of the project given varying endowments for the constraints; the equity aspects of the model are developed after the specification of the linear programming model. This analysis considers two situations: the nonfederal budget constant and federal budget constant. Results are presented and policy implications are discussed in detail. (Bell-Cornell)
W74-07307

WATER AND EFFLUENT TREATMENT PLANTS - COST CONSIDERATIONS AND CLIENT, CONTRACTOR, CONSULTANT RELATIONSHIPS, THE CONSULTANT'S VIEW,
For primary bibliographic entry see Field 5D.
W74-07312

DEVELOPMENT OF A DECISION ROOM FOR ENVIRONNTAL STUDIES, (FEASIBILITY STUDY),
Datametric C'OR H, McLean, Va.
For primary bibliographic entry see Field 6G.
W74-07371

PRODUCTION FUNCTION THEORY FOR USE IN OPTIMAL PLANNING DECISIONS,
Kentucky Univ., Lexington.
For primary bibliographic entry see Field 5D.
W74-07460

NEW CONCEPTS IN ENVIRONMENTAL PLANNING,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
D. A. Bella.
In: Proceedings 2nd Annual Technical Conference on Estuaries of the Pacific Northwest, March 16-17, 1972. Oregon State Univ., Corvallis (Engineering Experiment Station Circular No 44), p 13-17 (1972). 2 fig, 2 ref.

Descriptors: *Decision making, *Environment, Comprehensive planning, Projections.

The most significant element of the environmental predicament is the growing inability of man to predict the ecological results of any action taken and this gap appears destined to continue to grow. Traditional environmental decision making has refused to explicitly recognize this rising uncertainty, assuming instead that man's existing knowledge is adequate. This assumption may lead to resistance, reduction or elimination of those properties of ecological or social systems which are not explained within man's knowledge and which may be essential to the quality of life. A more appropriate environmental decision process would explicitly consider both man's knowledge and his ignorance. (See also W74-07491) (Schroeder-Wisconsin)
W74-07492

ENVIRONMENTAL QUALITY AND ITS EVALUATION,
Rutgers-The State Univ., New Brunswick, N.J. Water Resources Research Inst.
For primary bibliographic entry see Field 5G.
W74-07533

ENVIRONMENTAL PLANNING: AN ECONOMIC ANALYSIS. APPLICATIONS FOR THE COASTAL ZONE,
Clemson Univ., South Carolina. Dept. of Agricultural Economics and Rural Sociology.
J. C. Hite, and E. A. Laurent.
Praeger Publishers, Inc., New York, 1972. 155 p, 3 fig, 19 tab, 57 ref, append. OWRR B-012-SC(8).

Descriptors: *Methodology, *Input-output analysis, Economics, Environment, Planning, *South Carolina, Pollutants, Environmental effects, *Model studies.
Identifiers: *Coastal zones, *Charleston(S.C), Matrix, Environmental goods, Pecuniary income, Case study.

A conceptual framework for studying the linkages between the ecologic system and the socioeconomic system is developed and applied to analysis of the problems related to environmental planning in the coastal zone. This model contains two parts: an input-output matrix of the pecuniary sectors of the economy and an environmental matrix which shows the inputs (or outputs) of various natural resources (or pollutants) required to produce one dollar's worth of gross output by each sector in the input-output matrix. When the matrices are combined, empirical estimates of the direct and indirect linkages between the socioeconomic system and the environment are produced. This model is applied in a case study of the Charleston, South Carolina area. Applications of economic analysis to problems of evaluating planning alternatives for resource use in the coastal zone and types of institutions necessary to make use of such planning techniques are discussed. (Slattery-Wisconsin)
W74-07534

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

ECONOMIC STUDY OF THE EFFECT OF MUNICIPAL SEWER SURCHARGES ON INDUSTRIAL WASTES AND WATER USAGE,
Clemson Univ., S.C. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W74-07057

POLLUTION, PRODUCTION, AND COMPENSATION,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5G.
W74-07064

PUBLIC INVESTMENT CRITERIA: APPLICATION TO A PROJECT IN THE SOURIS RIVER BASIN,
Manitoba Univ., Winnepeg. Agassiz Centre for Water Studies.
For primary bibliographic entry see Field 6B.
W74-07070

UTILITIES AND FACILITIES FOR NEW RESIDENTIAL DEVELOPMENT: A SURVEY OF MUNICIPAL POLICY,
Urban Land Inst., Washington, D.C.
For primary bibliographic entry see Field 5D.
W74-07071

HIGH-RATE MULTI-MEDIA FILTRATION,
Environmental Protection Agency, New York. Region II.
For primary bibliographic entry see Field 5D.
W74-07261

PHOSPHORUS REMOVAL TREATABILITY STUDIES AT C.F.B. BORDON, PETAWAWA, TRENTON AND UPLANDS,
Environmental Protection Service, Burlington (Ontario). Wastewater Technology Center.
For primary bibliographic entry see Field 5D.
W74-07273

ECONOMIC SIZE SELECTION FOR PVC PIPELINES,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 8A.
W74-07303

OPTIMUM DESIGN HEIGHT OF COFFERDAMS,
Imperial Government of Iran, Tehran. Plan Organization.
For primary bibliographic entry see Field 8A.
W74-07304

COST SHARING FOR RECREATION: EFFICIENCY AND EQUITY,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W74-07307

CAPITAL COST MINIMIZATION OF DRAINAGE NETWORKS,
Duke Univ., Durham, N.C. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W74-07309

USER CHARGES AND INDUSTRIAL COST RECOVERY, DENVER SMSA,
Wilbur Smith and Associates, Denver, Colo.
For primary bibliographic entry see Field 5D.
W74-07370

POSSIBILITIES OF EFFLUENT CLARIFICATION (MOEGLICHKEITEN DER ABWASSERKLAERUNG),
Technische Universitaet, Darmstadt (West Germany). Wasser- und Abwasserforschungsstelle.
For primary bibliographic entry see Field 5D.
W74-07382

A REVIEW OF COLOUR REDUCTION TECHNOLOGY IN PULP AND PAPER MILL EFFLUENTS,
Beak (T. W.) Consultants Ltd., Montreal (Quebec).
For primary bibliographic entry see Field 5D.
W74-07406

ECONOMIC DAMAGES FROM RESIDENTIAL USE OF MINERALIZED WATER SUPPLY,
Environmental Protection Agency, Washington, D.C. Economic Analysis Div.
For primary bibliographic entry see Field 5C.
W74-07417

6D. Water Demand

COAL-ENERGY DEVELOPMENT IN THE NORTHERN GREAT PLAINS.
Wyoming Univ., Laramie. Water Resources Research Inst.
Available from the National Technical Information Service as PB-231 560, $4.75 in paper copy, $1.45 in microfiche. Completion Report, (October 1973). 131 p. OWRR B-024-WYO(1).

Descriptors: *Energy, *Great Plains, *Strip mines, *Demand, Coal mines, Lignite, Bituminous coal, Mining, Water resources development, Wyoming, North Dakota, Montana, Water demand, Research priorities, Projections, Decision making, Water quality management.
Identifiers: *Coal-energy development.

The growth demand for clean energy has focused attention on western coals, particularly the extensive lignite and sub-bituminous deposits in the Northern Great Plains. The Fort Union Powder River Coal beds, which underlie a large part of northeastern Wyoming, southeastern Montana and western North Dakota offer the greatest potential for development, because of the vast quantities of coal which can be strip mined. The U.S. Government has undertaken to assess coal/energy development problems through the Northern Great Plains Resources Program (NGPRP). The Water Resource Research Institutes of the three-state area, together with the Office of Water Resources Research, undertook the following tasks: (1) to determine the study needs, (2) to inventory current research efforts and to assess their potential contribution, (3) to establish the priorities for study as seen by the decision makers in the three states, and (4) to assess the capacity of the region's scientists to carry out the needed studies. Eight categories for study were identified: Trace elements; Atmospheric Effects; Surface Resources (including Reclamation); Coal Resources and Mining Techniques; Water (including Water Quality; Economic and Social Issues; Institutional and Legal Issues; and Technology Development.
W74-07056

PRELIMINARY WATER AND SEWER PLAN FOR ALCORN, BENTON, MARSHALL, PRENTISS, TIPPAH, TISHOMINGO COUNTIES.
Northeast Mississippi Planning and Development District, Booneville.
For primary bibliographic entry see Field 5D.
W74-07062

WATER AND WASTEWATER SYSTEMS INVENTORY - REGION H, NORTH CAROLINA,
Pee Dee Council of Governments, Troy, N.C.
For primary bibliographic entry see Field 5D.
W74-07063

WALLOWA LAKE BASIN COMPREHENSIVE PLAN.
Stevens, Thompson and Runyan, Inc., Portland, Oreg.
For primary bibliographic entry see Field 5D.
W74-07065

THE RELATIONSHIP OF LAND USE TO WATER USE IN SAN ANTONIO, TEXAS,
Texas Univ., Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 4A.
W74-07067

A FRAMEWORK FOR ECONOMIC PLANNING OF WATERSHED DRAINAGE,
Manitoba Univ., Winnepeg. Agassiz Centre for Water Studies.
For primary bibliographic entry see Field 4A.
W74-07069

MEASURES TO REDUCE WATER CONSUMPTION IN SOUTHEASTERN NEW YORK.
New York State Temporary Commission on the Water Supply Needs of Southeastern New York, Albany.
November 1, 1973. 106 p, 4 fig, 21 tab, 14 ref, append.

Descriptors: *Water distribution, *Water conservation, *Water supply, *Management, *Water policy, Water resources, Water shortage, Water utilization, Municipal water, New York, Water, Domestic water, Economics, Dependable supply, Water users, Water costs, Water delivery, Conservation, Planning, City planning, Estimated costs, Regional development, Bodies of water, Hudson River, Leakage, Water loss.
Identifiers: *New York City, Water distribution systems, Water pricing.

Public water supply deficits in southeastern New York are estimated to be between 410 and 570 MGD in 2000 and between 710 and 1000 MGD in 2020. Measures to decrease expected needs, including universal metering, reduction of leakage from water distribution systems, increased water price to consumers to reduce demand, replacement of residential water-using appliances and fixtures by those using less water, and public education campaigns, are analyzed. Universal metering for New York City is recommended to allow detailed analysis of where high water use and possible leakage occur. Metering requirements must be included in building codes. Use of water-saving toilets, shower heads, and appliances is encouraged, promoted through metering, public education, and higher-priced water. Water pricing to influence consumption is recommended. Retail price for metered water in the City should remain at $.525 per 100 cubic feet until additional information is obtained to develop a sophisticated pricing schedule. An intense campaign of education similar to the one used during the drought of the 1960's is recommended only in the event of water shortages, yet a long-range public education campaign should stress water-saving methods and appliances, water pricing, and metering. (Grden-North Carolina)
W74-07079

PROPOSED WATER SUPPLY PROJECTS FOR SOUTHEASTERN NEW YORK.
New York State Temporary Commission on the Water Supply Needs of Southeastern New York, Albany.
December 15, 1973. 300 p, 34 fig, 3 append, 17 tab.

Descriptors: *Water distribution, *Water supply, *Water demand, *Management, *Water policy, *New York, Water shortage, Water conservation, Water utilization, Municipal water, Domestic water, Economics, Water users, Water costs, Water delivery, Dependable supply, Estimated costs, Regional development, Hudson River, Bodies of water, Sources of supply, Supply, Water sources.

Local and regional water supply projects to overcome water deficiencies through 2020 in southeastern New York are discussed. Available water sources are inventoried to determine which can be developed for public water supply. Criteria to apply in project proposal development are presented to measure project value. Local projects recommended in previous water supply studies are reviewed to determine if they are feasible and offer the best alternatives for water supply use. If determined to be feasible, anticipated yields are subtracted from anticipated county and regional supply deficits. However, a large supply deficit still remains, which must be compensated for by regional projects. Eighteen regional projects are discussed and include data concerning supply capacity, construction stages, operating agencies, and requirements, and cost. All projects are combined into a regional plan to offer different possibilities for supplying regional deficits through 2020. Regional plans are first derived, assuming a middle level of population projection and universal metering, and the best alternative is selected. This plan is inspected to see how the combination and timing of projects would change if population projections and universal metering assumptions were modified. Additional projects to develop regional water supplies are then proposed. (Grden-North Carolina)
W74-07080

INSTITUTIONAL ARRANGEMENTS AND ALTERNATIVE FUTURES.
New York State Temporary Commission on the Water Supply Needs of Southeastern New York, Albany.
December 15, 1973. 255 p, 7 fig, 51 tab.

Descriptors: *Institutions, *Water resources development, *Water supply, *Management, *Water policy, Water resources, *Regional development, New York, Water distribution, Water demand, Water conservation, Water utilization, Municipal water, Hudson River, Water, Water users, Water costs, Water delivery, Conservation, Dependable supply, Planning, Supply, Sources of supply, Resources, Bodies of water, Estimated costs, Domestic water, Economics.
Identifiers: Regional corporation, *New York City, Institutional arrangements.

Numerous institutions governing water supply in southeastern New York are the product of ad hoc responses to individual water needs and preclude a unified effort to meet regional needs. This regional approach is needed to encompass source as well as service areas and can function more efficiently and equitably. Twenty-four recommendations are presented for regional water supply development, including the following examples: A regional self-supporting corporation should be established by the legislature to plan, develop, construct, and operate water supply facilities and to take over New York City's existing upstate facilities. Counties and N.Y. City would be the sole purchasers from the regional supplier and would then re-sell to local authorities. Federal, interstate, and state roles should be restricted to research, data collection, planning, regulation, and financial assistance functions. Local governments should consolidate water supply and related services, as well as integrate water supply and waste water disposal services. Developers should construct water, sewage, and drainage systems at their own expense, but municipalities should assume ownership and operational control. Each county should establish a sewer and drainage agency to perform water-related services. (Grden-North Carolina)
W74-07081

WATER USES AND WATER DEVELOPMENT IN FALL CREEK--POSSIBLE CONFLICTS,
Cornell Univ., Ithaca, N.Y. Dept. of Conservation.
For primary bibliographic entry see Field 6B.
W74-07149

PROBLEMS IN RECREATIONAL USE OF RESERVOIRS (PROBLEMY REKREATSIONNOGO ISPOL' ZOVANIYA VODOKHRANILISHCH),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 6B.
W74-07193

IPSWICH RIVER BASIN MODEL STUDY,
Geological Survey, Boston, Mass.
A. W. Burns.
Journal of the New England Water Works Association, Vol 87, No 4, p 307-320, December 1973. 7 fig, 9 ref.

Descriptors: *Water supply development, *Long-term planning, *Simulation analysis, River basins, *Water demand, *Management, Operation and maintenance, Hydrology, Water quality, Computer models, Digital computers, Streamflow, Reservoirs, Alternative planning, Evaluation, Estimating, Optimum development plans, Systems analysis, *Massachusetts.
Identifiers: *Ipswich River basin(Mass).

In the Ipswich River basin, just North of metropolitan Boston, planners predict a significant increase in the demand for water resources. Long-range plans are needed for water supply development; in addition to satisfying water demands, ideal plans would include waste disposal, recreation, and esthetics. The progress of a cooperative study between the Commonwealth of Massachusetts, Division of Water Resources, and the U.S. Geological Survey is reported in which emphasis has been on the development of a hydrologic model for planning and management. Described in detail is the Ipswich operational digital computer simulation model being used to analyze alternatives for municipal water supply. The model simulates the hydrologic regime resulting from operation of present and proposed supply systems; considered are streamflow, operation of supply systems, and quality of river and reservoir water. Streamflow simulation is based on unregulated mean monthly streamflows at gaging stations within the basin. Simulation of supply systems operations consists of pumping wells, diverting water from river or reservoirs, and purchasing water from external sources. The model evaluates effects of alternatives on the basin's water quality. Presented are study results which describe the relative performance of certain proposals for supply systems under certain management conditions. Level of demand, hydrologic sequence, and legislated operating restrictions seem to have the greatest influences on model results. (Bell-Cornell)
W74-07302

THE GEOLOGY OF WATER: THE LIMITING FACTOR IN URBAN DEVELOPMENT,
Indiana Purdue Univ., Indianapolis. Dept. of Geology.
For primary bibliographic entry see Field 3D.
W74-07402

6E. Water Law and Institutions

A STUDY OF POTENTIAL INSTITUTIONAL ARRANGEMENTS FOR WATER QUALITY AND WATER RESOURCES (QUANTITY) PLANNING AND MANAGEMENT,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 6B.
W74-07051

INSTITUTIONAL ARRANGEMENTS AND ALTERNATIVE FUTURES.
New York State Temporary Commission on the Water Supply Needs of Southeastern New York, Albany.
For primary bibliographic entry see Field 6D.
W74-07081

SIERRA CLUB V. FROEHLKE (INJUNCTION ACTION AGAINST RESERVOIR PROJECT).
486 F 2d 946-954 (7th Cir 1973).

Descriptors: *Environmental effects, *Flood control dam, *Environmental control, Judicial decisions, Environmental engineering, Ecology, Public welfare, Water law, Rivers, Habitats, Social aspects, Vegetation effects, Population, Public safety, Legal aspects, Permits, Standards, Regulations, Water policy.
Identifiers: *Injunction, *Sierra Club, *National Environmental Policy Act, *Environmental impact statement.

The United States Court of Appeals examined the primary issue of whether an environmental impact statement prepared by the Corps of Engineers concerning a flood control dam project complied with the mandates of the NEPA of 1969. A secondary issue considered was whether the failure of the Corps of Engineers to request and obtain local assurances of participation from two downstream communities voided the project. In 1962 Congress authorized the construction of a flood control dam on the Kickapoo River. Also involved were supplemental flood protection levees at two small downsteam communities. The Corps prepared a final environmental impact statement and forwarded to the Council on Environmental Quality. Plaintiffs argue that the Corps failed to include all possible detrimental effects and failed to give proper consideration to alternatives. Also argued was the failure of the district court to utilize the correct test to determine the sufficiency of the statement. The Corps argues that the environmental impact statement meets the requirements of NEPA. The court in affirming the lower court's decision for the defendants stated that the court was aware of several standards of review in assessing the adequacy of the environmental impact statement and that the decision was reached after a full, good faith consideration and balancing of environmental factors. (Proctor-Florida)
W74-07113

SCENIC RIVERS.
Pa. Stat. Ann., secs 821.1 thru 21.8 (1972).

Descriptors: *Pennsylvania, *Recreation, *Aesthetic, *Rivers, *Public lands, *Scenic easements, Engineering structures, Legislation, State governments, Adoption of practices, Coordination, Regulation, Conservation, Environmental sanitation, Land management, Water resources development, Parks, Watershed management, Federal government, Zoning, Natural resources, Wild rivers, Impounded waters, Watershed protection, Legal aspects, Economic aspects, Eminent domain.

This statute provides for the creation of a Pennsylvania scenic rivers system to preserve the aesthetic and recreational qualities of unspoiled streams. The system will be comprised of wild river areas, which are rivers that are free of impoundments and generally inaccessible except by trail, with primitive watersheds and shorelines and unpolluted waters. Also included are scenic rivers and recreational rivers. Scenic rivers are those

free of impoundments with undeveloped watersheds and shorelines, but accessible in places by roads. Recreational rivers are those rivers which are readily accessible, that may have some development along their shorelines, and that may have undergone some impoundment in the past. The Department of Environmental Resources is authorized to study and conduct public hearings to submit proposals for the designation of rivers as part of the scenic rivers system. The proposal will specify the category of the proposed river. A public hearing will be held in the county where the land is located concerning the proposed use. The department can acquire scenic easements within the boundaries of the river system by eminent domain or by other methods. The inclusion of rivers in a state river system is not meant to preclude the river from becoming part of a national scenic rivers system. (Sperling-Florida)
W74-07114

SEDIMENT CONTROL.
Ann. Cd of Md, art 96A, secs 105, 106 (Supp 1973).

Descriptors: *Maryland, *Project planning, *Adoption of practices, *Permits, *Soil erosion, *Sediment control, Legislation, Administrative agencies, State governments, Coordination, Watershed protection, Watershed management, Impaired water quality, Aquatic life, Recreation, Social aspects, Regulation, Specifications, Water resources development, Construction.

As a result of erosion and sediment deposition in waters within the watersheds of Maryland, such waters are being polluted and despoiled to such a degree that fish and the recreational use of the waters are being adversely affected. The Secretary of National Resources is to adopt criteria for the implementation of soil and shore erosion control programs. Before land is cleared, graded, transported, or otherwise disturbed, the proposed alteration is to be submitted for approval. Regulations for erosion and siltation control requirements for utility construction are to be adopted by the Washington Suburban Sanitary Commission. These regulations shall apply to all contractors doing work for the Commission. No utility construction will be undertaken until an erosion and sediment control plan has been submitted and approved. Upon review and approval by the county, the Commission can then issue a permit for construction. The county will inspect and enforce the conditions of the approved plans and permits. The Department of Natural Resources will assist the soil conservation districts in the preparation of a unified sediment control program. The Department will also review and approve all land clearing, soil movement, and construction undertaken by any agency of the state government. (Sperling-Florida)
W74-07115

NATURAL RESOURCES--WASTE CONTROL.
Ann Cd of Md, art 66C secs 411V-411AD, (1973).

Descriptors: *Maryland, *Specifications, *Waste water treatment, *Waste water disposal, *Sewage effluents, State governments, Legislation, Administration, Adoption of practices, Administrative agencies, Waste water(Pollution), Water pollution sources, Watershed protection, Environmental sanitation, Rivers, Engineering structures, Advanced waste treatment.
Identifiers: *Administrative regulations.

As a result of poorly treated effluent discharged from sewage disposal plants and from erosion and silt from construction on lands within the Patuxent River watershed, the river is being seriously polluted. The despoilation is severe enough that fish, marine life and recreational use of the river is being adversely affected and curtailed. All persons disposing of or treating sewage within the watershed shall anticipate the need for advanced waste treatment, and all future plants shall be constructed accordingly. The owners and operators of any existing plants that do not meet the standards will submit a plan for improved sewage disposal. The plan will indicate the necessary improvements required to insure purity of the effluent and a time schedule for the construction of those improvements within five years. If a plan is not submitted or it is submitted but construction does not take place, the county will proceed with the plan and the work. Owners of the plant will be liable for expenditures so made including attorney's fees. The county health department will take at least one monthly stream sample at the critical point of all sewage disposal plant overflows within the watershed. The discharge of raw sewage or waste into the river is a misdemeanor. Oyster and clam shells and other materials used in the culture of marine life are not considered waste. (Sperling-Florida)
W74-07116

ANSLEY V. TARRANT COUNTY WATER CONTROL AND IMPROVEMENT DISTRICT NO. ONE (LIABILITY FOR FLOODING AND AMOUNT OF DAMAGE).
498 S.W 2d 469-477 (Texas 1973).

Descriptors: *Texas, *Flood damage, *Flood recurrence interval, *Dam construction, Erosion, River flow, Construction, Spillways, Dams, Legal aspects, Judicial decisions, Water law, Floods, Flooding, Flood plains, Floodwater, Reservoirs, Reservoir construction, Damages, Water, Water control.

Appellant appealed decision in favor of appellee, water control district, to recover permanent damages to land alleged to have been caused by repeated flooding by a dam and spillway constructed by appellee. The appellee denied generally the allegations of the petition and specifically alleged that the land in question had been historically subject to floods prior to the construction of the dam and spillway and that they actually caused no damage to the lands because the land had always been and would be subject to flooding by the nearby river. In the alternative appellee alleged on temporary and sporadic damage and not a permanent one. The court held there was basic error in the assumption that property which had been floodlands from time to time suffers a decrease in value automatically as a matter of law, if the appellee's conduct contributed to additional flooding. The inquiry should be whether the property has, in fact, suffered a decrease in value by reason of the alleged unlawful interference. The jury is bound to decide the issue and opinion testimony does not establish any material fact as a matter of law. The court thinks the jury is authorized to consider before and after value and justified in leaving the parties where they found them. (Daniels-Florida)
W74-07117

METALLIC MINERAL MINING OPERATIONS, (ACQUISITION OF SURFACE LANDS FOR WATER QUALITY CONTROL).
Mich Comp Laws Ann, sec 425.181 (Supp 1973).

Descriptors: *Mining, *Environmental effects, *Michigan, *Legislation, Natural resources, Land use, Mine wastes, Minerals.

This act provides for the reclamation of lands subjected to the mining of minerals and seeks to control possible adverse environmental effects of mining. Its aim is to preserve the natural resources and to encourage the planning of future land use. The act further provides for the promotion of the orderly development of mining, encouragement of good mining practices, and the recognition and identification of the beneficial aspects of mining. (Daniels-Florida)
W74-07119

THE INTERLAKE AFFAIR,
Businessmen for the Public Interest, Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-07120

POLLUTION SANCTIONS--NEW ALTERNATIVES TO CIVIL LIABILITY,
Food and Agriculture Organization of the United Nations, Rome (Italy). Environment Law.
For primary bibliographic entry see Field 5G.
W74-07123

INSTITUTIONAL CONSIDERATIONS,
Oregon State Univ., Corvallis. Dept. of Agricultural Economics.
A. Sokoloski.
In: Multi-disciplinary Study of Water Quality Relationships. A Case Study of Yaquina Bay, Oregon Agricultural Experiment Station, Special Report 348, February 1972. p 91-104, 2 tab. WP-00107.

Descriptors: *Institutional constraints, *Alternate planning, *Waste disposal, Riparian rights, Local governments, Legal aspects, Recreation, Welfare(Economics), Sport fishing, Estuarine fisheries.
Identifiers: *Yaquina Bay(Ore.).

The institutional context in which economic decisions are made may aid or impede the implementation of efficient choices. The potential impacts of existing institutions on the economic consequences of varying water quality standards in Yaquina Bay, Oregon is examined to illustrate this point. Included in the institutions considered were water rights and pollution laws. The legal limits and performance limitations of counties, special districts, and the state are also discussed. The most formidable barrier limiting the ability of existing institutions to alter disposal choices were found to be pollution laws which prohibit any degree of effluent dilution and the absence of any existing local management units which might facilitate whatever adjustments are possible. Four other issues are discussed: the criterion to evaluate governmental entities, the measurement of benefit and cost flows across governmental units, the relationship of these flows to compensation theory in welfare economics, and potential integration of functions best performed by alternative governmental units to aid in the implementation of economic choices. (See also W74-07142) (Schroeder-Wisconsin)
W74-07147

STORMFLOW POLLUTION CONTROL IN THE U.S.,
Edison Water Quality Research Lab., N.J.
For primary bibliographic entry see Field 5D.
W74-07256

STREAM POLLUTION.
Tenn. Code Ann., secs. 70-324 through 70-342 (1971).

Descriptors: *Tennessee, *Water law, *Legislation, *Water quality, *Pollution, Water resources, Water resource planning, Water quality control, Pollution control, Pollution abatement, Waste disposal, Waste treatment, Waste water control, Waste water treatment, Waste discharge, Recreation, Water resources development.

The Water Quality Control Act of 1971 declares the interest of the public and the state of Tennessee in having unpolluted waters. This Act recognizes the obligation of the state to secure, protect and preserve this right and its purpose includes the abatement of existing pollution, the reclamation of polluted waters, the prevention of future pollution as well as a plan for the future use of the state's water resources so that they may be used and en-

joyed to the fullest extent consistent with the maintenance of unpolluted waters. The Act establishes the Tennessee water quality control board to adopt standards for all waters of the state, considering the size, depth, surface area covered, volume, direction, rate of flow, stream gradient and water temperature, as well as the character of the surrounding land. The board shall also consider all physical, chemical, biological, bacteriological or radiological properties that may be necessary for preserving the quality and purity of the waters. Alteration of water properties, construction or operation of treatment works, waste discharge facilities or waste discharge outlets shall henceforth require special permit issued by the board. (Silber-Florida)
W74-07275

SANITARY DISTRICTS FOR SEWAGE DISPOSAL.
W. Va. Code Ann., secs. 16-12-1 through 16-12-14 (1967).

Descriptors: *Sewage districts, *West Virginia, *Legislation, *Waste treatment, *Environmental sanitation, *Water quality control, Public health, Sewage treatment, Waste disposal, Waste water, Waste water treatment, Administrative agencies, Structures, Municipal wastes, Discharge, Drainage, Water pollution treatment, Pollution control, Pollution abatement.

One or more incorporated cities, towns and/or villages located in an area of contiguous territory are authorized to incorporate into one sanitary district for purposes of comfort, convenience or the preservation of the public health. The district may construct and maintain a plant or plants for the purification and treatment of sewage, and maintain one or more outlets for the drainage thereof. Each district may employ the necessary personnel needed to carry out its functions. The districts may provide for sewage disposal and drainage and provide for the savings and preservation of the water supplied to the districts from contamination, by contructing and maintaining sewage treatment plants, sewers, channels, drains or outlets. Nothing contained within the statute shall authorize the district to operate a system of waterworks for the purpose of furnishing or delivering water to any such municipality or its inhabitants. A district may acquire property necessary to carry out its functions. (Silber-Florida)
W74-07276

WEST VIRGINIA WATER DEVELOPMENT AUTHORITY.
W. Va. Code Ann., sec 20-5C-1 thru 20-5C-23 (1972).

Descriptors: *West Virginia, *Water law, *Legislation, *Water resources, *Water development, Water, Water purification, Water quality, Water quality control, Water policy, Project policy, Streams, Water pollution, Pollution control, Pollution abatement, Sewage, Sewage disposal, Water structures, Environmental engineering, Public health, Environment.

It is the responsibility of the state of West Virginia to establish, fund, operate and maintain water development projects, to maintain, preserve, protect, conserve, and in all instances possible to improve the purity and quality of water within the state. Other objectives include protecting and improving public health, assuring the fullest use and enjoyment of such water by the public and providing suitable environment for the propagation and protection of animal, bird, fish, aquatic and plant life. The state shall also provide water of the necessary quality and in the amount needed for the development, maintenance and expansion of all types of industries and businesses. The West Virginia Water Development Board is directed to assist in the preservation, protection, improvement and management of the purity and quality of the waters, prevent or abate pollution of water resources, promote the health and welfare of the state's citizens, improve stream quality, and remove harmful liquid and solid wastes from the waters. (Silber-Florida)
W74-07277

RIVER REGULATION--RESERVOIRS.
N.Y. Environmental Conservation Law, sections 15-2101 thru 15-2141, p 585-628 (1972).

Descriptors: *New York, *Legislation, *Rivers, *Water management, *Water development, Reservoirs, Dams, Floods, Flood control, Administrative agencies, State governments, Water resources, Water resources development, Water utilization, Power plants, Protection, Flood protection, Regulation, Drainage, Navigable waters, River flow, Water law, Planning, Cooperation, Coordination.

The establishment and operation of river development districts in New York are authorized. Each district is responsible for formulating and carrying out plans which regulate and maintain the orderly flow of rivers within their boundaries. Each district is also charged with determining the need for and feasibility of reservoirs and reservoir construction. Included within the scope of this duty is the power to discontinue or relocate highways, roads and streets. The districts are also authorized to grant access to their respective rivers for the purpose of developing sources and sites of potential water power resources. In addition, the districts shall have eminent domain powers to acquire lands and facilities necessary to fulfill their mandate, consistent with the best public interest. Moreover, each district may contract to dispose of the natural resources present upon any of their real property in any manner they deem appropriate, as long as it is consistent with the purposes of this statute and the public good. (Silber-Florida)
W74-07278

WILD, SCENIC RIVER SYSTEMS.
N.Y. Environmental Conservation Law, secs. 429v, p. 445-450 (1972).

Descriptors: *Water conservation, *Aquatic environment, *Water policy, *Rivers systems, *Water resources, *New York, Legislation, Administration, Inter-agency cooperation, Federal government, Water supply, Water quality, River flow, Boundaries(Property), Water resources development.

The establishment of a wild, scenic and recreational rivers system is described. Selected rivers shall be preserved in a free-flowing condition, so they and their immediate environs will be protected for the benefit and enjoyment of the people. The statute institutes a state river system, designating its initial components and prescribes methods and standards by which additional rivers may be added to the system. The commissioner of environmental conservation shall have exclusive jurisdiction over all river areas, other than those within the Adirondack Park, which shall be under control of the park agency. The rivers shall be classed either as wild, scenic or recreational rivers and the criteria for inclusion into one of those three categories are set forth, as well as the management objectives. After inclusion into the system, no structure impeding the natural flow shall be constructed. Land uses, within the exterior boundaries of the designated river areas are set forth and such boundaries shall be established by the commissioner. Cooperation is urged with the federal government and with other agencies. In case of a conflict with other laws, the more restrictive provision shall apply. (Sutton-Florida)
W74-07280

CLASSIFICATION OF WATER AND WATER STANDARDS.
N.Y. Environmental Conservation Law, secs. 17-0301 through 17-0303, p 656-668 (1972).

Descriptors: *Water pollution, *Water policy, *Water pollution control, *Water quality, Water supply, Legislation, *New York, Water conservation, Administration, Water quality control, Interagency cooperation, Water pollution sources, Waste water(Pollution), Water demand, Water quality standards.

Water pollution control, the classification of state waters and the promulgation of water standards are described. The (Department of Health), after investigation and public hearings, shall group designated state waters into classes. The classifications will be in accordance with the best usage in the public interest. Once classified, standards of water quality and purity will be assigned to each class, taking several criteria into consideration. Sources of water supply will be further classified according to the maximum amount of monthly median coliform allowed in each source, determined by a sampling technique. Further proceedings on the Commissioner's part are provided in case of violations and he may adopt and assign more restrictive standards for the best usage of the states waters. Regulations are set forth concerning the public hearings and notice therof. The general powers and duties applicable to the statute are detailed, with the department having administrative jurisdication to abate and prevent water pollution in the state's waters. The Commissioner's authority will include holding public hearings, requiring the discontinuance of sewage discharge, bringing suit to compel performances, issuing permits under proscribed conditions, as well as other powers. The duties and responsibilities of the department are then defined, including the right of inspection, at reasonable times, of operations and records. (Sutton-Florida)
W74-07281

LAW AFFECTING THE QUALITY OF THE MARINE ENVIRONMENT,
For primary bibliographic entry see Field 5G.
W74-07282

RIPARIAN RIGHTS IN CERTAIN COUNTIES.
Md. Code Ann., art. 66C, sec 253 (Supp. 1973).

Descriptors: *Maryland, *Legislation, *Water law, *Water utilization, *Water rights, *Riparian rights, Water resources development, Riparian law, Fisheries, Competing uses, Legal aspects, Ownership of beds, Prescriptive rights.

The owner, tenant, or lessee of any land bordering on any tidal waters of the tributaries of the Chesapeake Bay, except the waters of the Great Choptank River, lying in the state of Maryland is entitled to make a choice of the set or position to place nets or establish a haul seine fishery in front of such property. If such owners of the riparian rights do not avail themselves of this privilege within twenty days after receiving notice from any other person who may desire to locate their nets or fishery in front of said person's property, then it shall be lawful for such persons to locate their nets. Permission of the owners shall always be necessary for the waters of Baltimore, Talbot, Caroline, Dorchester, Prince George's, St. Mary's and Charles counties. Fishing shall not be permitted in any waters within 500 yards of any shore used as a pleasure resort, or to interfere with bathing or boating without the owner's permission. Persons quilty of violating these provisions shall be subject to fine and forfeiture of their fishing equipment. (Silber-Florida)
W74-07283

A BILL TO AUTHORIZE THE SECRETARY OF THE INTERIOR TO ENGAGE IN FEASIBILITY INVESTIGATIONS OF CERTAIN POTENTIAL WATER RESOURCE DEVELOPMENTS.
Senate Bill 3959, 92d Cong, 2d Sess September 1972 2 p.

Descriptors: *Water resource development, *Legislation, *Potential water supply, *Federal government, *Feasibility studies, Ground water resources, Water supply, Oklahoma, North Dakota.

This Senate bill authorizes the Secretary of the Interior to engage in feasibility investigations of certain potential water resource developments in southwestern Oklahoma and in central North Dakota. The bill was referred to the Committee on Interior and Insular Affairs. (Daniels-Florida)
W74-07284

FISHERIES AND GAME; GENERAL PROVISIONS.
Conn. Gen. Stat. Ann. secs. 26-3, 26-6, 26-8, 26-17a (Supp. 1972).

Descriptors: *Connecticut, *Wetlands, *Wildlife conservation, *Aquatic environment, Aquatic habitats, Inland waterways, Fish conservation, Fisheries, Game birds, Land classification, Spawning, Conservation, Legislation, Wildlife, Fish, Wildlife habitats, Environmental control.
Identifiers: Retaining ponds.

The Connecticut Commissioner of environmental protection shall enforce all laws relating to fish, birds and wildlife. He shall supervise hatcheries and retaining ponds and may designate any area of inland water as closed to fishing, in order to provide spawning beds. Acquisition may be made by gift, lease or purchase of lands for the establishment of fish hatcheries or game preserves. The commissioner may allocate the funds acquired for the purpose of preserving and propagating fish, birds and wildlife. Conservation officers and patrolmen will enforce the regulations issued by the commissioner, and may arrest any person found to be in violation of these provisions. An officer may, without a search warrent, examine various items of personal property if he believes that any animal is being kept within, in violation of the statutory provisions. Dwelling places may be likewise searched upon obtaining a search warrant. The commissioner is empowered to acquire title to or make agreements with the owners of any tidal wetlands area in order to limit the future use or otherwise conserve such tidal wetlands. (Ritchie-Florida)
W74-07286

UNITED STATES V. POT-NETS, INC. (VIOLATION OF RIVERS AND HARBORS ACT),
363 F. Supp. 812-817 (D.C. Delaware 1973). 6 p.

Descriptors: *Navigable waters, *Rivers and Harbors Act, *Tidal effects, *Channels, *Judicial decisions, Waterways, *Delaware, Tidal marshes, Lagoons, Bodies of water, Water levels, Water law, Dredging, Federal government, Legal aspects.
Identifiers: *Injunction.

The United States brought action against developers of projects which had been built in part on highlands and on abutting marshland for violation of the Rivers and Harbors Act. The government sought injunctive relief to bar further dredging, filling and bulkheading work and a mandatory order requiring the defendants at their expense to restore the marshes to their previous natural state. The plaintiff contended that all the waterways adjacent to defendant's projects were navigable in fact, and the adjacent marshes on which the projects were partially built were inundated by ordinary high tides of those navigable waters and are therefore also navigable waters of the United States. The defendants contended that the marshes were not navigable waters and that the natural or man-made canals or lagoons which do not lead to any public landing or place but merely dead-in into private property are either private or state waters and not navigable waters. The United States District Court concluded that the criterion for determining navigability is capability for commercial traffic rather than manner and extent of use. The court denied the motions for summary judgment concluding that material issues supported by affadavits and aerial photographs remained in dispute. (Proctor-Florida)
W74-07287

BURLEIGH V. CALLOWAY (INJUNCTION ACTION AGAINST A BEACH EROSION PROJECT).
362 F. Supp. 121-124 (D. Hawaii 1973). 4 p.

Descriptors: *Hawaii, *Beaches, *Beach erosion project, *Access routes(Recreation), *Cost-benefit analysis, *Environmental effects, Federal government, State governments, Administration, Economics, Recreational facilities, Tourism, Recreation demand, Judicial decisions, Project planning, Estimated costs, Estimated benefits.
Identifiers: *Environmental Impact Statements, *National Environmental Policy Act, Injunction.

The plaintiffs, citizens and community groups, sought under the National Environmental Policy Act (NEPA) to enjoin all acts on the part of the defendant, the Secretary of the Army, in furtherance of the Waikiki Beach erosion control project which threatened to demolish the Hawaii war memorial known as the Natatorium. The erosion control project was state and federally funded and is directed by the Army Corps of Engineers. Its purpose was to improve the beach by increasing beach land, improving access to the shoreland and preventing future beach sand erosion. The planned improvements in this segment of the project consisted of the construction of three new groins, placement of approximately 46,00 cubic yards of sand, and demolition of the Natatorium. The plaintiffs urge that the environmental impact statement and its supplement are insufficient to comply with NEPA. The court declared that the plaintiffs' motion for preliminary injunction must be dismissed as it appeared that (1) no viable alternatives to the Natatorium's destruction existed, (2) the restoration and incorporation of the Natatorium into the project was not feasible, and (3) no expert testimony showed a withholding of information of possible environmental impact as a result of the project. (Proctor-Florida)
W74-07288

PROTECTION OF THE ENVIRONMENT.
Federal Register, Vol 38, No 159, p 22298-11199 (1973).

Descriptors: *Legislation, *Regulations, *Permits, *Pollutants, *Discharge, Administrative agencies, Control, Wastes, Waste treatment, Effluents, Coliforms, Suspended solids, Sewers, Treatment facilities, Industrial wastes, Industrial pollution, Water quality, Water quality control, Legal aspects, Water law, Water policy, Pollution control, Pollution abatement, Impaired water quality, Water pollution sources.

The Environmental Protection Agency (EPA) has reorganized and clarified its regulations concerning secondary treatment within the scope of the Federal Water Pollution Control Act Amendments of 1972. Some of the major changes include: clarifying that in no case should the percentage removal of biochemical oxygen and suspended solids be less than eighty-five percent in any thirty day period, and a relaxing of certain of the above standards shall only be allowed for treatment works receiving flows from combined sewer systems during wet weather. The sections of the Act affected by the announced changes include those dealing with minimum level of effluents, biochemical oxygen demand, suspended solids, fecal coliform bacteria, combined sewers, secondary treatment works, industrial wastes, industrial pollution, sampling and test procedures. (Silber-Florida)
W74-07289

WILD AND SCENIC RIVERS.
Minn. Stat. Ann., secs. 104.31 to 104.40 (Supp. 1973), amended, ch. 271, secs. 1-10 (1973) Laws of Minn.

Descriptors: *River beds, *Management, *Water conservation, *Rivers, *Administration, Legislation, *Minnesota, Project planning, State governments, Inter-agency cooperation, Water resources development, Erosion control, Scenery, Land resources, Wildlife.
Identifiers: *Land acquisition.

This Minnesota statute relates to natural resources and the preservation and management of rivers. In the context of the Act, 'river' means a flowing body of water such as a stream or a segment or tributary thereof, including lakes through which the river or stream flows. A system of classification is established with three categories, wild, scenic or recreational rivers. The administration of the system is under the commissioner of natural resources and he shall promulgate statewide minimum standards and criteria for the preservation and protection of shorelands within the boundaries of the system. The Commission shall prepare a management plan, make it available to those affected and shall conduct public hearings. Local land use ordinances will be promulgated after the districts and management plans are made public. To futher the Act's purpose, acquisition of lands is provided for by all lawful means. Responsibilities of other governmental units, federal-state relations, and those situations where conflict with other laws arise are also dealt with. (Sutton-Florida)
W74-07290

UNITED STATES V. IRA S. BUSHEY AND SONS, INC. (INJUNCTION AGAINST OIL SPILLS).
363 F. Supp. 110-123 (D. Vermont 1973) 14 p.

Descriptors: *Vermont, *Oil spills, *Oil pollution, *Rivers and Harbors Act, *Water pollution sources, Oil, Water law, Common law, Water pollution, Regulation, Negligence, Judicial decisions, Coast Guard regulations, Legislation, Legal aspects, Federal Water Pollution Control Act.
Identifiers: *Nuisance(Legal aspects), Injunction.

Plaintiff-United States sued the corporate owners of vessels engaged in transporting oil on Lake Champlain, for injunctive relief with respect to oil spills. From April, 1967 to December, 1972 vessels of defendant corporation's subsidiaries were involved in nine oil spills. The court determined that the oil spills had occurred as a result of slack operations, including drinking on duty by crewmen, use of faulty equipment, and the employment of unlicensed operators. Such operation was said to be a continuing nuisance threatening the general public, wildlife, lakefront property owners and water quality of Lake Champlain. Defendant contended that the corporate veil shielded the parent firm from the torts of subsidiaries, that equitable relief was precluded by the Federal Water Pollution Prevention and Control Act of 1972, and that the Coast Guard's authority under the Navigation Rules precluded court action in the form of injunctive relief. The court held that equitable relief could be granted based on the Rivers and Harbors Act of 1899, and the federal common law of nuisance. The court issued a mandatory injunction to require compliance with a list of safety procedures adopted by the court. (Perrey-Florida)
W74-07291

ATIONAL POLLUTANT DISCHARGE LIMINATION SYSTEM.
ederal Register, Vol 38, No 141, p 19894-19896 973).

escriptors: *Legislation, *Regulations, *Permits, Discharge, *Pollutants, State governments, 'ater policy, Administrative agencies, Control, 'aste discharge, Sewage discharge, Effluents, ewage treatment, Waste treatment, Municipali-es, Industrial pollutants, Industrial wastes, 'ater quality control, Standards, Water pollution, 'ater pollution sources, Pollution abatement, Pol-tion control, Impaired water quality, Water pol-y, Legal aspects, Water law.

he Environmental Agency (EPA) pursuant to uthority granted in the Federal Water Pollution ontrol Act Amendments of 1972 and the National ollution Discharge Elimination System section ontained within shall issue permits for the ischarge of any pollutant or combination of pollu-nts, upon condition that such discharge will meet ll applicable requirements of the Act relating to ffluent limitations, water quality standards and nplementation plans. New source performance tandards, toxic and pretreatment effluent stan-ards, inspection, monitoring, entry provisions nd guidelines establishing ocean discharge riteria must also be met when applicable. States esiring to administer their own program must ubmit a full and complete program description to he EPA for approval. The state programs can not e approved unless they conform to the EPA uidelines. Certain standards regarding municipal reatment plants, capacities, industrial and manu-acturing plant discharges, and various procedural equirements have been adjusted in accordance vith various comments and suggestions that have een submitted. (Silber-Florida)
W74-07293

ENVIRONMENTAL IMPACT ANALYSIS: AN EXAMINATION OF THREE METHODOLO-GIES,
Wisconsin Univ., Madison. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6G.
W74-07339

MORE HEAT THAN LIGHT: THERMAL POL-LUTION VERSUS HEAT ENERGY UTILIZA-TION,
Snessard L. Holland Law Center, Gainesville, Fla.
For primary bibliographic entry see Field 5B.
W74-07465

LAWS AND REGULATIONS OF POLLUTION AND NAVIGATION IN PACIFIC NORTHWEST ESTUARIES,
Coast Guard, Portland, Oreg.
For primary bibliographic entry see Field 5G.
W74-07499

PACIFIC NORTHWEST COASTAL ZONE MANAGEMENT AS IT RELATES TO ESTUARY PROTECTION,
Oregon Coastal Conservation and Development Commission, Port Siuslaw.
W. B. Ternyik.
In: Proceedings 2nd Annual Technical Conference on Estuaries of the Pacific Northwest, March 16-17, 1972. Oregon State Univ., Corvallis (Engineering Experiment Station Circular No 44), p 109-111 (1972).

Descriptors: *Oregon, *Legislation, *Estuaries, *Protection, Coordination, Jurisdiction, Political constraints, Federal government, Comprehensive planning, State governments, Local governments, Permits.
Identifiers: *Coastal zone.

There were some 208 governmental bodies (federal, state, and local) that have traditional and/or legal interests in the Oregon coastal zone management. A substantial portion of the coastal zone management problem arose out of interagency conflicts over jurisdiction in addition to a maze of duplicating mandates. The Oregon Coastal Conservation and Development Commission, consisting of 24 elected coastal zone officials plus six governor's appointees, representing statewide interests was authorized by the legislature. The commission's mandate is to prepare a coordinated comprehensive natural resource use plan for the coastal zone by 1975. The plan is to be in the form of a legislative proposal. To accomplish this task full cooperation of state and federal agencies, as well as local government units is required; in addition a massive citizen involvement is essential at the outset. Most of Oregon's estuaries are now utilized in the multi-use concept which includes lumbering and recreation, both essential to maintain a year-round economic balance. State measures have helped maintain the quality of the coastal zone even though wetlands and marshlands are as yet not identified. The development of policies and standards based on the carrying capacities of the natural resources should insure their protection. (See also W74-07491) (Auen-Wisconsin)
W74-07500

6F. Nonstructural Alternatives

BACKGROUND SURVEY. SURFACE DRAINAGE PROGRAM, MADISON, SAINT CLAIR, MONROE AND RANDOLPH COUNTIES, ILLINOIS.
Southwestern Illinois Metropolitan Area Planning Commission, Collinsville.
For primary bibliographic entry see Field 4A.
W74-07066

THE RELATIONSHIP OF LAND USE TO WATER USE IN SAN ANTONIO, TEXAS,
Texas Univ., Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 4A.
W74-07067

FLOOD PLAIN INFORMATION-NEUSE AND TRENT RIVERS AND JACK SMITH CREEK, NEW BERN, NORTH CAROLINA.
Army Engineer District, Wilmington, N.C.
For primary bibliographic entry see Field 4A.
W74-07073

FLOOD PLAIN INFORMATION-NEUSE RIVER AND BUFFALO CREEK, SMITHFIELD, NORTH CAROLINA.
Army Engineer District, Wilmington, N.C.
For primary bibliographic entry see Field 4A.
W74-07074

FLOOD PLAIN INFORMATION: BURDENS AND TWO BOTTLE CREEKS AT RESEARCH TRIANGLE AREA, DURHAM COUNTY, NORTH CAROLINA.
Army Engineer District, Wilmington, N.C.
For primary bibliographic entry see Field 4A.
W74-07075

FLOOD PLAIN INFORMATION - GLADE CREEK, VINTON, VIRGINIA.
Army Engineer District, Wilmington, N.C.
For primary bibliographic entry see Field 4A.
W74-07076

STATE FLOOD CONTROL PROGRAM.
Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 4A.
W74-07111

FLOOD PROOFING DECISIONS WITH UNCERTAIN EVENTS,
Massachusetts Univ., Amherst. Dept. of Agricultural and Food Economics.
For primary bibliographic entry see Field 6A.
W74-07299

6G. Ecologic Impact Of Water Development

LANDSCAPE COMPARTMENTALIZATION: AN ECOLOGICAL APPROACH TO LAND USE PLANNING,
Duke Univ., Durham, N.C. School of Forestry.
J. E. Wuenscher, and J. M. Starrett.
Available from the National Technical Information Service as PB-231 554, $4.50 in paper copy, $1.45 in microfiche. North Carolina Water Resources Research Institute, Raleigh, Report No. 89, (UNC-WRRI-74-89), December 1973. 107 p, 22 fig, 38 ref. OWRR A-062-NC(1). 14-31-0001-3833.

Descriptors: Planning, *Environmental control, *Land use, Ecosystems, Land development, Land management, *North Carolina, Landscaping, *Preservation, Ecology, Multiple-purpose projects.
Identifiers: Symaps, *Landscape compartmentalization, *Eno River(NC), Durham(NC), Durham County(NC), Orange County(NC).

Basic objectives were to explore the use of the 'ecosystem concept' in land use planning and to develop methods of ecologically based planning. Basic ecosystem processes are reviewed and interpreted as services provided by natural systems to the human communities. A series of guidelines is presented for the use of ecosystem concepts in planning. Methods are developed and described for the use of the 'Landscape Compartmentalization' approach in which a planning area is divided into four compartments based on natural characteristics of the land and its ecosystems. Factors considered were distance from the nearest water course, slope, agricultural productivity index, forest site index, sub-soil permeability, shrink-swell potential of the soil, depth to bedrock, and position with respect to flood plains. The 'Protective Compartment' includes areas that must be protected from intensive use to maintain natural processes and environmental quality. 'The Productive Compartment' includes highly productive agricultural and forest land. 'The Urban Compartment' is composed of land well suited for intensive development. Remaining land is placed in the 'Multiple Use Compartment' and may be suitable locally for any prospective use. The compartmentalization method is applied to a specific land area--the Eno River Basin near Durham, North Carolina. (McJunkin-North Carolina)
W74-07053

ECOLOGY AND PRODUCTIVITY OF STRIP-MINE AREAS IN MERCER COUNTY, PENNSYLVANIA,
Grove City Coll., Pa. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W74-07055

PROCEDURES AND PROGRAMS TO ASSIST IN THE ENVIRONMENTAL IMPACT STATEMENT PROCESS,
California Univ., Berkeley. Inst. of Urban and Regional Development.
For primary bibliographic entry see Field 6B.
W74-07061

REGIONAL ENVIRONMENTAL REFERENCE.
Denver Regional Council of Governments, Colo.
Available from the National Technical Information Service as PB-221 295; $10.25 in paper copy, $1.45 in microfiche. Final report DRCOG-73-003, May, 1973. 210 p. Colo. P-105.

Descriptors: *Bibliographies, Environment, *Environmental effects, *Environmental control, Environmental engineering, *Colorado, Regional development, Air pollution, Air pollution effects, Climatology, Meteorology, Oceanography, Conservation, Fish, Wildlife, Flood plain, Recreation, Geology, Minerology, Soils, Urbanization, Solid wastes, Water quality, Vegetation, Water resources, Pesticides, Energy, Remote sensing.
Identifiers: *Denver(Colo), *Regional environmental references, Environmental Impact Statements.

This bibliography contains 1450 regional environmental references, with special emphasis on publications of interest to the Colorado Front Range communities. Entries are categorized under fourteen major headings, including air pollution; climatology, meteorology, and oceanography; conservation; environment and ecology; fish and wildlife; flood plain; geology; recreation; soils and minerals; solid waste management; vegetation; wastewater and water quality; water resources; and energy, pesticides, and remote sensing. Subheadings under environment-ecology include environmental assessments, impact statements, legislation, planning and policy, preservation and urbanization. Each document entry lists a location in a Colorado library (Denver Regional Council of Governments, Colorado University, Colorado State University, Denver Public Library, Colorado Water Conservation Board, and Municipal Government Reference Center). Maps and overlays prepared by the Regional Transportation District and by the Denver Regional Council of Governments are listed in a graphics section. (Grden-North Carolina)
W74-07085

SIERRA CLUB V. FROEHLKE (INJUNCTION ACTION AGAINST RESERVOIR PROJECT).
For primary bibliographic entry see Field 6E.
W74-07113

CALCASIEU RIVER AT COON ISLAND, LOUISIANA, SHIP CHANNEL (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New Orleans, La.
For primary bibliographic entry see Field 8A.
W74-07118

AGANA SMALL BOAT HARBOR, AGANA, GUAM (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Honolulu, Hawaii. Pacific Ocean Div.
For primary bibliographic entry see Field 4A.
W74-07294

SMALL BEACH EROSION CONTROL PROJECT, LEWES, DELAWARE (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Philadelphia, Pa.
For primary bibliographic entry see Field 4A.
W74-07295

ENVIRONMENTAL IMPACT ANALYSIS: AN EXAMINATION OF THREE METHODOLOGIES,
Wisconsin Univ., Madison. Dept. of Agricultural Economics.
M. L. Warner.
Available from the National Technical Information Service as PB-231 763 $6.50 in paper copy, $1.45 in microfiche. Ph.D. Thesis, 1973. 248 p, 10 fig, 9 tab, 119 ref, 4 append. OWRR B-057-WIS (2) 14-31-0001-3354.

Descriptors: *Environmental effects, *Legislation, *Water quality, Federal Water Pollution Control Act, Law enforcement, *Regulation, *Water policy, *Planning, *Idaho.

The National Environmental Policy Act of 1969 (NEPA) required the filing of environmental impact statements by Federal agencies proposing major actions significantly affecting the water quality of the human environment. This research suggests bases for the evaluation and further development of methodologies used to prepare impact statements. Three methodologies are critically analyzed. They are: the 'Lepold approach,' suggested by Luna B. Leopold, and others, the 'Battelle approach,' developed at Battelle's Columbus Laboratories for the U.S. Bureau of Reclamation, and the 'WRC approach,' contained in the 'Proposed Principles and Standards for Planning Water and Related Land Resources' of the U.S. Water Resources Council. Specific criteria for methodology evaluation are developed within the areas of: technical ecological content, practical applicability, and political utility. These criteria are designed to emphasize a 'full-disclosure law' interpretation of NEPA. The methodologies are examined using each set of criteria in turn. To provide a more concrete setting for this analysis, a test case involving a proposed U.S. Bureau of Reclamation water resources development project in Southwest Idaho was used. Data collection consisted of a point-by-point comparison of criteria and related desirable characteristics to each methodology. These data are analyzed for overall methodological conformance to the criteria to yield conclusions on the strengths and weaknesses of the methodologies. For political utility criteria, conclusions are based upon a model and theory of the Federal reclamation project policy-making process.
W74-07339

DEVELOPMENT OF A DECISION ROOM FOR ENVIRONNTAL STUDIES, (FEASIBILITY STUDY),
Datametric C'OR H, McLean, Va.
J. G. Moore.
Available from the National Technical Information Service as PB-231 864, $6.50 in paper copy, $1.45 in microfiche. Environmental Protection Agency Report EPA-600/5-73-011, June 1973. 61 p, 10 fig. EPA Program Element 1HA097. Grant 801522.

Descriptors: *Decision making, *Simulation analysis, *Management, Model studies, *Environmental effects, *Research facilities, Facilities, Legal aspects, Data processing, Information retrieval, *Evaluation.

Existing 'Decision Room' facilities were studied to determine the initial feasibility of constructing a 'Decision Room' facility for development and use of environmental simulations. Through presentation of the simulations, public officials would be apprised of environmental measurements and could view the simulated consequences of decision making and legislative policy inputs. The study concluded that 'Decision Room' technology is feasible and recommends a 'Research and Analysis Facility' oriented to the development of a prototype facility and its supporting capabilities as an appropriate first step for EPA. The architectual renderings of such a facility are presented. The study indicates that recent developments in computer based technologies have so improved information processing, storage, retrieval, and presentation that EPA requirements involving large amounts of complex information handling in these areas can be met. (EPA)
W74-07371

POSSIBLE EFFECTS OF CONSTRUCTION AND OPERATION OF A SUPERTANKER TERMINAL ON THE MARINE ENVIRONMENT IN NEW YORK BIGHT,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 5C.
W74-07488

ENVIRONMENTAL QUALITY AND ITS EVALUATION,
Rutgers-The State Univ., New Brunswick, N.J. Water Resources Research Inst.
For primary bibliographic entry see Field 5G
W74-07533

7. RESOURCES DATA

7A. Network Design

A SYSTEMS ANALYSIS OF WATER QUALITY SURVEY DESIGN,
Clemson Univ., S.C. Coll. of Engineering.
For primary bibliographic entry see Field 5B
W74-07310

7B. Data Acquition

BROAD SPECTRUM MICROWAVE SYSTEMS FOR REMOTELY MEASURING SOIL MOISTURE CONTENT,
Arkansas Univ., Fayetteville. Dept. of Electrical Engineering.
For primary bibliographic entry see Field 2G.
W74-07052

AN IMPROVED CORE CATCHER FOR THE KIEL BOX CORER ('KASTENLOT'),
Kiel Univ. (West Germany). Geologisch-Palaeontologisches Institut und Museum.
F. Werner.
Marine Geology, Vol 15, No 5, p M59-M65, December 1973. 3 fig, 3 ref.

Descriptors: *Bottom sampling, *Cores, *Core drilling, *Sampling, *Bottom sediments, Equipment.
Identifiers: Kiel box corer.

The efficiency of the Kiel box corer ('Kastenlot') is dependent upon the mechanical properties of the sediments. To avoid this limitation, a new core catcher was constructed and has been tested for several years in both shallow and deep-water sediments. The essential part of this catcher is a reinforced canvas curtain which is pulled slantwise through the core before the corer is pulled out of the sediment. (Knapp-USGS)
W74-07159

AN INNOVATIVE AUTOMATIC STREAM GAGING METHOD,
Oklahoma Univ., Norman. School of Engineering and Environmental Science.
J. F. Harp.
Journal of Hydrology, Vol 21, No 1, p 27-31, January 1974. 2 fig, 3 ref.

Descriptors: *Stream gages, *Water measurement, *Current meters, *Instrumentation, Automation, Discharge measurement, Gaging stations.

An extension of the moving boat method for stream gaging allows intermediate sized streams to be gaged automatically, by means of a moving meter, by remote control with no operator at the point of the velocity measurement. No velocity magnitude measurement is required, only an angle measurement and a known input constant velocity of traversing meter. The technique combines the new technique with classical methodology to produce a reliable field measurement of stream-flow rates in a short time. (Knapp-USGS)
W74-07181

PHOTOMETRIC DETERMINATION OF MANGANESE IN WATER BY USING O-TOLIDINE,
Water Management Board, Brno (Czechoslovakia).
For primary bibliographic entry see Field 2K.
W74-07315

ON THE DETERMINATION OF TURBULENT DIFFUSIVITY IN SHALLOW WATERS BY AERIAL PHOTOGRAPHY OF FLOATING MARKERS,
Texas A and M Univ., College Station. Dept. of Meteorology.
For primary bibliographic entry see Field 2H.
W74-07316

DETERMINATION OF CHLORINATED INSECTICIDES IN SUSPENDED SEDIMENT AND BOTTOM MATERIAL,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5A.
W74-07317

AERIAL SPILL PREVENTION SURVEILLANCE DURING SUB-OPTIMIM WEATHER,
Earth Satellite Corp., Washington, D.C.
For primary bibliographic entry see Field 5A.
W74-07342

SURFACE TEMPERATURES OF LAKE ERIE,
Atmospheric Environment Service, Downsview (Ontario).
For primary bibliographic entry see Field 2H.
W74-07415

PORTABLE REFLECTANCE METER FOR ESTIMATING CHLOROPHYLL CONCENTRATIONS IN LEAVES,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
E. F. Wallihan.
Agronomy Journal, Vol 65, No 4, p 659-662, July-August, 1973. 4 fig, 2 tab, 7 ref.

Descriptors: *Chlorophyll, *Measurement, *Leaves, *Citrus fruits.

The need to measure changes of chlorophyll concentration in citrus leaves required a nondestructive method of analysis applicable to field use. Light reflectance in the wavelength region of 600 nm had been shown to be useful but existing reflectance meters were too bulky for field use and generally required line power. The instrument described here is battery operated, compact, and measures light reflectance in a band of wavelengths from 610 nm to 700 nm from four miniature incandescent lamps. Arrangement of the light unit on a spring clamp permits readings in the field on several leaves per minute. Calibration against measured chlorophyll concentrations yields a log curve revealing maximum sensitivity at low chlorophyll concentrations. Tests on leaves from iron-deficient orange trees showed the coefficient of variability to be in the vicinity of plus or minus 15%. By reading 20 replicate leaves, sampling errors were compensated sufficiently to give precision of about plus or minus 3%. (Skogerboe-Colorado State)
W74-07437

A RAINFALL-RUNOFF MODEL BASED ON THE WATERSHED STREAM NETWORK,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 2A.
W74-07464

UTILIZATION OF ERTS-1 DATA TO MONITOR AND CLASSIFY EUTROPHICATION OF INLAND LAKES,
Bendix Aerospace Systems Div., Ann Arbor, Mich.
For primary bibliographic entry see Field 5C.
W74-07484

CALIBRATING A WATER YIELD MODEL FOR SMALL UNGAGED WATERSHEDS,
Kentucky Dept. of Natural Resources, Frankfort. Division of Water.
For primary bibliographic entry see Field 2A.
W74-07519

A GROUNDWATER PROFILE SAMPLER,
Forest Service (USDA), Cadillac, Mich. North Central Forest Experiment Station.
For primary bibliographic entry see Field 2F.
W74-07523

SPECIAL REPORT: SEMICONDUCTOR MEMORIES ARE TAKING OVER DATA-STORAGE APPLICATIONS,
W. B. Riley.
Electronics, Vol 46, No 16, p 75-90, August 2, 1973. 4 fig, 2 tab.

Descriptors: *Data storage and retrieval, *Computers, Reliability, Electronic equipment.
Identifiers: *Semiconductors, Controllers, Calculators, Memory(Computers).

Semiconductor memories are finding wide application in computer, controller, and calculator design. A general review is provided of the current status of semiconductors. Described are what is available, who is using the equipment, some criteria for selecting equipment, some problems that have been encountered, and some of the benefits from the new semiconductor technology. There are 16 different types of semiconductors, divided into two classes in any of four different and independent ways. The divisions are dynamic and static circuits, bipolar and metal-oxide-semiconductor (MOS) technology, read-write and read-only memories and random-access and serial-access memories. Not all 16 types are, however, purchasable or even practical. (Holoman-Battelle)
W74-07553

A DIRECT COMPARISON OF SATELLITE AND AIRCRAFT INFRARED (10 MICROMETERS-12 MICROMETERS) REMOTE MEASUREMENTS OF SURFACE TEMPERATURE,
Commonwealth Scientific and Industrial Research Organization, Aspendale (Australia). Div. of Atmospheric Physics.
C. M. R. Platt, and A. J. Troup.
Remote Sensing of Environment, Vol 2, No 4, p 243-247, 1973. 2 fig, 4 tab, 8 ref.

Descriptors: *Remote sensing, *Measurement, *Water temperature, *Sea water, *Satellites(Artificial), *Aircraft, Surface waters, Data collections, Infrared radiation, Australia, Water quality, Water vapor, Vapor pressure.
Identifiers: Comparative data, Radiometers, Nimbus IV Satellite THIR.

Nimbus IV Satellite THIR (10 micrometers-12 micrometers) sea surface temperature data for a region off the NE coast of Australia were compared with data taken over the same region and period with a radiometer detecting in the same special interval flown aboard a DC 3 aircraft at altitudes ranging from the surface to 3 km. When the aircraft ascended from the surface to above the tradewind inversion, the apparent sea surface temperature decreased by 2.6 C, on average. An empirical formula for the water vapor absorption coefficient, which include a component proportional to the water vapor pressure, was used successfully to account for the apparent temperature decrease. From above the inversion, the aircraft radiometer sea surface temperatures were slightly greater than the Nimbus IV THIR sea surface temperatures. This discrepancy was accounted for by residual water vapor between the inversion and the tropopause, nadir angles of viewing from Nimbus IV, and the slight mismatch between the spectral filters of the two instruments. (Holoman-Battelle)
W74-07578

7C. Evaluation, Processing and Publication

CRITICAL ANALYSIS OF THE ALTERNATING DIRECTION IMPLICIT METHOD OF AQUIFER ANALYSIS,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W74-07154

APPLICATION OF GEOCHEMISTRY TO THE SEARCH FOR CRUDE OIL AND NATURAL GAS,
Research Council of Alberta, Edmonton.
For primary bibliographic entry see Field 4B.
W74-07161

LINE INTERSECTION METHOD FOR ESTIMATING DRAINAGE DENSITY,
British Columbia Univ., Vancouver. Dept. of Geography.
For primary bibliographic entry see Field 2J.
W74-07174

A SYNTHETIC MODEL FOR DAILY STREAMFLOW,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W74-07179

AN INVESTIGATION OF FLOODS IN HAWAII THROUGH SEPTEMBER 30, 1973,
Geological Survey, Honolulu, Hawaii.
For primary bibliographic entry see Field 2E.
W74-07185

RECORDS OF GROUND-WATER LEVELS IN WYOMING, 1940-1971,
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 4B.
W74-07186

WATER RESOURCES INVESTIGATIONS IN NEW YORK, 1973.
Geological Survey, Albany, N.Y.
Water Resources Investigations Folder, 1 sheet, 1973. 5 fig, 1 map, 2 tab.

Descriptors: *New York, *Investigations, *Water resources, Groundwater, Surface waters, Water quality, Hydrogeology, Water supply, *Bibliographies.
Identifiers: Water resources investigations(NY).

This folder contains a brief description of the water-resources investigations in New York in which the U.S. Geological Survey participates, and a list of selected references. The water-resources program of the U.S. Geological Survey consists of the collection of basic information through its hydrologic-data stations, areal hydrologic and interpretive studies, and research projects. (Knapp-USGS)
W74-07188

WATER RESOURCES OF THE TAUNTON RIVER BASIN SOUTHEASTERN MASSACHUSETTS,
Geological Survey, Washington, D.C.
J. R. Williams, D. F. Farrell, and R. E. Willey.
For sale by USGS, Washington, D.C. 20244; Price $1.25 per set. Hydrologic Investigations Atlas HA-460, 3 sheets, 1973. 31 fig, 6 tab, 2 map, 31 ref.

Descriptors: *Water resources, *Surface waters, *Groundwater, *Massachusetts, Glacial drift, Streamflow, Water quality, Iron, Manganese,

Water yield, Water utilization, Groundwater basins, *Maps.
Identifiers: *Taunton River basin(Mass).

Information is provided on the water resources of the Taunton River basin, Massachusetts. The data will assist in locating additional water supplies, planning, and protecting water supplies. The basin's drainage area of 528 square miles includes at least 50 square miles of swamps and about 23 square miles of lakes and ponds. Six of the ponds furnish an average of 24 mgd to New Bedford and Taunton. The largest potential source of surface water is the Taunton River which, if treated, could furnish about 80 mgd from a reservoir in the estuary between Somerset and Freetown. Streamflow from the basin during the period 1931-65 averaged about 230 billion gallons per year, or about 57% of the average annual precipitation. In 1967 the total water pumped from streams, lakes, and surface-water reservoirs was about 178 billion gallons. Approximately 25 square miles of the basin is underlain by permeable material that is capable of yielding 300 gpm or more per well. Groundwater in some of the area cannot be used, however, because of urbanization, proximity of potential sources of pollution, or economic reasons. Many of the high-yielding parts of the aquifer system are located in thick, permeable stratified glacial drift which fills depressions in the underlying surface of till and bedrock. These deposits are the sources of the 3.1 billion gallons of groundwater pumped in 1967 by 21 cities, towns, and water districts, and for the 1.2 billion gallons pumped by industrial, institutional, domestic, and agricultural wells. The water in streams, reservoirs, and wells is generally soft, acid to slightly acid, and low in dissolved solids. (Knapp-USGS)
W74-07190

OPTIMAL LINEAR EXTRAPOLATION OF LEVEL FLUCTUATIONS OF CLOSED WATER BODIES (OPTIMAL'NAYA LINEYNAYA EKSTRAPOLYATSIYA KOLEBANIY UROVNYA ZAMKNUTYKH VODOYEMOV),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 4A.
W74-07195

A COMPUTER SIMULATION MODEL FOR FLOOD PLAIN DEVELOPMENT. PART II: MODEL DESCRIPTION AND APPLICATIONS,
INTASA, Menlo Park, Calif.
For primary bibliographic entry see Field 6A.
W74-07296

DATA FOR MUNICIPAL WELLS IN THE CITY OF MODESTO, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 4B.
W74-07320

WATER-RESOURCES INVESTIGATIONS IN TEXAS, FISCAL YEAR 1974.
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 2E.
W74-07321

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR URBAN STUDIES IN THE SAN ANTONIO, TEXAS METROPOLITAN AREA, 1971,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 2E.
W74-07323

A COMPUTER SYSTEM FOR STORAGE AND RETRIEVAL OF HYDROGEOLOGICAL DATA FROM WELL RECORDS,
Natural Environment Research Council, London (England). Inst. of Geological Sciences.
B. I. Harvey.
Report No 73/18, 1973. 34 p, 4 fig, 7 ref, 4 append.

Descriptors: *Data storage and retrieval, *Computer programs, *Water wells, Data collections, Data process, Basic data collections.
Identifiers: Great Britain.

Computer programs are given to operate a fixed-format system for the storage and retrieval of data abstracted from the well records in the Hydrogeological Department of the Institute of Geological Sciences of Great Britain. These data are stored on tape in nine interrelated lists which can be interrogated to retrieve detailed information relating to five primary data groups--record identity, well construction, hydrogeological data, stratigraphical information and hydrogeochemical data. Examples of the use of the retrieval programs are given, together with sample pages of metricated well inventories compiled by a modified input program. (Knapp-USGS)
W74-07328

PLANNING AND OPERATION OF URBAN WATER QUALITY MANAGEMENT SYSTEMS,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 5D.
W74-07334

INSTRUMENTATION FOR ENGINEERING MANAGEMENT OF A MULTI-PURPOSE RIVER BASIN SYSTEM (TRINITY RIVER BASIN, TEXAS) REAL-TIME ENGINEERING MANAGEMENT OF A MULTI-PURPOSE RIVER BASIN SYSTEM,
Texas Univ., Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 4A.
W74-07369

SOME GENERALIZED BETA DISTRIBUTIONS OF THE SECOND KIND HAVING DESIRABLE APPLICATION FEATURES IN HYDROLOGY AND METEOROLOGY,
Colorado State Univ., Fort Collins. Dept. of Statistics.
For primary bibliographic entry see Field 2A.
W74-07412

ALGEBRAIC BOUNDEDNESS OF SAMPLE STATISTICS,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 2A.
W74-07413

JUST A MOMENT,
IBM Thomas J. Watson Research Center, Yorktown Heights, N.Y.
For primary bibliographic entry see Field 2A.
W74-07414

ECONOMIC DAMAGES FROM RESIDENTIAL USE OF MINERALIZED WATER SUPPLY,
Environmental Protection Agency, Washington, D.C. Economic Analysis Div.
For primary bibliographic entry see Field 5C.
W74-07417

PARAMETER IDENTIFICATION IN FIELD PROBLEMS,
California Univ., Santa Barbara. Dept. of Mechanical Engineering.
T. M. Simundich.
Water Resources Research, Vol 10, No 1, p 73-79, February 1974. 1 fig, 6 tab, 23 ref. NSF Grant GK-31463X1 OWRR B-150-CAL(1).

Descriptors: *Data collections, *Hydrologic data, *Systems analysis, *Parametric hydrology, Mathematical models, Optimization.

In water resources field problems, unknown physical parameters in the governing partial differential equations must be determined before relevant numerical results can be obtained. The identification of these parameters is formulated as a minimization problem in which the function to be minimized is a least squares comparison between the model equation and the systems responses (the field data). The minimization technique utilized is the Fletcher-Powell method. Three typical water resources field problems are used as examples to demonstrate the technique. (Knapp-USGS)
W74-07428

GENERATION MODELS FOR SYNTHETIC ANNUAL AND MONTHLY FLOWS FOR SOME INDIANA WATERSHEDS,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 2A.
W74-07431

A COMPUTER ATLAS OF HYDROLOGIC AND GEOMORPHOLOGIC DATA FOR SMALL WATERSHEDS IN INDIANA,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 2A.
W74-07432

STREAMFLOW SIMULATION: 3. THE BROKEN LINE PROCESS AND OPERATIONAL HYDROLOGY,
Ecole Polytechnique, Montreal (Quebec). Hydraulic Div.
For primary bibliographic entry see Field 2A.
W74-07520

A NOTE ON THE USE OF SPECTRAL ANALYSIS TO DETECT LEADS AND LAGS IN ANNUAL CYCLES OF WATER QUALITY,
Colorado Univ., Boulder. Dept. of Economics.
J. M. Dowling.
Water Resources Research, Vol 10, No 2, p 343-344, April 1974. 1 tab, 4 ref.

Descriptors: *Time series analysis, *Water quality, Statistics, Statistical methods, *Input-output analysis.
Identifiers: *Spectral analysis.

Spectral analytic phase statistics can be interpreted as absolute delays in physical time only if the two series are related as input and output by a simple delay process. For all other linear input-output systems it is incorrect to interpret phase as if there is a simple delay between input and output series. To clarify interpretation of phase leads and lags, an explicit model should be constructed in the time domain. Without such clarification, ambiguities will be present in the interpretation of phase statistics. (Knapp-USGS)
W74-07522

SPECIAL REPORT: SEMICONDUCTOR MEMORIES ARE TAKING OVER DATA-STORAGE APPLICATIONS,
For primary bibliographic entry see Field 7B.
W74-07553

NUMERICAL ANALYSIS OF HANSENULA, PICHIA AND RELATED YEAST GENERA,
Heriot-Watt Univ., Edinburgh (Scotland). Dept. of Brewing and Biological Sciences.
For primary bibliographic entry see Field 5A.
W74-07583

8. ENGINEERING WORKS

8A. Structures

CALCASIEU RIVER AT COON ISLAND, LOUISIANA, SHIP CHANNEL (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New Orleans, La.
Available from National Technical Information Service, Springfield, Va 22151, as EIS-LA-73-0467-F, $5.25 paper copy, $1.45 microfiche. November 30, 1972. 63 p, 1 tab, 6 map.

Descriptors: *Channel improvement, *Dredging, *Environmental effects, Construction, Hydraulics, Water quality, Land use, Fish, Wildlife, Pollution, Rivers, *Louisiana, Water pollution, Spoil banks, Navigation, Ships, Turbidity, Channels.
Identifiers: *Environmental Impact Statements, *Coon Island(La).

The environmental impact and adverse effects are described of the construction of a ship channel and turning basin in the Coon Island channel to allow for more efficient use of the channel by larger and deeper-draft vessels. The construction requires the removal and disposal of large amounts of dredged material from the channel. Potential adverse environmental effects include air and water pollution by vessels and industry on the enlarged channel. The use of hydraulic dredges during construction and maintenance may degrade the water quality of the Calcasieu River by inducing temporary turbidity. No significant aesthetical or environmental changes in land use are associated with the project; because of the increased turbidity there will be unavoidable adverse impact to the fish, wildlife, water, and recreational resources. The resultant industrial expansion will require a land-use change. Alternatives to this action include retention of the existing ship channel, channel enlargement or no ship channel at all. (Daniels-Florida)
W74-07118

INFLATABLE DAMS AND DAM UNITS,
D. C. E. Fish.
U.S. Patent No 3,786,638, 4 p, 5 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 918, No 4, p 1364, January 22, 1974.

Descriptors: *Patents, *Surges, *Dams, *Tides, Water control, Saline water instrusion.
Identifiers: Inflatable dams.

Inflatable dams are designed to protect the upper reaches of a river from occasional tidal surges. The dam unit comprises an elongated flexible, watertight envelope. The dam is raised by inflating the envelope with water. The filled envelope becomes a barrier which spans the river from side to side and lies between the high water level of the 'upper pool' that forms on the tidal side of the envelope and the low water level that forms in the lower pool on the source side. The envelope is inflated from its collapsed state by a pumping station on the river bank which draws water from the upper pool through a pipe by way of a filter, and discharges it through a pipe to an inlet in the envelope. (Sinha - OEIS)
W74-07210

COMBINED SEWER OVERFLOW SEMINAR PAPERS.
Edison Water Quality Research Lab., N.J.
For primary bibliographic entry see Field 5D.
W74-07255

PRESSURE SEWERS,
New York State Dept. of Environmental Conservation, Alabany. Environmental Quality Research and Development Unit.
For primary bibliographic entry see Field 5D.
W74-07259

SCREENING/DISSOLVED-AIR FLOTATION TREATMENT OF COMBINED SEWER OVERFLOWS,
Envirex, Inc., Milwaukee, Wis. Environmental Sciences Div.
For primary bibliographic entry see Field 5D.
W74-07262

ECONOMIC SIZE SELECTION FOR PVC PIPELINES,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
J. M. Steichen, and J. E. Garton.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 16, No 6, p 1117-1120, November 1973. 14 fig, 1 tab, 3 ref.

Descriptors: Economics, *Pipelines, *Costs, *Size, *Equations, Flow rates, Interest rates, Pumping, Hazen-Williams equation, Optimization, Methodology, Systems analysis.
Identifiers: *Nomographs, Least-cost, Friction head, Pipe diameter.

Nomographs for selecting the most economical size of PVC pipe are considered for the design engineer. Two basic costs are involved in the operation of a piping system: the annual cost of owning the pipe and the cost of pumping. Small pipe has a low initial cost; however, the cost of pumping in small pipes is large due to the high friction loss. Large pipe will result in lower pumping costs, but the initial cost of the pipe will be higher. Equations developed for the total annual cost show that for a given flow rate and power cost, there is a least-cost diameter. These equations are developed and the results summarized in a series of nomographs, one for each class of pipe. The Hazen-Williams formula has been used to find the friction loss. (Bell-Cornell)
W74-07303

OPTIMUM DESIGN HEIGHT OF COFFERDAMS,
Imperial Government of Iran, Tehran. Plan Organization.
F. Neghabat, and R. M. Stark.
Ocean Engineering, Vol 2, No 5, p 231-241, November 1973. 6 fig, 2 tab, 4 ref.

Descriptors: *Cofferdams, *Design, *Height, Costs, Construction, *Flooding, *Risks, Probability, Poisson ratio, Reliability, Hydrologic data, Economics, Mathematical models, Operations research, Ohio River.
Identifiers: *Cost minimization, Sensitivity analysis.

The cost of cofferdams as a function of design height is described by a basic lot size model. Cofferdams function in a random environment characterized by fluctuations in surrounding water levels. Augmenting the height of the structure diminishes the chance of flooding and its associated costs but increases the cost of construction. Design height, therefore, is determined through achievement of an appropriate balance between the construction costs and flood risk costs. In a simple algebraic model for the total expected cost of the structure, the construction and flood risk costs are expressed in terms of design height; total expected cost minimization is the design criteria. Using an exponential function for the expected number of floods, together with Poisson assumptions, an expression is derived for the probability of no flooding. From this expression a reliability chart (for a given site) is constructed that can be used to estimate the flooding risk for a fixed design height and period. By minimizing the cost objective function, a design chart is presented giving optimum design height in terms of such parameters as (estimated) daily flooding cost, construction cost per unit height, average flood duration, and mean and variance of the hydrological data. Sensitivity of the solution to errors in estimating model parameters is discussed. (Bell-Cornell)
W74-07304

ECONOMIC EVALUATION AND DETERMINATION OF PLANT CAPACITY AND DAM HEIGHT,
Public Power Corp., Athens (Greece).
D. A. Xirokostas.
Water Power, Vol 26, No 1, p 17-22, January 1974. 6 fig, 5 ref.

Descriptors: Water resources development, *Economics, *Evaluation, *Dams, *Height, *Powerplants, *Cost-benefit analysis, Optimization, Design, Costs, Energy, Methodology, Fuels, Equations, Systems analysis.
Identifiers: Hydro plants, Installed capacity.

Using a revised definition of benefit-cost ratio, a method is developed for comparing different hydro plants to obtain optimum values of dam height and installed capacity; it is assumed that the main role of future hydro installations will be to cover peak and high-load requirements. The proposed definition is given by the ratio of the annual cost of alternative plant plus the cost of replacing the secondary energy divided by the annual cost of the hydro plant, where the annual cost of the alternative thermal plant is determined by considering that it replaces only the primary energy of the hydro plant. The secondary energy is assessed separately with the average incremental cost of the fuel consumed by the system's oil-fired steam-turbine stations since this is exactly what constitutes the contribution of the secondary energy to the system. The proposed method is based first on designing the dam height and installed capacity to the natural sizes and capacity factors at which they will render their maximum economically-justified service to a system, and then on incorporating them into the system on the dates when these services will be required. The method allows determination of the parameters of hydro plants separately from their incorporation into a system. The dam height and installed capacity are determined so as to maximize the difference between benefits and costs, provided that no physical or technical limits on these variables are exceeded, thus restricting the solution to the feasible optimum. (Bell-Cornell)
W74-07305

CONTRIBUTIONS TO THE CALCULATION OF THE ROOD TERRITORY WIDTH AND THE TRANSVERSAL SECTION UNDER THE RETENTION LEVEL AT THE WEIRS AND DAMS OF FISHERY PURPOSES, (IN RUMANIAN),
Institutul Politehnic din Galati (Rumania).
For primary bibliographic entry see Field 8I.
W74-07448

STATE OF THE ART OF FLOATING BREAKWATERS,
Washington Univ., Seattle. Dept. of Civil Engineering.
E. P. Richey, and R. E. Nece.
In: Proceedings 2nd Annual Technical Conference on Estuaries of the Pacific Northwest, March 16-17, 1972. Oregon State Univ., Corvallis (Engineering Experiment Station Circular No 44), p 74-86 (1972). 10 fig, 18 ref.

Descriptors: *Floats, *Ocean waves, *Breakwaters, Hydraulic structures, Barriers, Design, Marinas, Costs, *Washington.
Identifiers: *Floating breakwaters, Puget Sound(Wash.).

Shutdown time of weather dependent, waterborne activities like construction, logging, cargo handling and boating could be reduced by floating, transportable breakwaters. Also the infant mariculture industry might find more sites suitable for its special facilities if suitable wave protection could be provided. In view of their potential uses it is timely to reexamine the floating breakwater with regard to types, transmission characteristics, anchoring forces, economics, and multiple-use prospects. The performance characteristics of

major concern for floating breakwaters are the transmission coefficients, anchor forces, and motion. Prospects for a floating breakwater to be competitive with fixed structures appear to be favorable at sites where conventional forms are not suitable and where the exposure to the extreme wave events is excluded by restricted seasonal use. Four points in favor and three points detracting from their use are given. Areas of research which will aid in refining the current procedures for design are theory development, systematic measurements, field experience, cost-effective analyses, and considerations of the three-dimensional, random aspects of wind-generated waves. (See also W74-07491) (Jones-Wisconsin)
W74-07498

8B. Hydraulics

ATTENUATION OF WATER WAVES AND CONTROL AND UTILIZATION OF WAVE-INDUCED WATER MOVEMENTS,
FMC Corp., San Jose, Calif. (assignee).
D. L. Hammond.
U.S. Patent No 3,785,159, 11p, 31 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 918, No 3, p 972, January 15, 1974.

Descriptors: *Patents, *Barriers, *Breakwaters, *Shore protection, *Pollution abatement, Sedimentation, Beach erosion, Waves(Water), Equipment.

A series of curved vane-like structures are placed across the path of incident waves to reduce their height, speed and period, and to change the wave-induced water movements. They are positioned either horizontally beneath the mean water line or sloping upward at an angle with the upper portion exposed above the water's surface. They can be used as a breakwater or as a diverter. The currents produced by the structures may be useful but not limited to the dispersal of waters polluted by chemical, thermal or sewage discharges, to effect beach replenishment, and even to generate electric or hydraulic power. The structures can also be used as a dynamic barrier against the spread of floating contaminants such as oil or solid debris. (Sinha - OEIS)
W74-07204

APPARATUS FOR RECORDING SWELL FREQUENCY AND PROPAGATION DIRECTION OF WAVES,
Agence Nationale de Valorisation de la Recherche, Courbevoie (France). Assignee.
L. Erdely.
U. S. Patent No 3,765,236, 2 p, 5 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 915, No 3, p 827, October 16, 1973.

Descriptors: *Patents, *Waves(Water), *Coastal structures, Equipment, Measurement, Gauges, Gauging stations.
Identifiers: *Swell frequency, *Swell propagation.

During the design of coastal structures, it is necessary to be able to predict the forces to which the structures would be subject. An installation is described for swell frequency and propagation direction recording. The swell collector is made up of a water gauge which is partially submerged. The collector is connected, by a rigid shaft, to a ballast. The thrust center of the unit is connected by a flexible connection to an anchoring device and the collector enclosing a magnetic compass on a horizontal balance on a pivot and a counter of the number of movements of the water gauge with respect to the compass which also identified the direction of movements. (Sinha-OEIS)
W74-07224

RECENT INVESTIGATIONS IN STRATIFIED FLOWS RELATED TO ESTUARIAL HYDRAULICS,
Florida Univ., Gainesville. Dept. of Coastal and Oceanographic Engineering.
For primary bibliographic entry see Field 2L.
W74-07226

SOLUTIONS FOR LATERAL OUTFLOW IN PERFORATED CONDUITS,
Ghent Rijksuniversiteit (Belgium). Dept. of Civil Engineering.
J. Berlamont, and A. Van der Beken.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY9, p 1531-1549, September, 1973. 11 fig, 3 tab, 17 ref.

Descriptors: *Drainage, *Irrigation, Hydraulics, *Pipe flow, Sprinkler irrigation, Sewage disposal, Water distribution(Applied), *Conduits.

General solutions are presented for obtaining a uniform lateral outflow, either by varying the perforation area or the cross-sectional area. The distribution of the lateral outflow in a conduit with constant cross section and constant perforation area is analyzed under normalized form. Appropriate flow parameters are introduced which allow for inertia or pressure recovery, velocity distribution, laminar or turbulent out-flow, and laminar and turbulent smooth or rough flow. All results are presented in diagrams. A design rule for nearly uniform discharge under turbulent pipe flow conditions is derived. The agreement between experimental data and the presented solutions, when the velocity correction coefficient is properly chosen, sustains the actual approach. (Skogerboe-Colorado State)
W74-07433

A MIXING CELL MODEL FOR LONGITUDINAL DISPERSION IN OPEN CHANNELS,
Universidad Nacional Autonoma de Mexico, Mexico City. Facultad de Ingenieria.
R. B. Banks.
Water Resources Research, Vol 10, No 2, p 357-358, April 1974. 1 fig, 8 ref.

Descriptors: *Mixing, *Open channel flow, *Dispersion, Model studies, Mathematical models, Turbulent flow.

Mixing is described in a steady uniform flow in an open channel that consists of a series of cells arrayed in a longitudinal direction. At time zero a step function change in concentration is imposed at the origin, and it is assumed that complete mixing then occurs of the cells. The main result is that the longitudinal dispersion coefficient is essentially equal to the product of the flow velocity and the cell length. Relating this result to the well-known dispersion equation, a definition is obtained for the length of a dispersion unit. (Knapp-USGS)
W74-07527

8C. Hydraulic Machinery

HYDROELECTRIC POWER RESOURCES OF THE UNITED STATES, DEVELOPED AND UNDEVELOPED, JANUARY 1, 1972.
Federal Power Commission, Washington, D.C.
December 1972. 126 p, 3 fig, 2 map, 19 tab.

Descriptors: *Hydroelectric power, *Water resources development, *Pumped storage, Hydroelectric plants, Electric power production, Water utilization, *United States.
Identifiers: *Hydroelectric power resources.

As of January 1, 1972, the total potential conventional hydroelectric power capacity of the United States is estimated to be 178.6 million kilowatts, capable of generating an average of about 702 billion kilowatt-hours annually. Approximately 53.4 million kilowatts, or 30% of the total potential, had been developed, with the capability of an average annual generation of about 257 billion kilowatt-hours. Of the remaining undeveloped conventional hydroelectric potential of 125.2 million kilowatts, with a corresponding average annual energy production of about 445 billion kilowatt-hours, about 7.8 million kilowatts were under construction at the beginning of 1972. The total developed pumped storage capacity, as of January 1, 1972, amounted to 3.9 million kilowatts, including 2.6 million kilowatts in pure pumped storage plants and 1.3 million kilowatts in combined plants. A total of 6.0 million kilowatts were under construction in pure pumped storage plants, and 1.4 million kilowatts were under construction in combined plants. Of the major drainages, the North Pacific has the largest amount of both developed and undeveloped hydroelectric capacity, accounting for about one-third of the totals in each case. Among the states, Washington has the largest developed capacity and the largest total potential. Alaska has the largest undeveloped potential. (Knapp-USGS)
W74-07189

THE SWIRL CONCENTRATOR AS A COMBINED SEWER OVERFLOW REGULATOR,
American Public Works Association, Chicago, Ill.
For primary bibliographic entry see Field 5D.
W74-07264

8G. Materials

THE RELATIONSHIP OF POROSITY AND ANGLE OF REPOSE TO MIXTURE PROPORTIONS IN ASSEMBLAGES OF DIFFERENT SIZED MATERIALS,
Bristol Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 2J.
W74-07330

8H. Rapid Excavation

ANNOTATED BIBLIOGRAPHY OF EXPLOSIVE EXCAVATION RELATED RESEARCH.
Army Engineer Waterways Experiment Station, Livermore, Calif. Explosive Excavation Research Lab.
Available from NTIS, Springfield, Va. 22151 as AD-757 157; Price $6.75 printed copy; $1.45 microfiche. Technical Report E-72-32, July 1972. 220 p.

Descriptors: *Bibliographies, *Explosives, *Excavation, Nuclear explosions, Construction, Explosions, Craters, Engineering, *Research.
Identifiers: *Explosive excavations.

This bibliography contains a description of all reports prepared by the U.S. Army Corps of Engineers Nuclear Cratering Group, the Waterways Experiment Station Explosive Excavation Research Office, and the Waterways Experiment Station Explosive Excavation Research Laboratory from Fiscal Year 1962 through Fiscal Year 1972. The reports address themselves to the many topics associated with the use of chemical and nuclear explosives in excavation projects, and each is described by a brief summary or abstract. Indexing is by subject, author, title, and report number. (Knapp-USGS)
W74-07314

8I. Fisheries Engineering

MUSSEL FISHERY INVESTIGATIONS, TENNESSEE, OHIO, AND GREEN RIVERS,
Kentucky State Dept. of Fish and Wildlife Resources, Frankfort.
J. C. Williams.

Available from NTIS, Springfield, Va. 22151 as COM 72-11317; Price $3.00 printed copy; $1.45 microfiche. Contract report to NOAA, National Marine Fisheries Service, June 1969. 107 p, 16 fig, 29 plate, 30 tab, 33 ref. 4-19-R.

Descriptors: *Fisheries, *Kentucky, *Mussels, *Ohio River, Rivers, Shellfish, *Tennessee River.
Identifiers: Green River(Ky).

A 3-year mussel fishery investigation was instituted on July 1, 1966 on the portions of the Tennessee, Ohio, and Green Rivers that flow in Kentucky. The Ohio and Tennessee Rivers supported populations of commercial mussels. The Green River did not have a mussel fauna abundant enough or in sufficient numbers of legal size individuals to support a commercial mussel fishery. (Knapp-USGS)
W74-07187

A NEW TYPE OF INCUBATOR USED IN THE INDUCED SPAWNING OF PHYTOPHAGOUS FISHES, (IN RUMANIAN),
Statiunea de Cercetari Piscicole, Braila (Rumania).
Cristea Anghel, Elisabeta Cristea, and Jora Ieremia.
Bul Cercet Piscic, Vol 31, No 1/2, p 123-128, 1972. Illus. English summary.
Identifiers: *Fish hatcheries, *Incubators, *Phytophagous fish, *Spawning, *Fish reproduction.

Investigations at the hatchery Perisor-Danube Delta, regarding a new type of incubator used in the induced spawning of phytophagous fishes are presented. The incubator and its working are described. The results obtained and the advantages offered by the new type of incubator for the large production stations of phytophagous fishes by induced spawning in comparison to the Weiss jars usually employed, are shown.—Copyright 1973, Biological Abstracts, Inc.
W74-07434

CONTRIBUTIONS TO THE CALCULATION OF THE ROOD TERRITORY WIDTH AND THE TRANSVERSAL SECTION UNDER THE RETENTION LEVEL AT THE WEIRS AND DAMS OF FISHERY PURPOSES, (IN RUMANIAN),
Institutul Politehnic din Galati (Rumania).
A. Adam.
Bul Cercet Piscic, Vol 31, No 1/2, p 155-159, 1972. English summary.
Identifiers: Calculations, *Dams, *Fishery, Retention level, Territory width, *Transversal sections, *Weirs, Width.

Calculations of the territory width and the transverse section under the retention level at the weirs and dams are given for fishery purposes without drainage, constructed on sandy clay and clay-loam grounds, knowing the water head retained and the value of the slope.—Copyright 1973, Biological Abstracts, Inc.
W74-07448

RELATIONSHIP BETWEEN LOGGING ACTIVITIES AND SALMON PRODUCTION,
Alaska Dept. of Fish and Game, Juneau.
For primary bibliographic entry see Field 4C.
W74-07468

THE FOOD HABITS AND AGE AND GROWTH OF GOLDEYE, HIODON ALOSOIDES (RAFINESQUE), IN BEAVER CREEK, LAKE OAHE, NORTH DAKOTA, 1971-72,
North Dakota Univ., Grand Forks.
P. T. Schadewald.
Available from the National Technical Information Service as COM73-11338, $5.25 in paper copy, $1.45 in microfiche. National Marine Fisheries Service Report No NOAA 73073009, May 1973. 61 p, 5 fig, 20 tab, 28 ref.

Descriptors: *Freshwater fish, *Food habits, *Fish food organisms, *Animal growth, *North Dakota, Seasonal, Crustaceans, Daphnia, Insects, Diurnal distribution, Reservoirs, Spatial distribution, Commercial fish, Fish diets, Copepods, Fish parasites.
Identifiers: *Goldeye, Hiodon alosoides(Rafinesque), Lake Oahe(N.D.).

Food habits and growth of goldeye were studied in Lake Oahe, North Dakota to determine why the fish in that reservoir have better growth and can be harvested commercially while the Lake Sakakawea impoundment produced goldeye of smaller size, which were commercially unacceptable. Food availability may be the key to growth differences. A comparison of results from these two studies should provide a much better understanding of the status of goldeye in both reservoirs. The Beaver Creek site in Lake Oahe was selected as the study area. Stomach contents from 833 goldeye were analyzed to determine bihourly, and spring and summer food habits. Cladocera, principally Daphnia, comprised 75% of the average stomach volume. Frequency of occurrence was 98.4% for Cladocera and 87.2% for Insecta. Young-of-the-year goldeye fed entirely on microcrustaceans. The diet of older age classes was predominantly microcrustaceans, but always included insects. Goldeye were concentrated in surface waters when food was abundant, usually at night. At other times the population seemed to be distributed at all depths. The equation for the length-weight curve was log W = 5.3320 + 3.1211 log TL. K-TL was .9297. (Jones-Wisconsin)
W74-07474

DISEASES OF POND FISHES,
O. N. Bauer, V. A. Musselius, and Y. A. Strelkov.
Available from the National Technical Information Service as TT-72-50070, $5.75 in paper copy, $1.45 in microfiche. Bureau of Sport Fisheries and Wildlife and National Science Foundation, Translation TT-72-50070, 1973. 71 fig, 8 tab, 6 plates, 426 ref. Trans. of Bolezni Prudovykh Ryb.

Descriptors: *Fish diseases, *Ponds, *Epizootiology, Fisheries, Control, Vectors(Biological), Animal pathology, Hosts, Infection, Fish parasites, Treatment, Pathogenic bacteria, Viruses.
Identifiers: *Causative agents, *USSR, Immunity, Symptoms, Diagnosis, Drugs.

A comprehensive discussion of pone fish diseases and their control is presented. Described are diseases which have appeared in the USSR recently as a result of imports, as well as infectious, parasitic, and non-communicable diseases which have become especially dangerous due to current intensifications. Material published both in the USSR and elsewhere is included. Important therapeutic preparations used in pond fishery are compiled with an extensive bibliography. Diseases discussed are infectius, parasitic, those caused by infusoria, by helminths, by larvae of trematodes, by Crustacea, noncommunicable diseases (alimentary and functional), traumatic damage, and diseases caused by deterioration of rearing conditions, and diseases of unknown etiology. A chapter is devoted to pathological examination methods; bacteriological examination; media preparation, preparation and examination of stained preparations, pure cultures, morpbological and biochemical properties of microbes, and methods of examination for viruses and for parasitic diseases, including collection, fixation and storage of parasites in addition to formulas of common fixatives and stains. The volume is illustrated, especially in the 100 pages on parasitic diseases. (Jones-Wisconsin)
W74-07481

SOME ESTUARINE FACTORS INFLUENCING ASCENT OF ANADROMOUS CUTTHROAT TROUT IN OREGON,
Oregon State Game Commission, Corvallis.
For primary bibliographic entry see Field 2L.
W74-07493

ABUNDANCE AND MORTALITY OF THE PERCH FRY (PERCA FLUVIATILIS, LINNACUS, 1758) IN THE KLICAVA RESERVOIR,
Karlova Universita, Prague (Czechoslovakia). Inst. of Zoology.
K. Cerny, and K. Pivnicka.
Vestn Cesk Spol Zool. Vol 37, No 1, p 1-13. 1973. Illus.
Identifiers: *Czechoslovakia(Klicava reservoir), Embryo development, Larva development, *Mortality, Perca-Fluviatilis, *Perch fry, Rervoirs.

The abundance of the perch fry in the Klicava reservoir (Czechoslovakia) during the years 1967, 1970, and 1971 was studied. There is a decreasing trend in successive values of all estimations, which is correlated with the initially great and subsequent lower numbers of fish captured. The successive estimated values descend to the final known value. On the basis of 2 consecutive estimations in the year 1971 the value of daily mortality of perch fry was calculated as 0.66%. Mortality values in fry of different fish species when compared among themselves lead to the conclusion that the values in the embryonal and larval development periods fluctuate considerably. After these periods (in the juvenile period) daily mortality is stable and similar in different fish species.—Copyright 1973, Biological Abstracts, Inc.
W74-07588

POPULATION DENSITY, BIOMASS AND MAXIMUM NATALITY RATE AND FOOD CONDITIONS IN LIGIDIUM HYPNORUM L. (ISOPODA),
Polish Academy of Sciences, Warsaw. Inst. of Ecology.
A. Stachurski.
Ekol Pol. Vol 20, No 19, p 185-198. 1972. Illus.
Identifiers: Biomass, Fecundity, Food, *Isopoda, Ligidium-Hypnorum, *Natality rate, *Population density(Isopods).

The influence of food resources of a habitat on the density, biomass, sex and age structure, condition and fecundity of populations of L. hypnorum was studied. Better food conditions gave higher density and biomass; and greater percentage of females and young individuals in the population resulted in greater maximum natality rate of the population.—Copyright 1973, Biological Abstracts, Inc.
W74-07590

FERTILITY OF THE FISH FROM VARVARA RESERVOIR, (IN RUSSIAN),
Yu. A. Abdurakhmanov.
Dokl Akad Nauk Az SSR. Vol 27, No 10, p 81-84, 1971. English summary.
Identifiers: Abramis-brama, Cyprinus-carpio, *Fertility(Fish), Length, Reservoir, Rutilus-rutilus-caspicus, *USSR(Varvara reservoir), Weight.

The fertility of Rutilus rutilus caspicus varies from 14.8 to 67.3 (average 33.3), Cyprinus carpio-from 45.3 to 276.9 (average 121.3) and Abramis brama-from 13.8 to 55.9 (average 32.5) thousands of spawn. The fertility of Cyprinus carpio and Abramis brama in Varvara reservoir USSR is diminished in connection with earlier ripen under low length and weight.—Copyright 1973, Biological Abstracts, Inc.
W74-07591

FOOD SUPPLY AND CHARACTER OF ITS UTILIZATION BY DNIESTER VIMBA FRY IN PONDS, (IN RUSSIAN),
M. Z. Vladimirov, and A. I. Naberezhnyi.
Izv Akad Nauk Mold SSR Ser Biol Khim Nauk. 6 p, 45-48, 1971.

Identifiers: Character, Cladocera, Copepods, Food, Hydrobionts, Intestine, Ponds, Rotifers, *Vimba fry, Vimba-vimba, *USSR(Dniester), *Fishery.

The food base was studies in 2 ponds of the Dniester, USSR, fishery in which vimba (Vimba-vimba) fry were cultivated and the contents of 170 intestines of larvae and fingerlings were analyzed. The food spectrum of the fry included 49 components of planktonic and benthic fauna with a predominance of rotifers, caldocerans and copepods.--Copyright 1973, Biological Abstracts, Inc.
W74-07592

EFFECT OF ANHYDROUS AMMONIA ON A CENTRAL TEXAS POND, AND A REVIEW OF PREVIOUS RESEARCH WITH AMMONIA IN FISHERIES MANAGEMENT,
Texas A and M Univ., College Station. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W74-07595

ON THE COMPOSITION OF MIXED FODDER RATIONS FOR TROUT IN NET CAGES, (IN GERMAN),
Munich Univ. (West Germany). Institut fuer Physiologie und Ernaehrung der Tiere.
J. Tiews, J. Gropp, H. Koops, and K. Tiews.
Z Tierphysiol Tierernaehr Futtermittelkd. Vol 29, No 6, p 267-275, 1972. Illus. English summary.
Identifiers: Corn(Field), Fish fodder, Rations, Soy, Starch, *Trout, Vitamins, *Fish cages.

Feeding experiments with trout in net cages were carried out in fresh water or coastal water (NaCl = 12-18%,respectively). A 92 g weight gain in 123 days was obtained with a ration containing 42% crude protein (3/4 derived from fishmeal) and 15% cooked corn starch. The addition of 15% untreated corn starch to the ration lowered the weight gain to 80 g and decreased feed efficiency (1.74) significantly, indicating that raw starch is poorly utilized by the fish, probably due to a lack of amylase-activity in the intestines. Even the 49% protein basal ration (without additional starch) resulted only in 86 g weight gain and a feed efficiency of 1.60, indicating that part of the protein may have served for energetic purposes in the metalolism of trout. All rations were supplemented with synthetic vitiams. Omitting the vitamins did not decrease weight gain and feed conversion in the first 100 days of the experiment, but later the appetite declined drastically. Cooked starch is better utilized than raw starch by the trout, and 42% crude protein in the trouts' ration is preferable to 32%. There was not a very large difference between protein of animal (fishmeal) or plant (soy) origin in the various protein levels. The best results (141 g weight gain in 76 days; feed conversion 1.46) were obtained with a 40% protein level in the ration, mainly derived from fishmeal. Therefore, commercial trout feeds should contain at least 40% crude protein derived from high quality fishmeals.--Copyright 1973, Biological Abstracts, Inc.
W74-07599

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

ANNUAL REPORT/FISCAL YEAR 1973.
Delaware Univ., Newark. Water Resources Center.
For primary bibliographic entry see Field 9D.
W74-07252

EIGHTH ANNUAL REPORT, PROGRAM ACTIVITIES, JULY 1, 1971-JUN 30, 1972.
Maryland Univ., College Park.
For primary bibliographic entry see Field 9D.
W74-07332

MINUTES, IOWA STATE WATER RESOURCES RESEARCH INSTITUTE ADVISORY BOARD AND COUNCIL, EIGHTH ANNUAL MEETING.
Iowa State Water Resources Research Inst., Ames.
Available from the National Technical Information Service as PB-231 915; $6.00 in paper copy, $1.45 in microfiche. 50 p, September 1973. OWRR A-999-IA(7).

Descriptors: Water resources research act, *Iowa, Research and development, *Universities, *Water resources institute, *Research priorities, Projects.

This report contains the minutes of the Eighth Annual Meeting of the Iowa State Water Resources Research Institute Advisory Board and Council. A review paper, 'Water problems and related research needs in the State of Iowa,' contains identification of major problem areas and identification of high priority research of an interdisciplinary and regional nature. Comments and suggestions were made by advisors on current projects and on identifying high priority research areas. A list of completed projects and a list of current projects are included. (Knapp-USGS)
W74-07456

NINTH ANNUAL REPORT OF THE WATER RESOURCES RESEARCH INSTITUTE OF THE UNIVERSITY OF WYOMING (ACTIVITIES DURING FY 1973).
Wyoming Univ., Laramie. Water Resources Research Inst.
Available from the National Technical Information Service as PB-231 914; $8.75 in paper copy, $1.45 in microfiche. August 1, 1973. 109 p, OWRR A-999-WYO(18).

Descriptors: Water resources research act, *Wyoming, *Research and development, *Universities, *Water resources institute, Research, Training, Colleges, Grants, Projects.
Identifiers: *North Platte basin(Wyo).

The work of the Water Resources Institute at the University of Wyoming during FY 1973 is summarized. The basic focus for the research program of the Institute is the hydrologic and economic simulation models of the North Platte basin. Largely through the efforts of the Water Resources Research Institute, the University of Wyoming began offering work towards a degree of Master of Science in Water Resources in September 1966. (Knapp-USGS)
W74-07457

9D. Grants, Contracts, and Research Act Allotments

ANNUAL REPORT/FISCAL YEAR 1973.
Delaware Univ., Newark. Water Resources Center.
Available from the National Technical Information Service as PB-231 794, $6.50 in paper copy, $1.45 in microfiche. 1973. 49 p. OWRR A-999-DEL(5).

Descriptors: *Delaware, *Water Resources Institute, *Research, *Universities, Training, Colleges, Water resources development.

Delaware's principal natural resource is ground water, plentiful in its southern counties (Kent and Sussex) but becoming scarcer in northern New Castle County. Affinity was established between water availability and geologic features in the rock aquifers, resulting in new producing wells in the Newark water-short area. Well-development possibilities became predictable by gamma-ray logs of test holes in coastal plain aquifers characterized by alternate layers of sand and clay. The Delaware Water Resources Center's work has stimulated public and governmental debate on single (large) versus regional (small) sewage treatment facilities and on a new reservoir versus water-recycling plants. A Christina River Basin Study resulted in a flood-plain ordinance for Newark, a proposed erosion and sedimentation control ordinance for New Castle County; and distribution of a public information brochure on water conservation in developing areas. It also enlisted the guidance of a very distinguished Citizens' Council chaired by a former Delaware Governor and Senator in Washington. The Center is helping to find a solution to pollution of a large coastal aquifer by leachate from an old sanitary landfill. Affected are about 150,000 customers of a privately owned water company using the aquifer. (Varrin-Delaware)
W74-07252

EIGHTH ANNUAL REPORT, PROGRAM ACTIVITIES, JULY 1, 1971-JUN 30, 1972.
Maryland Univ., College Park.
Available from the National Technical Information Service as PB-231 804 $7.25 in paper copy, $1.45 in microfiche. Water Resources Research Center. 1972. 91p. OWRR A-999-MD(8).

Descriptors: *Water resources development, *Water Resources Institute, *Maryland, Bibliographies, *Projects, Reviews, *Universities, State governments, Water pollution, Grants, Training, Colleges, Publications.
Identifiers: Projects progress report.

Projects in progress during the 1972 FY by the Water Resources Research Center of the University of Maryland include: the thermal requirements and tolerance of key estuarine organisms; agricultural waste water accomodation and utilization by various forages; mechanism of organic adsorption on activated carbon; the transient behavior of recharge-discharge areas in regional groundwater systems; a statistical investigation and simulation of hydroclimatological events; pollution loads in percolate water from surface spread swine wastes; bacterial degradation of arylsulfonates in treatment of waste water; analysis of time variant waste treatment systems; chlorinated sewage effluents and avoidance reaction of stream fish; effects of economic development upon water resources; biogeochemistry of estuarine ecosystem with emphasis on heavy metals and shellfish; the effects of thermal loading and water quality on estuarine primary production; and the role of organic debris and associated microorganisms in pelagic estuarine food chains. (Woodard-USGS)
W74-07332

MINUTES, IOWA STATE WATER RESOURCES RESEARCH INSTITUTE ADVISORY BOARD AND COUNCIL, EIGHTH ANNUAL MEETING.
Iowa State Water Resources Research Inst., Ames.
For primary bibliographic entry see Field 9A.
W74-07456

NINTH ANNUAL REPORT OF THE WATER RESOURCES RESEARCH INSTITUTE OF THE UNIVERSITY OF WYOMING (ACTIVITIES DURING FY 1973).
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 9A.
W74-07457

10. SCIENTIFIC AND TECHNICAL INFORMATION

10A. Acquisition And Processing

REGIONAL ENVIRONMENTAL REFERENCE.
Denver Regional Council of Governments, Colo.
For primary bibliographic entry see Field 6G.
W74-07085

10C. Secondary Publication And Distribution

THE SAGUARO GIANT CACTUS, A BIBLIOGRAPHY,
National Park Service, San Francisco, Calif.
For primary bibliographic entry see Field 2I.
W74-07098

WATER RESOURCES INVESTIGATIONS IN NEW YORK, 1973.
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 7C.
W74-07188

OZONE IN WATER AND WASTE WATER TREATMENT, A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 5D.
W74-07251

LAND APPLICATION OF SEWAGE SLUDGE,
Guelph Univ. (Ontario). Dept. of Land Resource Science.
For primary bibliographic entry see Field 05D.
W74-07266

ANNOTATED BIBLIOGRAPHY OF EXPLOSIVE EXCAVATION RELATED RESEARCH.
Army Engineer Waterways Experiment Station, Livermore, Calif. Explosive Excavation Research Lab.
For primary bibliographic entry see Field 08H.
W74-07314

LAND DISPOSAL OF WASTEWATER--LITERATURE REVIEW FOR 1973,
New York State Dept. of Environmental Conservation, Albany.
For primary bibliographic entry see Field 05D.
W74-07327

SUBJECT INDEX

ABSORPTION
Ultra-Violet Absorption Characteristics of Natural Waters,
W74-07419 2K

Ammonium and Nitrate Uptake by Corn (Zea mays L.) as Influenced by Nitrogen Concentration and NH4(+)/NO3(-) Ratio,
W74-07459 3F

A Study of the Movement of Phosphorous in the Little River Estuary, N.S.W.,
W74-07483 5B

Effects of Thickness on Bacterial Film,
W74-07545 5C

A Continuous Culture Study of Phosphate Uptake, Growth Rate and Polyphosphate in Scenedesmus Sp.,
W74-07549 5C

Pharmacodynamics of Methyl Mercury in the Rainbow Trout (Salmo Gairdneri): Tissue Uptake, Distribution and Excretion,
W74-07597 5C

ACCESS ROUTES (RECREATION)
Burleigh V. Calloway (Injunction Action Against a Beach Erosion Project).
W74-07288 6E

ACETYLENE
Acetylene Reduction by Beijerinckia Under Various Partial Pressures of Oxygen and Acetylene,
W74-07572 5C

ACETYLENE REDUCTION
Acetylene Reduction by Beijerinckia Under Various Partial Pressures of Oxygen and Acetylene,
W74-07572 5C

ACTIVATED CARBON
Rotating Biological Disk Wastewater Treatment Process - Pilot Plant Evaluation,
W74-07373 5D

A Review of Colour Reduction Technology in Pulp and Paper Mill Effluents,
W74-07406 5D

Reactions of Chloramines with Active Carbon,
W74-07544 5B

ACTIVATED SLUDGE
Plastic Moving-Surface Treatment of Sewage,
W74-07198 5D

Foam Flotation Concentration of Sewage,
W74-07214 5D

Hydrogen Peroxide Cures Filamentous Growth in Activated Sludge,
W74-07253 5D

Aerobic Digestion of Organic Sludges Containing Inorganic Phosphorus Precipitates: Phase I,
W74-07268 5D

Mechanical Waste Water Clarification and Biological-Chemical Waste Water Purification Using the Attisholz and Ruthner System (Mechanische Abwasserklaerung und biologisch-chemische Abwasserreinigung nach System Attisholz und Ruthner),
W74-07381 5D

Study of the Adaptation of an Activated Sludge to the Purification of an Industrial Effluent (Etude de l'adaptation d'une boue activee a l'epuration d'un effluent industriel),
W74-07389 5D

Biodegradation of Resin Acid Sodium Salts,
W74-07393 5D

ADAMS COUNTY (ILL)
Public Groundwater Supplies in Adams County,
W74-07172 4B

ADAPTATION
Productivity and Water Stress in Cacti,
W74-07109 2I

ADMINISTRATION
Wild and Scenic Rivers.
W74-07290 6E

ADMINISTRATIVE REGULATIONS
Natural Resources--Waste Control.
W74-07116 6E

ADOPTION OF PRACTICES
Sediment Control.
W74-07115 6E

ADSORPTION
The Chemistry of Cadmium in Natural Water--II. The Adsorption of Cadmium on River Muds and Naturally Occurring Solids,
W74-07420 2K

Rotating Ring-Disk Electrode Study of the Adsorption of Lead on Gold in 0.5M Potassium Chloride,
W74-07555 2K

ADVECTION
Evaporation from an Irrigated Rice Crop in a Semi-Arid Region,
W74-07096 2D

AERATION
Water Treatment Apparatus,
W74-07196 5D

System and Method for Separating Heavier and Lighter Components of Liquid Mixtures,
W74-07203 5D

Water Purification Apparatus,
W74-07209 5D

Foam Flotation Concentration of Sewage,
W74-07214 5D

Treatment Apparatus,
W74-07218 5D

Waste water treatment,
W74-07219 5D

Agitating and Aerating Apparatus,
W74-07221 5D

Predicting the Quality of Stream Water Under Conditions of Oxygen Deficiency (O prognoze kachetva vody vodotokov pri bol'shikh defitsitakh kisloroda),
W74-07388 5B

AERIAL PHOTOGRAPHY
On The Determination of Turbulent Diffusivity in Shallow Waters by Aerial Photography of Floating Markers,
W74-07316 2H

Aerial Spill Prevention Surveillance During Sub-Optimim Weather,
W74-07342 5A

A Rainfall-Runoff Model Based on the Watershed Stream Network,
W74-07464 2A

AEROBIC BACTERIA
The Bacterial Flora of the Atlantic Salmon (Salmo salar L.) in Relation to its Environment,
W74-07567 5A

AEROBIC DIGESTION
Aerobic Digestion of Organic Sludges Containing Inorganic Phosphorus Precipitates: Phase I,
W74-07268 5D

AEROBIC TREATMENT
Aerobic Digestion of Organic Sludges Containing Inorganic Phosphorus Precipitates: Phase I,
W74-07268 5D

AESTHETIC
Scenic Rivers.
W74-07114 6E

AGRICULTURE
Pollution Caused by Agriculture,
W74-07366 5B

AGROCLIMATOLOGY
Agroclimatic Regions of Rajasthan,
W74-07102 3F

AIR POLLUTION
Pollution, Production, and Compensation,
W74-07064 5G

Catalytic Oxidation of Phenol in Dilute Concentration in Air,
W74-07086 5D

Source and Budget of Sulfate in Precipitation from Central Alberta, Canada,
W74-07164 5B

Pollution Caused by Agriculture,
W74-07366 5B

Volcanic Air Pollution: Deleterious Effects on Tomatoes,
W74-07430 5C

AIR POLLUTION EFFECTS
Volcanic Air Pollution: Deleterious Effects on Tomatoes,
W74-07430 5C

AIR TEMPERATURE
Model Tests with Thin Sheets to Reduce Evaporation,
W74-07103 3B

AIRCRAFT
A Direct Comparison of Satellite and Aircraft Infrared (10 Micrometers-12 Micrometers) Remote Measurements of Surface Temperature,
W74-07578 7B

ALABAMA
Marine Geology and Estuarine History of Mobile Bay, Alabama: Part 1. Contemporary Sediments,
W74-07248 2L

ALASKA
Relationship Between Logging Activities and Salmon Production,
W74-07468 4C

Studies on Organisms Found in Arctic Sea Ice,
W74-07487 5C

ALASKA

An Ecosystem Study in the Inside Passage of Southeastern Alaska,
W74-07495 5C

ALBAQUALF SOILS)
Distribution and Chemistry of Phosphorus in an Albaqualf Soil After 82 Years of Phosphate Fertilization,
W74-07532 5B

ALBERNI INLET (VANCOUVER ISLAND)
The Influence of Wind on the Surface Waters of Alberni Inlet,
W74-07497 2L

ALGAE
Extracellular Products of Algae in Freshwater,
W74-07353 5C

ALGAL CONTROL
Bacteria-Assimilable Organic Compounds, Phosphate, and Enhanced Growth of Bacteria-Associated Blue-Green Algae,
W74-07587 5C

ALGAL PHYSIOLOGY
Hydrogen Sulfide Production by Synechococcus lividus Y52-si,
W74-07546 5C

Effect of Light Intensity and Glycerol on the Growth, Pigment Composition, and Ultrastructure of Chroomonas Sp.,
W74-07548 5C

A Continuous Culture Study of Phosphate Uptake, Growth Rate and Polyphosphate in Scenedesmus Sp.,
W74-07549 5C

The Effect of Selenite on the Physiological and Morphological Properties of the Blue-Green Alga Phormidium luridum Var. Olivacea,
W74-07550 5C

Bacteria-Assimilable Organic Compounds, Phosphate, and Enhanced Growth of Bacteria-Associated Blue-Green Algae,
W74-07587 5C

ALGORITHMS
Network Approach to Management of Conjunctively Operated Ground Water - Surface Water Systems,
W74-07335 4A

ALLUVIAL CHANNELS
Underflow in River Valleys of the Carpatho-Ukraine (Podruslovyy stok v rechnykh dolinakh Zakarpat'ya),
W74-07504 2F

ALPINE
Water Yield, Annual peaks and Exposure in Mountainous Terrain,
W74-07165 2A

ALTERNATE PLANNING
Institutional Considerations,
W74-07147 6E

ALTERNATIVE PLANNING
Flood Proofing Decisions with Uncertain Events,
W74-07299 6A

A Model of Irrigated Agriculture and Regional Development in Southern Argentina: The Rio Negro Basin,
W74-07306 6A

AMAZON RIVER
Amazon River Estuarine System,
W74-07229 2L

AMBERLITE XAD
Use of Amberlite XAD-4 for Extraction and Recovery of Chlorinated Insecticides and Polychlorinated Biphenyls from Water,
W74-07383 5D

AMMONIA
The Identification of the Reaction Products Formed by the Oxidation of Aqueous Ammonia with Potassium Ferrate VI,
W74-07333 5D

Losses of Inorganic Nitrogen From Aquatic Systems,
W74-07426 5B

An Explanatory Work on the Oxidation of Ammonia by Potassium Ferrate (VI),
W74-07454 5D

AMMONIA (ANHYDROUS)
Effect of Anhydrous Ammonia on a Central Texas Pond, and a Review of Previous Research with Ammonia in Fisheries Management,
W74-07595 5C

AMMONIUM
Ammonium and Nitrate Uptake by Corn (Zea mays L.) as Influenced by Nitrogen Concentration and NH4(+)/NO3(-) Ratio,
W74-07459 3F

AMPILLICIN
Incidence of Resistance to Tetracycline, Chloramphenicol and Ampicillin Among Salmonella Species Isolated in the Netherlands in 1969, 1970 and 1971,
W74-07562 5C

ANADROMOUS FISH
Some Estuarine Factors Influencing Ascent of Anadromous Cutthroat Trout in Oregon,
W74-07493 2L

ANAEROBIC-AEROBIC SYSTEMS
Waste Water Treatment in Commercial Fish Processing: Reducing Stick Water Loadings,
W74-07270 5D

ANAEROBIC CONDITIONS
Hydrogen Sulfide Production by Synechococcus lividus Y52-si,
W74-07546 5C

ANAEROBIC DIGESTION
Foam Flotation Concentration of Sewage,
W74-07214 5D

ANALYSIS
Utility Analysis in the Valuation of Extra-Market Benefits with Particular Reference to Water-Based Recreation,
W74-07150 6B

ANALYTICAL TECHNIQUES
Techniques for use of Organic and Amorphous Materials in Source Investigations of Estuary Sediments,
W74-07241 2L

ANIMAL GROWTH
The Food Habits and Age and Growth of Goldeye, Hiodon alosoides (Rafinesque), in Beaver Creek, Lake Oahe, North Dakota, 1971-72,
W74-07474 8I

ANIMAL TISSUES
The Chemical Form and Bodily Distribution of Mercury in Marine Fish,
W74-07551 5A

Recovery of Arsenic by Dry Ashing from Animal Tissue Fortified with Organoarsenicals or Arsenic Trioxide,
W74-07573 5A

ANIONS
Structural Changes in Tropical Soils Due to Anions in Irrigation Water,
W74-07348 2G

ANNELIDS
Taxonomic Position of Two Lumbriners Spp.,
W74-07568 2L

ANTI-CORROSION COATINGS
Hygienic Features of Silicate Anticorrosion Coatings for Water Reservoirs, (In Russian),
W74-07364 5F

ANTIBIOTICS (PESTICIDES)
Incidence of Resistance to Tetracycline, Chloramphenicol and Ampicillin Among Salmonella Species Isolated in the Netherlands in 1969, 1970 and 1971,
W74-07562 5C

AQUATIC ALGAE
Bacteria-Assimilable Organic Compounds, Phosphate, and Enhanced Growth of Bacteria-Associated Blue-Green Algae,
W74-07587 5C

AQUATIC BACTERIA
Bacteria-Assimilable Organic Compounds, Phosphate, and Enhanced Growth of Bacteria-Associated Blue-Green Algae,
W74-07587 5C

AQUATIC ENVIRONMENT
Wild, Scenic River Systems.
W74-07280 6E

Fisheries and Game; General Provisions.
W74-07286 6E

AQUATIC FUNGI
Marine Fungi Isolated from a Kraft Pulp Mill Outfall Area,
W74-07396 5B

AQUATIC HABITATS
Agana Small Boat Harbor, Agana, Guam (Final Environmental Impact Statement).
W74-07294 4A

Habitat Distribution of the Shore Flies of Northeastern Ohio (Diptera: Ephydridae),
W74-07556 5C

AQUATIC INSECTS
Habitat Distribution of the Shore Flies of Northeastern Ohio (Diptera: Ephydridae),
W74-07556 5C

AQUATIC LIFE
Ecology and Productivity of Strip-Mine Areas in Mercer County, Pennsylvania,
W74-07055 5B

A Preliminary Description of the Physico-Chemical Characteristics and Biota of Three Strip Mine Lakes, Spencer County, Indiana,
W74-07403 5B

AQUATIC MICROORGANISMS
Studies on Organisms Found in Arctic Sea Ice,
W74-07487 5C

AQUATIC PLANTS
A Study of the Communities of Invertebrates of Plants of Lake Chad: Preliminary Inquires, (In French),
W74-07538 2H

AQUATIC PRODUCTIVITY
A Preliminary Description of the Physico-Chemical Characteristics and Biota of Three Strip Mine Lakes, Spencer County, Indiana,
W74-07403 5B

AQUATIC WEED CONTROL
Herbivorous Fish for Aquatic Plant Control,
W74-07470 4A

Response of Aquatic Weeds to Laser Radiation,
W74-07475 5G

AQUEOUS SOLUTIONS
Kaempferol (3,5,7,4'-Tetrahydroxyflavone) as a Chromogenic Reagent for Tin(IV),
W74-07579 5A

Microdetermination of Resorcinol in Presence of Phenol,
W74-07580 5A

AQUICLUDES
Development of Dike Stored Water By Drilling, Waihee, Oahu,
W74-07137 2F

AQUIFER CHARACTERISTICS
Hydrogeology of Carbonate and Volcanic Rocks--Similarities and Contrasts,
W74-07134 2F

Hydrogeology of the Sasso Lungo Group, a Dolomitic Reef Stock in the Alpine Dolomites of North Italy,
W74-07153 2F

Public Groundwater Supplies in Adams County,
W74-07172 4B

Ground-Water Resources of McLean County, North Dakota,
W74-07313 2F

Sandstone Aquifers in Eastern Sullivan County, Indiana,
W74-07401 4B

Public Groundwater Supplies in Bond County,
W74-07429 4B

AQUIFER TESTING
Vertical Movements in the Nonsaturated Zone and the Specific Yield of a Water-Table Aquifer (Etude des transferts verticaux dans la zone non saturee et de l'emmagasinement d'une nappe libre, dans le cas d'un pompage, dans les conditions na turelles),
W74-07182 2F

Evaluation of Methods of Pumping Test Analyses for Application to Hawaiian Aquifers,
W74-07531 5C

AQUIFERS
Development of Dike Stored Water By Drilling, Waihee, Oahu,
W74-07137 2F

Evaluation of Methods of Pumping Test Analyses for Application to Hawaiian Aquifers,
W74-07531 5C

ARCTIC
Studies on Organisms Found in Arctic Sea Ice,
W74-07487 5C

ARGENTINA (MANSO SUPERIOR RIVER)
First Characterization of the Runoff From the Watershed of the Manso Superior River and its Basins (Argentina), (In Spanish),
W74-07536 2E

ARGENTINA (RIO DE LA PLATA)
Rio De La Plata Estuary Environments,
W74-07236 2L

ARGENTINA (RIO DEL LA PLATA ESTUARY)
Strontium Isotope Composition and Sediment Transport in the Rio de la Plata Estuary,
W74-07240 2L

ARGENTINA (RIO NEGRO BASIN)
A Model of Irrigated Agriculture and Regional Development in Southern Argentina: The Rio Negro Basin,
W74-07306 6A

ARID CLIMATES
Agroclimatic Regions of Rajasthan,
W74-07102 3F

ARID LANDS
Problems in Distribution of Water Resources in the Arid Zone of the Amudar'ya River Basin (Voprosy raspredeleniya vodnykh resursov v arisnoy zone (na primere Amudar'i)),
W74-07192 4A

ARIZONA
Groundwater Geology of Fort Valley, Coconino County, Arizona,
W74-07092 4B

Probability Distribution of Snow Course Data for Central Arizona,
W74-07094 2C

Annotated Checklist and Host Index for Arizona Wood-Rotting Fungi,
W74-07097 2I

Arizona State Lake Improvement Fund Plan.
W74-07108 6B

Interdisciplinary Modeling in the Analysis of the Salinity Problems of the Safford Valley,
W74-07297 5B

ARKANSAS
Interim Storm Drainage Plan Report-Little Rock-North Little Rock Metropolitan Area.
W74-07082 5D

ARSENIC
Recovery of Arsenic by Dry Ashing from Animal Tissue Fortified with Organoarsenicals or Arsenic Trioxide,
W74-07573 5A

ARSENICALS (PESTICIDES)
Recovery of Arsenic by Dry Ashing from Animal Tissue Fortified with Organoarsenicals or Arsenic Trioxide,
W74-07573 5A

ARTESIAN AQUIFERS
Ground-Water Flow Patterns in Confined Aquifers and Pollution,
W74-07510 5B

ASPERGILLUS NIDULANS
The Effect of Lack of a Carbon Source on Nitrate-Reductase Activity in Aspergillus nidulans,
W74-07581 5C

ASPHALT
Effects of Subsurface Asphalt Layers on Corn and Tomato Root Systems,
W74-07447 3F

ATLANTIC COASTAL PLAIN
Regional Clay Mineral Facies in Estuaries and Continental Margin of the United States East Coast,
W74-07237 2L

Source of Recent Nearshore Marine Clays, Southeastern United States,
W74-07238 2L

ATLANTIC SALMON
The Bacterial Flora of the Atlantic Salmon (Salmo salar L.) in Relation to its Environment,
W74-07567 5A

ATRAZINE
Erosional Losses of S-Triazine Herbicides,
W74-07421 5B

AUKE BAY (ALASKA)
An Ecosystem Study in the Inside Passage of Southeastern Alaska,
W74-07495 5C

AUSTRALIA
Evaporation from an Irrigated Rice Crop in a Semi-Arid Region,
W74-07096 2D

Trickle Irrigation in Australia,
W74-07450 3F

A Study of the Movement of Phosphorous in the Little River Estuary, N.S.W.,
W74-07483 5B

Taxonomic Position of Two Lumbrineris Spp.,
W74-07568 2L

AUSTRALIA (ADELAIDE RIVER)
Liveweight Gains of Shorthorn Steers on Native and Improved Pastures at Adelaide River Northern Territory,
W74-07453 3F

AUSTRALIA (QUEENSLAND)
Performance of Lucerne (Medicago sativa) Lines in Pure Stands Under Irrigated and Rain Grown Conditions in Sub-Coastal Central Queensland,
W74-07359 3F

AUTOMATION
Irrigation and Sprinkler System,
W74-07212 3F

AUTOREGRESSIVE PROCESS
Generation Models for Synthetic Annual and Monthly Flows for Some Indiana Watersheds,
W74-07431 2A

AVALANCHES
Avalanche Studies (1971-1972),
W74-07319 2C

BACTERIA
Effect of Irrigation on Dynamics of Microorganism Quantity in Dark-Brown Soils in Southern Ukraine, (In Ukrainian),
W74-07279 2G

Microbial Indicators for the Biological Quality of Treated Wastewater Effluents,
W74-07372 5D

Biodegradation of Resin Acid Sodium Salts,
W74-07393 5D

BACTERIA (DYSENTERY)
Effect of Effluents from Hydrolysis Plant on the Survival of Typhoid Fever and Dysentery Bacteria, (In Russian),
W74-07367 5C

BACTERIAL FILMS
Effects of Thickness on Bacterial Film,
W74-07545 5C

BACTERIAL PHYSIOLOGY
Acetylene Reduction by Beijerinckia Under Various Partial Pressures of Oxygen and Acetylene,
W74-07572 5C

BALTIC SEA
Supply of Terrigenous Material to the Baltic Sea (Pitaniye Baltiyskogo morya terrigennym materialom),
W74-07501 2J

BARLEY
Evapotranspiration on a Palouse Watershed,
W74-07087 2D

BARRIERS
Attenuation of Water Waves and Control and Utilization of Wave-Induced Water Movements,
W74-07204 8B

BARROW (ALASKA)
Studies on Organisms Found in Arctic Sea Ice,
W74-07487 5C

BASINS
Physical Modeling of Residence Times in Tidal Basins,
W74-07496 2L

BAYS
Some Aspects of the Temperature, Oxygen and Nutrient Distributions in Monterey Bay, California. Annual Report, Part 1, 1973,
W74-07469 5C

An Ecosystem Study in the Inside Passage of Southeastern Alaska,
W74-07495 5C

BEACH EROSION PROJECT
Burleigh V. Calloway (Injunction Action Against a Beach Erosion Project).
W74-07288 6E

BEACHES
Burleigh V. Calloway (Injunction Action Against a Beach Erosion Project).
W74-07288 6E

BED LOAD
Dispersion of Contaminated Sediment Bed Load,
W74-07446 5B

BEIJERINCKIA INDICUM
Acetylene Reduction by Beijerinckia Under Various Partial Pressures of Oxygen and Acetylene,
W74-07572 5C

BENEFITS
Utility Analysis in the Valuation of Extra-Market Benefits with Particular Reference to Water-Based Recreation,
W74-07150 6B

Flood Proofing Decisions with Uncertain Events,
W74-07299 6A

BENOMYL
A New Colorimetric Procedure for the Determination of Benomyl,
W74-07559 5A

BENTHIC FAUNA
Nutritive Importance and Structure of Detritus,
W74-07471 5C

BETHANY RESERVOIR (CALIF
Bethany Reservoir Recreation Development Plan.
W74-07127 6B

BIBLIOGRAPHIES
Regional Environmental Reference.
W74-07085 6G

The Saguaro Giant Cactus, A Bibliography,
W74-07098 2I

Water Resources Investigations in New York, 1973.
W74-07188 7C

Ozone in Water and Waste Water Treatment, a Bibliography.
W74-07251 5D

Land Application of Sewage Sludge,
W74-07266 5D

Annotated Bibliography of Explosive Excavation Related Research.
W74-07314 8H

BIOACCUMULATION
The Chemical Form and Bodily Distribution of Mercury in Marine Fish,
W74-07551 5A

BIOASSAY
The Effect of Selenite on the Physiological and Morphological Properties of the Blue-Green Alga Phormidium luridum Var. Olivacea,
W74-07550 5C

BIOCHEMICAL OXYGEN DEMAND
Rotating Biological Disk Wastewater Treatment Process - Pilot Plant Evaluation,
W74-07373 5D

BIOCHEMICAL TREATMENT
Hydrogen Peroxide Cures Filamentous Growth in Activated Sludge,
W74-07253 5D

BIOCHEMISTRY
Biogeochemical Variables in Bottom Sediments of the Rapphannock River Estuary,
W74-07244 2L

BIOCONTROL
Herbivorous Fish for Aquatic Plant Control,
W74-07470 4A

BIODEGRADATION
Biochemistry of Selective Toxicity and Biodegradability: Comparative O-Dealkylation by Aquatic Organisms,
W74-07126 5C

A Comparison of Effluent Characteristics from Conventional and Oxygen Bleaching Sequences: Results of a Laboratory Study,
W74-07375 5D

Study of the Adaptation of an Activated Sludge to the Purification of an Industrial Effluent (Etude de l'adaptation d'une boue activee a l'epuration d'un effluent industriel),
W74-07389 5D

Biodegradation of Resin Acid Sodium Salts,
W74-07393 5D

BIOINDICATORS
Microbial Indicators for the Biological Quality of Treated Wastewater Effluents,
W74-07372 5D

Field and Experimental Studies on the Systematics and Ecology of Ulva carvata and Ulva rotundata,
W74-07473 5C

The Bacterial Flora of the Atlantic Salmon (Salmo salar L.) in Relation to its Environment,
W74-07567 5A

BIOLOGICAL COMMUNITIES
Systems simulation of the effect of tertiary treatment for carbon, nitrogen, and phosphorus removal upon primary productivity, standing crop, and community structure of autotrophic and hetertrophic communities in receiving model streams.
W74-07337 5C

BIOLOGICAL CONTACTOR (ROTATING)
Combined Sewer Overflow Treatment by the Rotating Biological Contactor Process.
W74-07374 5D

BIOLOGICAL PROPERTIES
Chemical and Biological Problems in the Grand Canyon,
W74-07093 5B

BIOLOGICAL TREATMENT
Waste water treatment,
W74-07219 5D

Combined Sewer Overflow Treatment by the Rotating Biological Contactor Process.
W74-07374 5D

New Effluent Plant at Colthrop Board Mills.
W74-07380 5D

Mechanical Waste Water Clarification and Biological-Chemical Waste Water Purification Using the Attisholz and Ruthner System (Mechanische Abwasserklaerung und biologisch-chemische Abwasserreinigung nach System Attisholz und Ruthner),
W74-07381 5D

On Some Special Problems of Sulfite Pulp Waste Water Purification (Zu einigen speziellen Problemen der Sulfitzellstoff-Abwasserreinigung),
W74-07386 5D

Microbiological Purification of Hydrogen Sulfide-Containing Kraft Mill Effluents (Mikrobiologicheskaya ochistka serovodorodnykh stochnykh vod sul'fatno-tsellyuloznogo proizvodstva),
W74-07387 5D

Pilot Application of the Rotating Biological Surface Concept for Secondary Treatment of Insulating Board Mill Effluents,
W74-07398 5D

BIOLOGY
Environmental Quality and its Evaluation,
W74-07533 5G

BIOMASS
Productivity and Water Stress in Cacti,
W74-07109 2I

)SYNTHESIS
n Vitro Formation of Nitrate Reductase Using Extracts of the Nitrate Reductase Mutant of Neurospora crassa, Nit-1, and Rhodospirillum ubrum,
W74-07577 5B

ANCHING (HOT-GAS)
n-Plant, Continuous Hot-Gas Blanching of Spinach,
W74-07368 3E

EACHING WASTES
A Comparison of Effluent Characteristics from Conventional and Oxygen Bleaching Sequences: Results of a Laboratory Study,
W74-07375 5D

Oxygen Bleaching -- A Flexible Process for Pollution Abatement,
W74-07376 5D

Water Reuse and Recycle in the D(C)EDED Bleach Sequence,
W74-07377 5D

The Effluent-Free Bleached Kraft Pulp Mill. Part V. The R4 Process for Chlorine Dioxide Manufacture to Decrease Production of Sodium Sulphate,
W74-07378 5D

The Effluent-Free Bleached Kraft Pulp Mill. Part IV. The Salt Recovery Process,
W74-07379 5D

On Some Special Problems of Sulfite Pulp Waste Water Purification (Zu einigen speziellen Problemen der Sulfitzellstoff-Abwasserreinigung),
W74-07386 5D

Environmental Protection Techniques to be Applied in a Bleached Kraft Pulp Mill in Sweden,
W74-07392 5D

Water Reuse and Recycle in Kraft Bleacheries,
W74-07394 5D

Residuals in Manufacture of Paper,
W74-07399 5B

A Review of Colour Reduction Technology in Pulp and Paper Mill Effluents,
W74-07406 5D

)OATING
Planning and Developing Waterfront Property,
W74-07072 6B

)OATING REGULATIONS
Arizona State Lake Improvement Fund Plan.
W74-07108 6B

)OGS
Nutrient Cycling and Productivity of Dystrophic Lake-Bog Systems (Part B),
W74-07466 5C

)ORON
Effect of Gypsum in Reducing Boron Hazard of Saline Waters and Soils,
W74-07095 3C

Influence of Mineral-Water Reactions in Estuaries on Boron Budget in the Oceans,
W74-07227 2L

)OTTOM SAMPLING
An Improved Core Catcher for the Kiel Box Corer ('Kastenlot'),
W74-07159 7B

BOTTOM SEDIMENTS
Basin Plains in the Eastern Mediterranean: Significance in Interpreting Ancient Marine Deposits: 1. Basin Depth and Configuration,
W74-07158 2J

An Improved Core Catcher for the Kiel Box Corer ('Kastenlot'),
W74-07159 7B

Sedimentation by Non-Tidal Currents Around Northern Denmark,
W74-07160 2L

Remanent Magnetization of Modern Tidal Flat Sediments from San Francisco Bay, California,
W74-07173 2L

Sand-Wave Fields in Taiwan Strait,
W74-07175 2J

Mass Physical and Engineering Properties of Some York River Sediments,
W74-07239 2L

Techniques for use of Organic and Amorphous Materials in Source Investigations of Estuary Sediments,
W74-07241 2L

Texture and Organic Carbon Content of Bottom Sediments in some Estuaries of the United States,
W74-07243 2L

Biogeochemical Variables in Bottom Sediments of the Rapphannock River Estuary,
W74-07244 2L

Determination of Chlorinated Insecticides in Suspended Sediment and Bottom Material,
W74-07317 5A

Methylmercury Formation in Mercury-Treated River Sediments During in Situ Equilibration,
W74-07425 5B

BOUNDARIES (SURFACES)
Problem of Calculating Depth of the Quasiuniform Layer of the Ocean (K voprosu o raschete tolshchiny kvaziodnorodnogo sloya okeana),
W74-07506 2A

BOUNDARY LAYERS
Problem of Calculating Depth of the Quasiuniform Layer of the Ocean (K voprosu o raschete tolshchiny kvaziodnorodnogo sloya okeana),
W74-07506 2A

BOUSSINESQ THEORY
A Numerical Model Based on Coupled One-Dimensional Richards and Boussinesq Equations,
W74-07515 2F

BRAIDING
Depositional Features of Braided-Meandering Stream,
W74-07163 2J

BREAKWATERS
Attenuation of Water Waves and Control and Utilization of Wave-Induced Water Movements,
W74-07204 8B

State of the Art of Floating Breakwaters,
W74-07498 8A

BROMIDES
Relative Movement of Bromide and Nitrate Through Soils,
W74-07423 5B

BROMINE
Bromine in Groundwater of Uzbekistan (Brom v podzemnykh vodakh Uzbekistana),
W74-07505 2K

BUILDING CODES
State Flood Control Program.
W74-07111 4A

BYPRODUCTS
Residuals in Manufacture of Paper,
W74-07399 5B

CACAO
Effects of Drainage on the Yield of Cacao, (In Portuguese),
W74-07435 3F

CACTI
The Saguaro Giant Cactus, A Bibliography,
W74-07098 2I

Productivity and Water Stress in Cacti,
W74-07109 2I

CADMIUM
The Chemistry of Cadmium in Natural Water--II. The Adsorption of Cadmium on River Muds and Naturally Occurring Solids,
W74-07420 2K

The Environmental Impact of Cadmium,
W74-07530 5A

CALCIUM
Studies of the Ingredients Variation of the Sake-Gawa River, A Tributary of the Mogami River (In Japanese),
W74-07360 2K

CALIFORNIA
Remanent Magnetization of Modern Tidal Flat Sediments from San Francisco Bay, California,
W74-07173 2L

Data for Municipal Wells in the City of Modesto, California,
W74-07320 4B

Sediment Discharge in the Lake Tahoe Basin, California, 1972 Water Year,
W74-07326 2J

Volatility of DDT Residues in Soil as Affected by Flooding and Organic Matter Applications,
W74-07424 5B

Development of an Agricultural Drainage Guide,
W74-07438 4A

Nitrate Concentrations in the Unsaturated Zone Beneath Irrigated Fields in Southern California,
W74-07445 5G

Some Aspects of the Temperature, Oxygen and Nutrient Distributions in Monterey Bay, California. Annual Report, Part 1, 1973,
W74-07469 5C

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W74-07489 5C

Kelp Habitat Improvement Project, Annual Report July 1, 1971 - June 30, 1972.
W74-07490 5C

CALIFORNIA

The Influence of Geological Membranes on the Geochemistry of Subsurface Waters from Miocene Sediments at Kettleman North Dome in California,
W74-07513 2K

CALIFORNIA (IMPERIAL VALLEY)

Manganese and Iron Solubility Changes as a Factor in Tile Drain Clogging: I. Observations During Flooding and Drying,
W74-07151 2G

Manganese and Iron Solubility Changes as a Factor in Tile Drain Clogging: II. Observations During the Growth of Cotton,
W74-07152 2G

CANADA

Urban Impacts of Rural Resource Development Expenditures in the Interlake Area of Manitoba,
W74-07068 6B

A Framework for Economic Planning of Watershed Drainage,
W74-07069 4A

Public Investment Criteria: Application to a Project in the Souris River Basin,
W74-07070 6B

Source and Budget of Sulfate in Precipitation from Central Alberta, Canada,
W74-07164 5B

Phosphorus Removal Treatability Studies at C.F.B. Bordon, Petawawa, Trenton and Uplands,
W74-07273 5D

Petroleum Refinery Effluent Regulations and Guidelines.
W74-07274 5G

Marine Fungi Isolated from a Kraft Pulp Mill Outfall Area,
W74-07396 5B

Pilot Application of the Rotating Biological Surface Concept for Secondary Treatment of Insulating Board Mill Effluents,
W74-07398 5D

A Practical and Trouble-Free Sewer Spill Monitor,
W74-07404 5D

Pollution Control by Recycling Effluent,
W74-07407 5D

Pollution Control Through Training, Education, and Rigorous Follow-Up,
W74-07408 5G

Seasonal Abundance and Vertical Distribution of Crustacean Zooplankton in a Coloured Dystrophic Lake in Northeastern Ontario,
W74-07467 5C

The Influence of Wind on the Surface Waters of Alberni Inlet,
W74-07497 2L

CANADA (MARION LAKE-B

In Comparison of the Food of Salamanders and Fish in Marion Lake, British Columbia,
W74-07349 2H

CARBAMATE PESTICIDES

The Photochemistry of Carbamates. I. The Photodecomposition of Zectran: 4-Dimethylamino-3,5-XYLYL-N-Methyl Carbamate,
W74-07552 5B

CARBOFURAN

Acid Ammonium Acetate Extraction and Electron Capture Gas Chromatographic Determination of Carbofuran in Soils,
W74-07574 5A

CARBON

Function of Marshes in Reducing Eutrophication of Estuaries of the Middle Atlantic Region,
W74-07336 5C

The Effect of Lack of a Carbon Source on Nitrate-Reductase Activity in Aspergillus nidulans,
W74-07581 5C

CARBON COMPOUNDS

Extracellular Products of Algae in Freshwater,
W74-07353 5C

CARBON RADIOISOTOPES

Summary of the State of the Art in Radiochromatography,
W74-07571 5A

CARBONATE ROCKS

Hydrogeology of Carbonate and Volcanic Rocks--Similarities and Contrasts,
W74-07134 2F

Hydrogeology of the Sasso Lungo Group, a Dolomitic Reef Stock in the Alpine Dolomites of North Italy,
W74-07153 2F

CARP

Herbivorous Fish for Aquatic Plant Control,
W74-07470 4A

CATALYSTS

Catalytic Oxidation of Phenol in Dilute Concentration in Air,
W74-07086 5D

CATALYTIC OXIDATION

Catalytic Oxidation of Phenol in Dilute Concentration in Air,
W74-07086 5D

Cyanide Waste Treatment Utilizing Catalytic Oxidation,
W74-07272 5D

CATION EXCHANGE

Micro-Determination of Cation-Exchange Capacity by Neutron Activation Analysis,
W74-07439 2G

CATIONS

Gas Chromatographic Studies of Mixed-Ligand Complexes of Divalent Cations,
W74-07582 5A

CATTLE (SHORTHORN STEERS)

Liveweight Gains of Shorthorn Steers on Native and Improved Pastures at Adelaide River Northern Territory,
W74-07453 3F

CAUSATIVE AGENTS

Diseases of Pond Fishes,
W74-07481 8I

CELL EXTRACTS

In Vitro Formation of Nitrate Reductase Using Extracts of the Nitrate Reductase Mutant of Neurospora crassa, Nit-1, and Rhodospirillum rubrum,
W74-07577 5B

CELLULOSE

Utilization of Fibrous Wastes as Sources o Nutrients,
W74-07472 5I

CEYLON (SRI LANKA REGION)

Drainage Density and Effective Precipitation,
W74-07155 2A

CHAD (LAKE CHAD)

A Study of the Communities of Invertebrate of Plants of Lake Chad: Preliminary Inquires (In French),
W74-07538 2I

CHANNEL IMPROVEMENT

Calcasieu River at Coon Island, Louisiana Ship Channel (Final Environmental Impac Statement).
W74-07118 8A

CHANNELS

United States V. Pot-Nets, Inc. (Violation o Rivers and Harbors Act),
W74-07287 6E

CHARGE TRANSFER

Mass and Charge Transfer Kinetics and Cou lometric Current Efficiencies. Part VII. Condi tional Potentials, and Single-Scan Voltammetry of Pure Vanadium(V) - Vanadium(IV) System in Various Media at Platinum Elec trodes Pre Treated By Five Methods,
W74-07557 2H

Mass and Charge Transfer Kinetics and Cou lometric Current Efficiencies. Part VIII. Single Scan Voltammetry of Vanadium(V) - Vanadi um(IV) in the Presence of Chromium, Man ganese and Iron, and the Kinetic Parameters o the Vanadium System, at Platinum Electrode Pre-Treated by Five Methods,
W74-07558 5A

CHARLESTON (S

Environmental Planning: An Economic Analy sis. Applications for the Coastal Zone,
W74-07534 6E

CHEMICAL ANALYSIS

Photometric Determination of Manganese in Water by Using O-Tolidine,
W74-07315 2K

Recovery of Arsenic by Dry Ashing from Animal Tissue Fortified with Organoarsenicals or Arsenic Trioxide,
W74-07573 5A

CHEMICAL REACTIONS

Reactions of Chloramines with Active Carbon,
W74-07544 5B

CHEMICAL RECOVERY

Recovery of Arsenic by Dry Ashing from Animal Tissue Fortified with Organoarsenicals or Arsenic Trioxide,
W74-07573 5A

CHEMICAL TREATMENT; *LAUNDRY EFFLUENT

Modular Wastewater Treatment System Demonstration For The Textile Maintenance Industry,
W74-07343 5D

CHEMISTRY OF PRECIPITATION

Source and Budget of Sulfate in Precipitation from Central Alberta, Canada,
W74-07164 5B

CHESAPEAKE BAY
Distribution and Transportation of Suspended Sediment in Upper Cheasapeake Bay,
W74-07234 2L

Processes Affecting Gas Distributions in Estuarine Sediments,
W74-07242 2L

An Investigation of the Physical Impact of Sewage Outflow on a River-Estuarine Environment,
W74-07477 5C

Effects of Temperature on Activity and Mortality of the Scyphozoan Medusa, Chrysaora quinquecirrha,
W74-07561 5C

CHICAGO (ILL)
Laundry Detergents and Environmental Quality,
W74-07122 5C

CHIRONOMID LARVAE
Distribution and Standing Crops of Chironomid-Larvae in Shiozu Bay of Lake Biwa (In Japanese),
W74-07101 5C

CHIRONOMIDAE
Vertical Migration of Spaniotoma akamusi Larvae (Diptera:Chironomidae) through the Bottom Deposits of Lake Suwa,
W74-07543 2H

CHLORAMINES
Reactions of Chloramines with Active Carbon,
W74-07544 5B

CHLORAMPHENICAL
Incidence of Resistance to Tetracycline, Chloramphenicol and Ampicillin Among Salmonella Species Isolated in the Netherlands in 1969, 1970 and 1971,
W74-07562 5C

CHLORETONE
Purification of Effluents and Improvement of the Technology in the Production of Chloretone, (In Russian),
W74-07285 5D

CHLORIDES
Studies of the Ingredients Variation of the Sake-Gawa River, A Tributary of the Mogami River (In Japanese),
W74-07360 2K

CHLORINATED HYDROCARBON PESTICIDES
Determination of Chlorinated Insecticides in Suspended Sediment and Bottom Material,
W74-07317 5A

Use of Amberlite XAD-4 for Extraction and Recovery of Chlorinated Insecticides and Polychlorinated Biphenyls from Water,
W74-07383 5D

Determination of Pentachlorophenol in Natural and Waste Waters,
W74-07385 5A

CHLORINATION
Method of and Apparatus for the Purification of Water Containing Organic Contaminants,
W74-07199 5D

Microbial Indicators for the Biological Quality of Treated Wastewater Effluents,
W74-07372 5D

The Effluent-Free Bleached Kraft Pulp Mill. Part V. The R4 Process for Chlorine Dioxide Manufacture to Decrease Production of Sodium Sulphate,
W74-07378 5D

Utilization of White Water in Board Mills (Ispol'zovanie oborotnoi vody na kartonnykh fabrikakh),
W74-07397 5D

CHLOROPHYLL
Portable Reflectance Meter for Estimating Chlorophyll Concentrations in Leaves,
W74-07437 7B

CHROMATOGRAPHY
Determination of Chlorinated Insecticides in Suspended Sediment and Bottom Material,
W74-07317 5A

CHROMIUM REOXIDATION
Regeneration of Chromated Aluminum Deoxidizers, Phase I Report,
W74-07254 5D

CHROMOGENIC REAGENTS
Kaempferol (3,5,7,4'-Tetrahydroxyflavone) as a Chromogenic Reagent for Tin(IV),
W74-07579 5A

CHROOMONAS
Effect of Light Intensity and Glycerol on the Growth, Pigment Composition, and Ultrastructure of Chroomonas Sp.,
W74-07548 5C

CIMARRON RIVER (OKLA)
Depositional Features of Braided-Meandering Stream,
W74-07163 2J

CITIES
Planning and Operation of Urban Water Quality Management Systems,
W74-07334 5D

CITRUS FRUITS
Portable Reflectance Meter for Estimating Chlorophyll Concentrations in Leaves,
W74-07437 7B

CITY PLANNING
The Relationship of Land Use to Water Use in San Antonio, Texas,
W74-07067 4A

CIVIL LAW
Pollution Sanctions--New Alternatives to Civil Liability,
W74-07123 5G

CLARIFIERS
Treatment Apparatus,
W74-07218 5D

CLAY LOAM
Residues of Atrazine, Cyanazine, and Their Phytotoxic Metabolites in a Clay Loam Soil,
W74-07585 5A

CLAY MINERALS
Mineralogical Composition of Clays in Soil Profiles of Israel: I. The Soils of the Mediterranean Zone,
W74-07099 2G

Mineralogical Composition of Clays in Soil Profiles of Israel: II. The Soils of the Desert Zone,
W74-07100 2G

Regional Clay Mineral Facies in Estuaries and Continental Margin of the United States East Coast,
W74-07237 2L

Source of Recent Nearshore Marine Clays, Southeastern United States,
W74-07238 2L

CLAYS
Groundwater Geology of Fort Valley, Coconino County, Arizona,
W74-07092 4B

Micro-Determination of Cation-Exchange Capacity by Neutron Activation Analysis,
W74-07439 2G

CLEVELAND (OHIO)
High-Rate Multi-Media Filtration,
W74-07261 5D

CLIMATIC ZONES
Agroclimatic Regions of Rajasthan,
W74-07102 3F

CLONORCHIS-SINENSIS
An Epidemiological Study on Clonorchis sinensis at the Northern part of Wakayama Prefecture, Middle Japan, (In Japan),
W74-07540 5C

CLOSED CONDUITS
Environmental Protection Techniques to be Applied in a Bleached Kraft Pulp Mill in Sweden,
W74-07392 5D

CLOVER
The Effect of Waterlogging on the Mineral Nutrient Content of Trifolium Subterraneum,
W74-07355 3F

COAGULATION
Mechanical Waste Water Clarification and Biological-Chemical Waste Water Purification Using the Attisholz and Ruthner System (Mechanische Abwasserklaerung und biologisch-chemische Abwasserreinigung nach System Attisholz und Ruthner),
W74-07381 5D

How Polyacrylamides can Help Effluent Problems,
W74-07391 5D

Utilization of White Water in Board Mills (Ispol'zovanie oborotnoi vody na kartonnykh fabrikakh),
W74-07397 5D

A Review of Colour Reduction Technology in Pulp and Paper Mill Effluents,
W74-07406 5D

Pollution Control by Recycling Effluent,
W74-07407 5D

COAL-ENERGY DEVELOPMENT
Coal-Energy Development in the Northern Great Plains.
W74-07056 6D

COASTAL STRUCTURES
Apparatus for Recording Swell Frequency and Propagation Direction of Waves,
W74-07224 8B

COASTAL ZONE
Pacific Northwest Coastal Zone Management as it Relates to Estuary Protection,
W74-07500 6E

COASTAL ZONE MANAGEMENT
Technology Transfer in the Marine Environment of Long Island,
W74-07059 6B

COASTAL ZONES
Environmental Planning: An Economic Analysis. Applications for the Coastal Zone,
W74-07534 6B

COASTS
Biological Investigations of Noxious Coelenterates and Ctenophores in Coastal North Carolina,
W74-07479 2L

Investigation of the Biology and Control of Noxious Coelenterates Occurring in the Coastal Waters of Puerto Rico,
W74-07480 2L

Laws and Regulations of Pollution and Navigation in Pacific Northwest Estuaries,
W74-07499 5G

COBALT
Comparison of Conditional Stability Constants of North Carolina Humic and Fulvic Acids with Co(II) and Fe(III),
W74-07228 5B

COELENTERATA
Investigation of the Biology and Control of Noxious Coelenterates Occurring in the Coastal Waters of Puerto Rico,
W74-07480 2L

COELENTERATES
Biological Investigations of Noxious Coelenterates and Ctenophores in Coastal North Carolina,
W74-07479 2L

COFFERDAMS
Optimum Design Height of Cofferdams,
W74-07304 8A

COLD ATOMIC ABSORPTION SPECTROPHOTOMETRY
The Chemical Form and Bodily Distribution of Mercury in Marine Fish,
W74-07551 5A

COLOR
Oxygen Bleaching -- A Flexible Process for Pollution Abatement,
W74-07376 5D

A Review of Colour Reduction Technology in Pulp and Paper Mill Effluents,
W74-07406 5D

COLORADO
Regional Environmental Reference.
W74-07085 6G

User Charges and Industrial Cost Recovery, Denver SMSA,
W74-07370 5D

COLORADO RIVER
Chemical and Biological Problems in the Grand Canyon,
W74-07093 5B

The Bittersweet Waters of the Lower Colorado,
W74-07292 3F

COLORIMETRY
Photometric Determination of Manganese in Water by Using O-Tolidine,
W74-07315 2K

A New Colorimetric Procedure for the Determination of Benomyl,
W74-07559 5A

COMBINED SEWERS
Combined Sewer Overflow Seminar Papers.
W74-07255 5D

Combined Sewer Overflow Regulator Facilities,
W74-07258 5D

Pressure Sewers,
W74-07259 5D

Application of Microstraining to Combined Sewer Overflow,
W74-07260 5D

High-Rate Multi-Media Filtration,
W74-07261 5D

Screening/Dissolved-Air Flotation Treatment of Combined Sewer Overflows,
W74-07262 5D

High-Rate Disinfection of Combined Sewer Overflow,
W74-07263 5D

The Swirl Concentrator as a Combined Sewer Overflow Regulator,
W74-07264 5D

The EPA Stormwater Management Model: A Current Overview,
W74-07265 5D

Combined Sewer Overflow Treatment by the Rotating Biological Contactor Process.
W74-07374 5D

COMMERCIAL FISH
Waste Water Treatment in Commercial Fish Processing: Reducing Stick Water Loadings,
W74-07270 5D

COMMERCIAL FISHERY
Seasonal Abundance and Distribution of Juvenile Blue Crabs in Core Sound, N.C. 1965-1966,
W74-07350 2L

COMPREHENSIVE PLANNING
Wallowa Lake Basin Comprehensive Plan.
W74-07065 5D

Study Design. Surface Drainage Program, Madison, St. Clair, Monroe and Randolph Counties, Illinois.
W74-07083 4A

COMPUTER MODELS
A Computer Simulation Model for Flood Plain Development. Part II: Model Description and Applications,
W74-07296 6A

Simulation--A Tool for Water Resource Management,
W74-07300 6A

COMPUTER PROGRAMS
A Computer System for Storage and Retrieval of Hydrogeological Data from Well Records,
W74-07328 7C

Economic Damages from Residential Use of Mineralized Water Supply,
W74-07417 5C

COMPUTERS
Special Report Semiconductor Memories are Taking Over Data-Storage Applications,
W74-07553 7B

CONDENSATION
Distillation-Condensation of Water and Nutrient Movement in a Desert Ecosystem,
W74-07110 2I

Self Cleaning, Tubular Solar Still,
W74-07207 3A

CONDUCTION
Instability of Water Cooled from Above,
W74-07458 2H

CONDUITS
Solutions for Lateral Outflow in Perforated Conduits,
W74-07433 8B

CONFERENCES
Proceedings 2nd Annual Technical Conference on Estuaries of the Pacific Northwest.
W74-07491 2L

CONIFEROUS FORESTS
The Age Dynamics and the Economic Selection Cuttings in Broad Leaved Dark Coniferous Forests of the Water Protective Shelterbelt of the UFA River Within the Sverdlovsk Region, (In Russian),
W74-07600 4A

CONJUNCTIVE USE
Network Approach to Management of Conjunctively Operated Ground Water - Surface Water Systems,
W74-07335 4A

CONNECTICUT
Fisheries and Game; General Provisions.
W74-07286 6E

The Environmental Impact of Cadmium,
W74-07530 5A

CONNECTICUT RIVER BASIN
A Computer Simulation Model for Flood Plain Development. Part II: Model Description and Applications,
W74-07296 6A

CONSTRAINTS
Flood Proofing Decisions with Uncertain Events,
W74-07299 6A

CONSTRUCTION COSTS
High-Rate Multi-Media Filtration,
W74-07261 5D

User Charges and Industrial Cost Recovery, Denver SMSA,
W74-07370 5D

CONTINENTAL SHELF
Sedimentation by Non-Tidal Currents Around Northern Denmark,
W74-07160 2L

CONTOUR FURROWS
Effect of Contour Furrows and Contour Bunds on Water Conservation in Grasslands of Western Rajasthan,
W74-07090 3F

CONTROL SYSTEMS
Waste Water Process Tank Control Facility,
W74-07216 5D

ONVECTION
Heat Dispersion Effect on Thermal Convection in a Porous Medium Layer,
W74-07156 2F

Instability of Water Cooled from Above,
W74-07458 2H

OON ISLAND (LA)
Calcasieu River at Coon Island, Louisiana, Ship Channel (Final Environmental Impact Statement).
W74-07118 8A

OOS BAY (OREG)
Hydrology of the Dunes Area North of Coos Bay, Oregon,
W74-07325 2L

ORE DRILLING
An Improved Core Catcher for the Kiel Box Corer ('Kastenlot'),
W74-07159 7B

ORES
An Improved Core Catcher for the Kiel Box Corer ('Kastenlot'),
W74-07159 7B

ORN (FIELD)
Subsurface Heating and Irrigation of Soils: Its Effect on Temperature and Water Content and on Plant Growth,
W74-07054 2G

Effects of Subsurface Asphalt Layers on Corn and Tomato Root Systems,
W74-07447 3F

Ammonium and Nitrate Uptake by Corn (Zea mays L.) as Influenced by Nitrogen Concentration and NH4(+)/NO3(-) Ratio,
W74-07459 3F

CORRELATION ANALYSIS
Cross-Spectral Analysis of Rainfall and Runoff for Raritan and Mullica River Basins in New Jersey,
W74-07183 2A

COST ALLOCATION
Pollution, Production, and Compensation,
W74-07064 5G

User Charges and Industrial Cost Recovery, Denver SMSA,
W74-07370 5D

COST-BENEFIT ANALYSIS
Bethany Reservoir Recreation Development Plan.
W74-07127 6B

Lake Perris Recreation Development Plan.
W74-07128 6B

The Demand for Sport Fishing at Yaquina Bay,
W74-07143 6B

Burleigh V. Calloway (Injunction Action Against a Beach Erosion Project).
W74-07288 6E

Economic Evaluation and Determination of Plant Capacity and Dam Height,
W74-07305 8A

COST MINIMIZATION
Optimum Design Height of Cofferdams,
W74-07304 8A

Capital Cost Minimization of Drainage Networks,
W74-07309 4A

COST SHARING
Cost Sharing for Recreation: Efficiency and Equity,
W74-07307 6B

COSTS
Possible Impact of Costs of Selected Pollution Control Equipment on the Electric Utility Industry and Certain Power Intensive Consumer Industries. Executive Summary.
W74-07140 5G

Economic Size Selection for PVC Pipelines,
W74-07303 8A

Water and Effluent Treatment Plants - Cost Considerations and Client, Contractor, Consultant Relationships, The Consultant's View,
W74-07312 5D

The Effluent-Free Bleached Kraft Pulp Mill. Part V. The R4 Process for Chlorine Dioxide Manufacture to Decrease Production of Sodium Sulphate,
W74-07378 5D

Possibilities of Effluent Clarification (Moeglichkeiten der Abwasserklaerung),
W74-07382 5D

A Review of Colour Reduction Technology in Pulp and Paper Mill Effluents,
W74-07406 5D

The Pulp and Paper Industry and the Environment,
W74-07411 5D

Economic Damages from Residential Use of Mineralized Water Supply,
W74-07417 5C

COULSON CONDUCTIVITY DETECTOR
Residues of Atrazine, Cyanazine, and Their Phytotoxic Metabolites in a Clay Loam Soil,
W74-07585 5A

COULTER COUNTER
Determination of Mean Cell Size of Tetrahymena in Growing Cultures,
W74-07586 5A

COUNTING
Determination of Mean Cell Size of Tetrahymena in Growing Cultures,
W74-07586 5A

COWS (AYRSHIRE)
A Study of the Intake of Drinking Water by Dairy Cows at Grass,
W74-07358 3F

CRABS (BLUE)
Seasonal Abundance and Distribution of Juvenile Blue Crabs in Core Sound, N.C. 1965-1966,
W74-07350 2L

CROP PRODUCTION
Performance of Lucerne (Medicago sativa) Lines in Pure Stands Under Irrigated and Rain Grown Conditions in Sub-Coastal Central Queensland,
W74-07359 3F

Effects of Drainage on the Yield of Cacao, (In Portuguese),
W74-07435 3F

CROP RESPONSE
Plant and Irrigation Water Requirements,
W74-07452 3F

CROSS-SPECTRAL ANALYSIS
Cross-Spectral Analysis of Rainfall and Runoff for Raritan and Mullica River Basins in New Jersey,
W74-07183 2A

CRUSTACEANS
Seasonal Abundance and Vertical Distribution of Crustacean Zooplankton in a Coloured Dystrophic Lake in Northeastern Ontario,
W74-07467 5C

CTENOPHORES
Biological Investigations of Noxious Coelenterates and Ctenophores in Coastal North Carolina,
W74-07479 2L

CULTURE MEDIA
The Effect of Lack of a Carbon Source on Nitrate-Reductase Activity in Aspergillus nidulans,
W74-07581 5C

CULTURES
The Effect of Lack of a Carbon Source on Nitrate-Reductase Activity in Aspergillus nidulans,
W74-07581 5C

Determination of Mean Cell Size of Tetrahymena in Growing Cultures,
W74-07586 5A

CURRENT METERS
An Innovative Automatic Stream Gaging Method,
W74-07181 7B

CUTTINGS (BROAD-LEAF)
The Age Dynamics and the Economic Selection Cuttings in Broad Leaved Dark Coniferous Forests of the Water Protective Shelterbelt of the UFA River Within the Sverdlovsk Region, (In Russian),
W74-07600 4A

CYANIDES
Cyanide Waste Treatment Utilizing Catalytic Oxidation,
W74-07272 5D

CYANOPHYTA
Hydrogen Sulfide Production by Synechococcus lividus Y52-si,
W74-07546 5C

The Effect of Selenite on the Physiological and Morphological Properties of the Blue-Green Alga Phormidium luridum Var. Olivacea,
W74-07550 5C

Effect of Restricted Use of Phosphate-Based Detergents on Onondaga Lake,
W74-07566 5C

CYCLING NUTRIENTS
Nutrient Cycling and Productivity of Dystrophic Lake-Bog Systems (Part B),
W74-07466 5C

CYPRUS
Planning and Operational Studies in the Integrated Use of Desalination. Case Studies for Cyprus and Jersey,
W74-07308 3A

CYTOLOGICAL STUDIES
The Marine Diatom Ethmodiscus rex: Its Morphology and Occurrence in the Plankton of the Sargasso Sea,
W74-07547 5A

CZECHOSLOVAKIA (KLICAVA RESERVOIR)

CZECHOSLOVAKIA (KLICAVA RESERVOIR)
Abundance and Mortality of the Perch Fry (Perca Fluviatilis, Linnacus, 1758) in the Klicava Reservoir,
W74-07588 8I

DALLAS-FORT WORTH METROPOLITAN AREA
Determinants of Use of Water-Based Recreational Facilities,
W74-07058 6B

DAM CONSTRUCTION
Ansley V. Tarrant County Water Control and Improvement District No. One (Liability for Flooding and Amount of Damage).
W74-07117 6E

DAMAGES
Economic Damages from Residential Use of Mineralized Water Supply,
W74-07417 5C

DAMS
Flood Plain Information-Neuse River and Buffalo Creek, Smithfield, North Carolina.
W74-07074 4A

Inflatable Dams and Dam Units,
W74-07210 8A

The Bittersweet Waters of the Lower Colorado,
W74-07292 3F

Economic Evaluation and Determination of Plant Capacity and Dam Height,
W74-07305 8A

Contributions to the Calculation of the Rood Territory Width and the Transversal Section Under the Retention Level at the Weirs and Dams of Fishery Purposes, (In Rumanian),
W74-07448 8I

DATA COLLECTIONS
Records of Ground-Water Levels in Wyoming, 1940-1971,
W74-07186 4B

A Systems Analysis of Water Quality Survey Design,
W74-07310 5B

Data for Municipal Wells in the City of Modesto, California,
W74-07320 4B

Annual Compilation and Analysis of Hydrologic Data for Urban Studies in the San Antonio, Texas Metropolitan Area, 1971,
W74-07323 2E

Parameter Identification in Field Problems,
W74-07428 7C

DATA STORAGE AND RETRIEVAL
A Computer System for Storage and Retrieval of Hydrogeological Data from Well Records,
W74-07328 7C

Special Report: Semiconductor Memories are Taking Over Data-Storage Applications,
W74-07553 7B

DDT
Volatility of DDT Residues in Soil as Affected by Flooding and Organic Matter Applications,
W74-07424 5B

DEALKYLATION
Biochemistry of Selective Toxicity and Biodegradability: Comparative O-Dealkylation by Aquatic Organisms,
W74-07126 5C

DEATH VALLEY
Distillation-Condensation of Water and Nutrient Movement in a Desert Ecosystem,
W74-07110 2I

DECAYING ORGANIC MATTER
Population Dynamics of Protozoa Associated with the Decay of Organic Materials in Fresh Water,
W74-07541 5C

DECISION MAKING
North Coastal Area Action Program. A Study of the McKinleyville-Trinidad Area: Public Hearing Comments.
W74-07129 6B

Multi-Disciplinary Study of Water Quality Relationships: A Case Study of Yaquina Bay, Oregon,
W74-07142 6B

Resource Management Decisions: Externalities and Public Policy,
W74-07148 6A

Development of a Decision Room for Environntal Studies, (Feasibility Study),
W74-07371 6G

Production Function Theory for Use in Optimal Planning Decisions,
W74-07460 5D

New Concepts in Environmental Planning,
W74-07492 6B

DECONTAMINATION
Hygienic Evaluation of Means of Enrichment with Salts and Decontamination of Demineralized Water, (In Russian),
W74-07365 5F

DEEP TILLAGE
Reactivating Soil Ripping Treatments for Runoff and Erosion Control in the Southwestern U.S.,
W74-07089 2G

DEGRADATION (DECOMPOSITION)
Volatility of DDT Residues in Soil as Affected by Flooding and Organic Matter Applications,
W74-07424 5B

Observations on the Gas Chromatography of Kelthane (Dicofol),
W74-07575 5A

Residues of Atrazine, Cyanazine, and Their Phytotoxic Metabolites in a Clay Loam Soil,
W74-07585 5A

DEL NORTE COUNTY (CALIF
North Coastal Area Action Program: A Study Of The Smith River Basin And Plain.
W74-07132 6B

DELAWARE
Annual Report/Fiscal Year 1973.
W74-07252 9D

United States V. Pot-Nets, Inc. (Violation of Rivers and Harbors Act),
W74-07287 6E

Small Beach Erosion Control Project, Lewes Delaware (Final Environmental Impact Statement)
W74-07295 4A

DELAWARE BAY
Suspended Sediment Transport in Delaware Bay,
W74-07233 2L

DEMAND
Coal-Energy Development in the Northern Great Plains.
W74-07056 6D

DEMAND FUNCTION
The Demand for Sport Fishing at Yaquina Bay,
W74-07143 6B

DEMINERALIZATION
Hygienic Evaluation of Means of Enrichment with Salts and Decontamination of Demineralized Water, (In Russian),
W74-07365 5F

DENITRIFICATION
Losses of Inorganic Nitrogen From Aquatic Systems,
W74-07426 5B

DENMARK
Sedimentation by Non-Tidal Currents Around Northern Denmark,
W74-07160 2L

DENSITY CURRENTS
Planar and Axisymmetric Bottom Withdrawal from a Density-Stratified Reservoir,
W74-07340 4A

DENVER (COLO)
Regional Environmental Reference.
W74-07085 6G

DENVER SMSA
User Charges and Industrial Cost Recovery, Denver SMSA,
W74-07370 5D

DEPOSITION (SEDIMENTS)
Biodeposition as a Factor in Sedimentation of Fine Suspended Solids in Estuaries,
W74-07231 2L

Supply of Terrigenous Material to the Baltic Sea (Pitaniye Baltiyskogo morya terrigennym materialom),
W74-07501 2J

DEPTH
Problem of Calculating Depth of the Quasiuniform Layer of the Ocean (K voprosu o raschete tolshchiny kvaziodnorodnogo sloya okeana),
W74-07506 2A

DESALINATION
Self Cleaning, Tubular Solar Still,
W74-07207 3A

Planning and Operational Studies in the Integrated Use of Desalination. Case Studies for Cyprus and Jersey,
W74-07308 3A

DESERT PLANTS
The Saguaro Giant Cactus, A Bibliography,
W74-07098 2I

Distillation-Condensation of Water and Nutrient Movement in a Desert Ecosystem,
W74-07110 2I

ESIGN
Optimum Design Height of Cofferdams,
W74-07304 8A

A Systems Analysis of Water Quality Survey Design,
W74-07310 5B

Water and Effluent Treatment Plants - Cost Considerations and Client, Contractor, Consultant Relationships, The Consultant's View,
W74-07312 5D

Development of an Agricultural Drainage Guide,
W74-07438 4A

ESORPTION
Phosphorus Supply Characteristics of Acid Organic Soils as Measured by Desorption and Mineralization,
W74-07345 2G

ETERGENTS
Laundry Detergents and Environmental Quality,
W74-07122 5C

Effect of Restricted Use of Phosphate-Based Detergents on Onondaga Lake,
W74-07566 5C

ETRITUS
Nutritive Importance and Structure of Detritus,
W74-07471 5C

IATOMS
The Marine Diatom Ethmodiscus rex: Its Morphology and Occurrence in the Plankton of the Sargasso Sea,
W74-07547 5A

ICOTS
A Contribution to the Botany of Ganganagar District, North Rajasthan,
W74-07357 3F

IELECTRIC CONSTANT
Broad Spectrum Microwave Systems for Remotely Measuring Soil Moisture Content,
W74-07052 2G

IFFUSION
Heat Dispersion Effect on Thermal Convection in a Porous Medium Layer,
W74-07156 2F

IFFUSIVITY
On The Determination of Turbulent Diffusivity in Shallow Waters by Aerial Photography of Floating Markers,
W74-07316 2H

The Estimation of Vertical Eddy Diffusivities Below the Thermocline in Lakes,
W74-07416 2H

Flux-Gradient Relationships and Soil-Water Diffusivity from Curves of Water Content Versus Time,
W74-07512 2G

DIGESTION
Reduction in Mercury Content of Fish Protein Concentrate by Enzymatic Digestion,
W74-07576 5A

DIPTERA
Vertical Migration of Spaniotoma akamusi Larvae (Diptera:Chironomidae) through the Bottom Deposits of Lake Suwa,
W74-07543 2H

DISCHARGE
Protection of the Environment.
W74-07289 6E

National Pollutant Discharge Elimination System.
W74-07293 6E

DISCHARGE (WATER)
Water Reuse and Recycle in the D(C)EDED Bleach Sequence,
W74-07377 5D

DISINFECTION
Ozone in Water and Waste Water Treatment, a Bibliography.
W74-07251 5D

High-Rate Disinfection of Combined Sewer Overflow,
W74-07263 5D

DISPERSION
Heat Dispersion Effect on Thermal Convection in a Porous Medium Layer,
W74-07156 2F

On The Determination of Turbulent Diffusivity in Shallow Waters by Aerial Photography of Floating Markers,
W74-07316 2H

Dispersion of Contaminated Sediment Bed Load,
W74-07446 5B

A Mixing Cell Model for Longitudinal Dispersion in Open Channels,
W74-07527 8B

DISSOLVED GASES
Processes Affecting Gas Distributions in Estuarine Sediments,
W74-07242 2L

DISSOLVED OXYGEN
Predicting the Quality of Stream Water Under Conditions of Oxygen Deficiency (O prognoze kachetva vody vodotokov pri bol'shikh defitsitakh kisloroda),
W74-07388 5B

Application of a Large Scale Nonlinear Programming Problem to Pollution Control,
W74-07461 5D

Some Aspects of the Temperature, Oxygen and Nutrient Distributions in Monterey Bay, California. Annual Report, Part 1, 1973,
W74-07469 5C

DISSOLVED SOLIDS
Quality of Well Waters of Jaipur District,
W74-07106 4B

Dissolved-Solids Discharge to the Oceans from the Conterminous United States,
W74-07162 5B

Evaporation of Water from Sand: 5. The Effect of Evaporation on the Concentration of Salts Dissolved in Water Stored in Sand,
W74-07169 2D

Quantitative Chemical Analysis of Specific Components of the Waters of Lost Creek and the Wabash River, Vigo County, Indiana,
W74-07405 5A

Supply of Terrigenous Material to the Baltic Sea (Pitaniye Baltiyskogo morya terrigennym materialom),
W74-07501 2J

DISTILLATION
Distillation-Condensation of Water and Nutrient Movement in a Desert Ecosystem,
W74-07110 2I

Method of and Apparatus for the Recovery of Oil from Water,
W74-07201 5G

Self Cleaning, Tubular Solar Still,
W74-07207 3A

DISTRIBUTION
Seasonal Abundance and Vertical Distribution of Crustacean Zooplankton in a Coloured Dystrophic Lake in Northeastern Ontario,
W74-07467 5C

Some Aspects of the Temperature, Oxygen and Nutrient Distributions in Monterey Bay, California. Annual Report, Part 1, 1973,
W74-07469 5C

Biological Investigations of Noxious Coelenterates and Ctenophores in Coastal North Carolina,
W74-07479 2L

Distribution and Chemistry of Phosphorus in an Albaqualf Soil After 82 Years of Phosphate Fertilization,
W74-07532 5B

Pharmacodynamics of Methyl Mercury in the Rainbow Trout (Salmo Gairdneri): Tissue Uptake, Distribution and Excretion,
W74-07597 5C

DISTRIBUTION FUNCTIONS
Just a Moment,
W74-07414 2A

DISTRIBUTION PATTERNS
Probability Distribution of Snow Course Data for Central Arizona,
W74-07094 2C

Mechanism of Element Distribution in the Pacific Ocean (Japanese Profile) (K poznaniyu mekhanizma raspredeleniya elementov v Tikhom okeane (Yaponskiy profil')),
W74-07503 2J

The Chemical Form and Bodily Distribution of Mercury in Marine Fish,
W74-07551 5A

DISTRIBUTION SYSTEMS
North Coastal Area Action Program. A Study of the McKinleyville-Trinidad Area: Public Hearing Comments.
W74-07129 6B

DISTRICT OF COLUMBIA
Hydrogen Peroxide Cures Filamentous Growth in Activated Sludge,
W74-07253 5D

DOLOMITE
Hydrogeology of the Sasso Lungo Group, a Dolomitic Reef Stock in the Alpine Dolomites of North Italy,
W74-07153 2F

DOMESTIC WATER
Economic Damages from Residential Use of Mineralized Water Supply,
W74-07417 5C

DRAINAGE
Solutions for Lateral Outflow in Perforated Conduits,
W74-07433 8B

DRAINAGE

Effects of Drainage on the Yield of Cacao, (In Portuguese),
W74-07435 3F

Development of an Agricultural Drainage Guide,
W74-07438 4A

Shallow Drain Performance in a Heavy Soil,
W74-07442 4A

Nitrate Concentrations in the Unsaturated Zone Beneath Irrigated Fields in Southern California,
W74-07445 5G

DRAINAGE AREAS

A Framework for Economic Planning of Watershed Drainage,
W74-07069 4A

DRAINAGE BASINS

A Framework for Economic Planning of Watershed Drainage,
W74-07069 4A

DRAINAGE DENSITY

Drainage Density and Effective Precipitation,
W74-07155 2A

Line Intersection Method for Estimating Drainage Density,
W74-07174 2J

A Computer Atlas of Hydrologic and Geomorphologic Data for Small Watersheds in Indiana,
W74-07432 2A

A Rainfall-Runoff Model Based on the Watershed Stream Network,
W74-07464 2A

DRAINAGE GUIDE

Development of an Agricultural Drainage Guide,
W74-07438 4A

DRAINAGE PATTERNS (GEOLOGIC)

Line Intersection Method for Estimating Drainage Density,
W74-07174 2J

DRAINAGE SYSTEMS

Background Survey. Surface Drainage Program, Madison, Saint Clair, Monroe and Randolph Counties, Illinois.
W74-07066 4A

Interim Storm Drainage Plan Report-Little Rock-North Little Rock Metropolitan Area.
W74-07082 5D

Capital Cost Minimization of Drainage Networks,
W74-07309 4A

DRAINAGE WATER

Background Survey. Surface Drainage Program, Madison, Saint Clair, Monroe and Randolph Counties, Illinois.
W74-07066 4A

Evaluation of Current Techniques for Nutrient Removal from Wastewaters,
W74-07441 5D

DRAWDOWN

Vertical Movements in the Nonsaturated Zone and the Specific Yield of a Water-Table Aquifer (Etude des transferts verticaux dans la zone non saturee et de l'emmagasinement d'une nappe libre, dans le cas d'un pompage, dans les conditions na turelles),
W74-07182 2F

DREDGING

Calcasieu River at Coon Island, Louisiana, Ship Channel (Final Environmental Impact Statement).
W74-07118 8A

DROUGHT TOLERANCE

Extruded Peat Cylinders: Their Physical Characteristics as Affecting Tree Seedling Growth and Greenhouse Drought Tolerance,
W74-07180 2I

DUNE SANDS

Sand Dune Reclamation in Iraq – Present Status and Future Prospects,
W74-07104 2J

DUNES

Hydrology of the Dunes Area North of Coos Bay, Oregon,
W74-07325 2L

DYNAMIC PROGRAMMING

Nonlinear Programming in River Basin Modeling,
W74-07298 5B

Planning and Operation of Urban Water Quality Management Systems,
W74-07334 5D

DYSTROPHY

Nutrient Cycling and Productivity of Dystrophic Lake-Bog Systems (Part B),
W74-07466 5C

ECOLOGICAL DISTRIBUTION

Habitat Distribution of the Shore Flies of Northeastern Ohio (Diptera: Ephydridae),
W74-07556 5C

ECOLOGY

Ecology and Productivity of Strip-Mine Areas in Mercer County, Pennsylvania,
W74-07055 5B

Environmental Quality and its Evaluation,
W74-07533 5G

Moina Sp. (Cladocera: Moinidae) in a Sewage Plant, Wellington, Referred to Moina tenuicornis Sars, 1896 (Note),
W74-07569 5A

ECONOMIC EFFICIENCY

Interdisciplinary Modeling in the Analysis of the Salinity Problems of the Safford Valley,
W74-07297 5B

Flood Proofing Decisions with Uncertain Events,
W74-07299 6A

Cost Sharing for Recreation: Efficiency and Equity,
W74-07307 6B

ECONOMIC FEASIBILITY

An Economic Analysis of Selected Agricultural Uses of Warm Water in the Pacific Northwest Resulting from Electric Power Generation,
W74-07125 3C

ECONOMIC IMPACT

Urban Impacts of Rural Resource Development Expenditures in the Interlake Area of Manitoba,
W74-07068 6B

Pollution and Industry: Pros, Cons of Growing Fight
W74-07112 5G

Possible Impact of Costs of Selected Pollution Control Equipment on the Electric Utility Industry and Certain Power Intensive Consumer Industries. Executive Summary.
W74-07140 5G

The Predicted Influence of Kraft Mill Effluent on the Fishery Resources,
W74-07145 5C

An Economic Evaluation of Alternative Levels of Water Quality: The Role of Water Quality in Relation to Economic Benefits,
W74-07146 6B

Resource Management Decisions: Externalities and Public Policy,
W74-07148 6A

A Model of Irrigated Agriculture and Regional Development in Southern Argentina: The Rio Negro Basin,
W74-07306 6A

ECONOMICS

Economic Evaluation and Determination of Plant Capacity and Dam Height,
W74-07305 8A

Environmental Quality and its Evaluation,
W74-07533 5G

The Age Dynamics and the Economic Selection Cuttings in Broad Leaved Dark Coniferous Forests of the Water Protective Shelterbelt of the UFA River Within the Sverdlovsk Region, (In Russian),
W74-07600 4A

EDUCATION

Pollution Control Through Training, Education, and Rigorous Follow-Up,
W74-07408 5G

Selection and Operation of Small Wastewater Treatment Facilities - Training Manual.
W74-07485 5D

EFFLUENTS

A Comparison of Effluent Characteristics from Conventional and Oxygen Bleaching Sequences: Results of a Laboratory Study,
W74-07375 5D

Oxygen Bleaching – A Flexible Process for Pollution Abatement,
W74-07376 5D

ELECTRIC POWER INDUSTRY

Possible Impact of Costs of Selected Pollution Control Equipment on the Electric Utility Industry and Certain Power Intensive Consumer Industries. Executive Summary.
W74-07140 5G

ELECTRIC POWER PLANTS

Radiation Safety Problems in the Operation of Atomic Electric Power Stations, (In Russian),
W74-07363 5B

ELECTROCHEMISTRY

Removal of Phosphates from Wastewaters with Electro-Chemically Generated Gadolinium Ions,
W74-07271 5D

Rotating Ring-Disk Electrode Study of the Adsorption of Lead on Gold in 0.5M Potassium Chloride,
W74-07555 2K

ELECTRODES
Rotating Ring-Disk Electrode Study of the Adsorption of Lead on Gold in 0.5M Potassium Chloride,
W74-07555 2K

ELECTROLYSIS
Water Treatment Apparatus,
W74-07196 5D

Regeneration of Chromated Aluminum Deoxidizers, Phase I Report,
W74-07254 5D

ELECTROPLATING
Cyanide Waste Treatment Utilizing Catalytic Oxidation,
W74-07272 5D

ENERGY
Coal-Energy Development in the Northern Great Plains.
W74-07056 6D

ENO RIVER (NC)
Landscape Compartmentalization: An Ecological Approach to Land Use Planning,
W74-07053 6G

ENVIRONMENT
New Concepts in Environmental Planning,
W74-07492 6B

Environmental Quality and its Evaluation,
W74-07533 5G

ENVIRONMENTAL CONTROL
Landscape Compartmentalization: An Ecological Approach to Land Use Planning,
W74-07053 6G

Program Development Plan for the Mesa-New York Bight Regional Project.
W74-07078 6B

Regional Environmental Reference.
W74-07085 6G

Sierra Club V. Froehlke (Injunction Action Against Reservoir Project).
W74-07113 6E

Irrigation and Sprinkler System,
W74-07212 3F

ENVIRONMENTAL EFFECTS
Procedures and Programs to Assist in the Environmental Impact Statement Process,
W74-07061 6B

Regional Environmental Reference.
W74-07085 6G

Sierra Club V. Froehlke (Injunction Action Against Reservoir Project).
W74-07113 6E

Calcasieu River at Coon Island, Louisiana, Ship Channel (Final Environmental Impact Statement).
W74-07118 8A

Metallic Mineral Mining Operations, (Acquisition of Surface Lands for Water Quality Control).
W74-07119 6E

Effects of Man-Made Works on the Hydraulic, Salinity, and Shoaling Regimens of Estuaries,
W74-07249 5C

Effect of Increasing Depth on Salinity in the James River Estuary,
W74-07250 2L

Burleigh V. Calloway (Injunction Action Against a Beach Erosion Project).
W74-07288 6E

Agana Small Boat Harbor, Agana, Guam (Final Environmental Impact Statement).
W74-07294 4A

Environmental Impact Analysis: An Examination of Three Methodologies,
W74-07339 6G

Development of a Decision Room for Environntal Studies, (Feasibility Study),
W74-07371 6G

Possible Effects of Construction and Operation of a Supertanker Terminal on the Marine Environment in New York Bight,
W74-07488 5C

The Environmental Impact of Cadmium,
W74-07530 5A

Environmental Quality and its Evaluation,
W74-07533 5G

ENVIRONMENTAL ENGINEERING
Capital Cost Minimization of Drainage Networks,
W74-07309 4A

ENVIRONMENTAL IMPACT STATEMENT
Sierra Club V. Froehlke (Injunction Action Against Reservoir Project).
W74-07113 6E

Small Beach Erosion Control Project, Lewes, Delaware (Final Environmental Impact Statement).
W74-07295 4A

ENVIRONMENTAL IMPACT STATEMENTS
Procedures and Programs to Assist in the Environmental Impact Statement Process,
W74-07061 6B

Calcasieu River at Coon Island, Louisiana, Ship Channel (Final Environmental Impact Statement).
W74-07118 8A

Burleigh V. Calloway (Injunction Action Against a Beach Erosion Project).
W74-07288 6E

Agana Small Boat Harbor, Agana, Guam (Final Environmental Impact Statement).
W74-07294 4A

ENVIRONMENTAL QUALITY
Environmental Quality and its Evaluation,
W74-07533 5G

ENVIRONMENTAL SANITATION
Sanitary Districts for Sewage Disposal.
W74-07276 6E

EPIDEMIOLOGICAL STUDIES
An Epidemiological Study on Clonorchis sinensis at the Northern part of Wakayama Prefecture, Middle Japan, (In Japan),
W74-07540 5C

EPIZOOTIOLOGY
Diseases of Pond Fishes,
W74-07481 8I

EQUATIONS
Economic Size Selection for PVC Pipelines,
W74-07303 8A

EQUIPMENT
The Effluent-Free Bleached Kraft Pulp Mill. Part V. The R4 Process for Chlorine Dioxide Manufacture to Decrease Production of Sodium Sulphate,
W74-07378 5D

Some Equipment Used in Fibre Recovery and Effluent Treatment Operations.
W74-07390 5D

EQUITY
Cost Sharing for Recreation: Efficiency and Equity,
W74-07307 6B

EROSION
Drainage Density and Effective Precipitation,
W74-07155 2A

Recent Estuarine Sediment History of the Roanoke Island Area, North Carolina,
W74-07245 2L

Erosional and Depositional Estuarine 'Terraces,' Southeastern United States,
W74-07246 2L

Santee Submergence, Example of Cyclic Submerged and Emerged Sequences,
W74-07247 2L

A New Look at River Capture and At The Denudation History of the Weald,
W74-07324 2J

Dispersion of Contaminated Sediment Bed Load,
W74-07446 5B

Suspended-Sediment Yield in Rivers of Gor'kiy Oblast as an Indication of Recent Erosion Processes (Stok vzveshennykh nanosov v rekakh Gor'kovskoy obl. kak pokazatel' razvitiya sovremennykh erozionnykh protsessov),
W74-07507 2J

EROSION CONTROL
Reactivating Soil Ripping Treatments for Runoff and Erosion Control in the Southwestern U.S.,
W74-07089 2G

Sand Dune Reclamation in Iraq -- Present Status and Future Prospects,
W74-07104 2J

Control of Grading Practices in the City and County of Honolulu,
W74-07139 4D

Small Beach Erosion Control Project, Lewes, Delaware (Final Environmental Impact Statement).
W74-07295 4A

ERTS-1
Utilization of ERTS-1 Data to monitor and Classify Eutrophication of Inland Lakes,
W74-07484 5C

ESTIMATED COSTS
Phosphorus Removal Treatability Studies at C.F.B. Bordon, Petawawa, Trenton and Uplands,
W74-07273 5D

ESTUARIES

ESTUARIES

Environmental Framework of Coastal Plain Estuaries.
W74-07225 2L

Recent Investigations in Stratified Flows Related to Estuarial Hydraulics,
W74-07226 2L

Influence of Mineral-Water Reactions in Estuaries on Boron Budget in the Oceans,
W74-07227 2L

Comparison of Conditional Stability Constants of North Carolina Humic and Fulvic Acids with Co(II) and Fe(III),
W74-07228 5B

Amazon River Estuarine System,
W74-07229 2L

Biodeposition as a Factor in Sedimentation of Fine Suspended Solids in Estuaries,
W74-07231 2L

Spatial and Temporal Distribution of Suspended Sediment in Narragansett Bay and Rhode Island Sound,
W74-07232 2L

Suspended Sediment Transport in Delaware Bay,
W74-07233 2L

Distribution and Transportation of Suspended Sediment in Upper Cheasapeake Bay,
W74-07234 2L

Rio De La Plata Estuary Environments,
W74-07236 2L

Regional Clay Mineral Facies in Estuaries and Continental Margin of the United States East Coast,
W74-07237 2L

Source of Recent Nearshore Marine Clays, Southeastern United States,
W74-07238 2L

Mass Physical and Engineering Properties of Some York River Sediments,
W74-07239 2L

Strontium Isotope Composition and Sediment Transport in the Rio de la Plata Estuary,
W74-07240 2L

Techniques for use of Organic and Amorphous Materials in Source Investigations of Estuary Sediments,
W74-07241 2L

Texture and Organic Carbon Content of Bottom Sediments in some Estuaries of the United States,
W74-07243 2L

Biogeochemical Variables in Bottom Sediments of the Rapphannock River Estuary,
W74-07244 2L

Recent Estuarine Sediment History of the Roanoke Island Area, North Carolina,
W74-07245 2L

Erosional and Depositional Estuarine 'Terraces,' Southeastern United States,
W74-07246 2L

Santee Submergence, Example of Cyclic Submerged and Emerged Sequences,
W74-07247 2L

Marine Geology and Estuarine History of Mobile Bay, Alabama: Part 1. Contemporary Sediments,
W74-07248 2L

Effects of Man-Made Works on the Hydraulic, Salinity, and Shoaling Regimens of Estuaries,
W74-07249 5C

Effect of Increasing Depth on Salinity in the James River Estuary,
W74-07250 2L

Field and Experimental Studies on the Systematics and Ecology of Ulva curvata and Ulva rotundata,
W74-07473 5C

An Investigation of the Physical Impact of Sewage Outflow on a River-Estuarine Environment,
W74-07477 5C

A Study of the Movement of Phosphorous in the Little River Estuary, N.S.W.,
W74-07483 5B

Proceedings 2nd Annual Technical Conference on Estuaries of the Pacific Northwest.
W74-07491 2L

Some Estuarine Factors Influencing Ascent of Anadromous Cutthroat Trout in Oregon,
W74-07493 2L

Pacific Northwest Coastal Zone Management as it Relates to Estuary Protection,
W74-07500 6E

ESTUARINE FISHERIES

The Predicted Influence of Kraft Mill Effluent on the Fishery Resources,
W74-07145 5C

An Economic Evaluation of Alternative Levels of Water Quality: The Role of Water Quality in Relation to Economic Benefits,
W74-07146 6B

ETHMODISCUS REX

The Marine Diatom Ethmodiscus rex: Its Morphology and Occurrence in the Plankton of the Sargasso Sea,
W74-07547 5A

EUROPE

The Pulp and Paper Industry and the Environment,
W74-07411 5D

EUTROPHIC LAKES

Leech Communities (Hirudinea) in the Mazurian and Bialystok Regions and the Pomeranian Lake District,
W74-07542 5C

EUTROPHICATION

Factors Affecting Phytoplankton Production in a Eutrophic Reservoir,
W74-07121 5C

Function of Marshes in Reducing Eutrophication of Estuaries of the Middle Atlantic Region,
W74-07336 5C

Systems simulation of the effect of tertiary treatment for carbon, nitrogen, and phosphorus removal upon primary productivity, standing crop, and community structure of autotrophic and hetertrophic communities in receiving model streams.
W74-07337 5C

Utilization of ERTS-1 Data to monitor and Classify Eutrophication of Inland Lakes,
W74-07484 5C

Bacteria-Assimilable Organic Compounds, Phosphate, and Enhanced Growth of Bacteria-Associated Blue-Green Algae,
W74-07587 5C

EVALUATION

Economic Evaluation and Determination of Plant Capacity and Dam Height,
W74-07305 8A

Development of a Decision Room for Environmtal Studies, (Feasibility Study),
W74-07371 6G

EVAPORATION

Evaporation of Water from Sand: 5. The Effect of Evaporation on the Concentration of Salts Dissolved in Water Stored in Sand,
W74-07169 2D

Self Cleaning, Tubular Solar Still,
W74-07207 3A

Instability of Water Cooled from Above,
W74-07458 2H

Investigation of the Relation of Groundwater Evaporation to Lithological Structure of the Zone of Aeration (K izucheniyu zavisimosti ispareniya gruntovykh vod ot litologicheskogo stroyeniya zony aeratsii),
W74-07529 2D

EVAPORATION CONTROL

Model Tests with Thin Sheets to Reduce Evaporation,
W74-07103 3B

EVAPORATION PANS

Solar Evaporation Controlled Irrigation System,
W74-07211 2D

Irrigation and Sprinkler System,
W74-07212 3F

EVAPOTRANSPIRATION

Evapotranspiration on a Palouse Watershed,
W74-07087 2D

Evaporation from an Irrigated Rice Crop in a Semi-Arid Region,
W74-07096 2D

EXCAVATION

Annotated Bibliography of Explosive Excavation Related Research.
W74-07314 8H

EXPLORATION

Application of Geochemistry to the Search for Crude Oil and Natural Gas,
W74-07161 4B

EXPLOSIVE EXCAVATIONS

Annotated Bibliography of Explosive Excavation Related Research.
W74-07314 8H

EXPLOSIVES

Annotated Bibliography of Explosive Excavation Related Research.
W74-07314 8H

EXTERNAL DISECONOMIES

Pollution, Production, and Compensation,
W74-07064 5G

L CREEK (N
Vater Uses and Water Development in Fall reek-Possible Conflicts,
774-07149 6B

RM MANAGEMENT
and Application of Sewage Sludge,
774-07266 5D

mmonium and Nitrate Uptake by Corn (Zea ays L.) as Influenced by Nitrogen Concentra-on and NH4(+)/NO3(-) Ratio,
774-07459 3F

RMERS METHOD (CHARACTERISTIC DES)
he Forecasting of Streamflow Using the lethod of Characteristic Modes,
774-07178 4A

T
luorocarbon and Oxygen-Providing Com-ound Treatment of Waste Waters,
774-07200 5D

TE OF POLLUTANTS
he Photochemistry of Carbamates. 1. The hotodecomposition of Zectran: 4-Dimethylamino-3,5-XYLYL-N-Methyl Carba-nate,
W74-07552 5B

ASIBILITY STUDIES
A Bill to Authorize the Secretary of the Interior o Engage in Feasibility Investigations of Cer-ain Potential Water Resource Developments.
W74-07284 6E

DERAL GOVERNMENT
Stormflow Pollution Control in the U.S.,
W74-07256 5D

A Bill to Authorize the Secretary of the Interior o Engage in Feasibility Investigations of Cer-ain Potential Water Resource Developments.
W74-07284 6E

DERAL PROJECT POLICY
Procedures and Programs to Assist in the En-vironmental Impact Statement Process,
W74-07061 6B

RMENTATION
Water Reuse in Protein Feed Process Utilizing Lumber Mill Wastes,
W74-07409 5D

RTILITY (FISH)
Fertility of the Fish From Varvara Reservoir, (In Russian),
W74-07591 8I

RTILIZERS
Effects of Moisture Stress at Early Heading and of Nitrogen Fertilizer on Three Spring Wheat Cultivars,
W74-07351 3F

ELD CROPS
Soil Moisture Dynamics and Its Variations in Soils Under Field Crops (Dinamika vlazhnosti i stepen' yeye var'irovaniya v pochvakh pod polevymi kul'turami),
W74-07509 2G

ILLING
Small Beach Erosion Control Project, Lewes, Delaware (Final Environmental Impact State-ment).
W74-07295 4A

FILTERS
Microbiological Purification of Hydrogen Sul-fide-Containing Kraft Mill Effluents (Mikrobiologicheskaya ochistka serovodorod-nykh stochnykh vod sul'fatno-tsellyuloznogo proizvodstva),
W74-07387 5D

Some Equipment Used in Fibre Recovery and Effluent Treatment Operations.
W74-07390 5D

FILTRATION
Method of and Apparatus for the Purification of Water Containing Organic Contaminants,
W74-07199 5D

Apn aratus for Separating Oil and SolidsfFrm m Water,
W74-07202 5D

High-Rate Multi-Media Filtration,
W74-07261 5D

Modular Wastewater Treatment System Demonstration For The Textile Maintenance Industry,
W74-07343 5D

Effluent - Fibre Recovery - Water Savings; Case History of a Recent Plant Installation,
W74-07395 5D

Pollution Control by Recycling Effluent,
W74-07407 5D

FINANCING
Utilities and Facilities for New Residential Development: A Survey of Municipal Policy,
W74-07071 5D

FINITE ELEMENT ANALYSIS
Critical Analysis of the Alternating Direction Implicit Method of Aquifer Analysis,
W74-07154 2F

Steady State Flow in Rigid Networks of Frac-tures,
W74-07521 2F

FISH CAGES
On the Composition of Mixed Fodder Rations for Trout in Net Cages, (In German),
W74-07599 8I

FISH DISEASES
Diseases of Pond Fishes,
W74-07481 8I

FISH FOOD
In Comparison of the Food of Salamanders and Fish in Marion Lake, British Columbia,
W74-07349 2H

FISH FOOD ORGANISMS
The Food Habits and Age and Growth of Gol-deye, Hiodon alosoides (Rafinesque), in Beaver Creek, Lake Oahe, North Dakota, 1971-72,
W74-07474 8I

FISH HATCHERIES
A New Type of Incubator Used in the Induced Spawning of Phytophagous Fishes, (In Rumani-an),
W74-07434 8I

FISH PARASITES
Nematode Fishe Parasites from Sangalkam, Senegal,
W74-07589 2H

FISH POPULATIONS
Ecology and Productivity of Strip-Mine Areas in Mercer County, Pennsylvania,
W74-07055 5B

FISH PROTEIN CONCENTRATE
Reduction in Mercury Content of Fish Protein Concentrate by Enzymatic Digestion,
W74-07576 5A

FISH REPRODUCTION
A New Type of Incubator Used in the Induced Spawning of Phytophagous Fishes, (In Rumani-an),
W74-07434 8I

FISH SPECIES
Structure of Fish Groupings in the Rivers and Streams of the River Nida Drainage Basin,
W74-07539 2I

FISHERIES
Multi-Disciplinary Study of Water Quality Relationships: A Case Study of Yaquina Bay, Oregon,
W74-07142 6B

Mussel Fishery Investigations, Tennessee, Ohio, and Green Rivers,
W74-07187 8I

FISHERIES MANAGEMENT
Effect of Anhydrous Ammonia on a Central Texas Pond, and a Review of Previous Research with Ammonia in Fisheries Manage-ment,
W74-07595 5C

FISHERY
Contributions to the Calculation of the Rood Territory Width and the Transversal Section Under the Retention Level at the Weirs and Dams of Fishery Purposes, (In Rumanian),
W74-07448 8I

Food Supply and Character of its Utilization by Dniester Vimba Fry in Ponds, (In Russian),
W74-07592 8I

FJORDS
A Strategy for Modeling Primary Production in Stratified Fjords,
W74-07494 5C

FLOATING BREAKWATERS
State of the Art of Floating Breakwaters,
W74-07498 8A

FLOATS
State of the Art of Floating Breakwaters,
W74-07498 8A

FLOCCULATION
Modular Wastewater Treatment System Demonstration For The Textile Maintenance Industry,
W74-07343 5D

New Effluent Plant at Colthrop Board Mills.
W74-07380 5D

Mechanical Waste Water Clarification and Biological-Chemical Waste Water Purification Using the Attisholz and Ruthner System (Mechanische Abwasserklaerung und biologisch-chemische Abwasserreinigung nach System Attisholz und Ruthner),
W74-07381 5D

How Polyacrylamides can Help Effluent Problems,
W74-07391 5D

Pollution Control by Recycling Effluent,
W74-07407 5D

FLOOD CONTROL
Flood Plain Information-Neuse and Trent Rivers and Jack Smith Creek, New Bern, North Carolina.
W74-07073 4A

Flood Plain Information-Neuse River and Buffalo Creek, Smithfield, North Carolina.
W74-07074 4A

Interim Storm Drainage Plan Report-Little Rock-North Little Rock Metropolitan Area.
W74-07082 5D

Study Design. Surface Drainage Program, Madison, St. Clair, Monroe and Randolph Counties, Illinois.
W74-07083 4A

State Flood Control Program.
W74-07111 4A

The Bittersweet Waters of the Lower Colorado,
W74-07292 3F

FLOOD CONTROL DAM
Sierra Club V. Froehlke (Injunction Action Against Reservoir Project).
W74-07113 6E

FLOOD DAMAGE
Background Survey. Surface Drainage Program, Madison, Saint Clair, Monroe and Randolph Counties, Illinois.
W74-07066 4A

Flood Plain Information-Neuse and Trent Rivers and Jack Smith Creek, New Bern, North Carolina.
W74-07073 4A

Flood Plain Information-Neuse River and Buffalo Creek, Smithfield, North Carolina.
W74-07074 4A

Flood Plain Information: Burdens and Two Bottle Creeks at Research Triangle Area, Durham County, North Carolina.
W74-07075 4A

Flood Plain Information - Glade Creek, Vinton, Virginia.
W74-07076 4A

Ansley V. Tarrant County Water Control and Improvement District No. One (Liability for Flooding and Amount of Damage).
W74-07117 6E

FLOOD DATA
An Investigation of Floods in Hawaii Through September 30, 1973,
W74-07185 2E

FLOOD IRRIGATION
Evaporation from an Irrigated Rice Crop in a Semi-Arid Region,
W74-07096 2D

FLOOD PLAINS
A Computer Simulation Model for Flood Plain Development. Part II: Model Description and Applications,
W74-07296 6A

FLOOD PROFILES
Flood Plain Information: Burdens and Two Bottle Creeks at Research Triangle Area, Durham County, North Carolina.
W74-07075 4A

Flood Plain Information - Glade Creek, Vinton, Virginia.
W74-07076 4A

FLOOD PROTECTION
Background Survey. Surface Drainage Program, Madison, Saint Clair, Monroe and Randolph Counties, Illinois.
W74-07066 4A

A Computer Simulation Model for Flood Plain Development. Part II: Model Description and Applications,
W74-07296 6A

FLOOD RECURRENCE INTERVAL
Ansley V. Tarrant County Water Control and Improvement District No. One (Liability for Flooding and Amount of Damage).
W74-07117 6E

FLOODING
Research on the Micromorphology of the Flooded Poszolic Soils of Shallow Water Reservoirs, (In Russian),
W74-07235 2G

Optimum Design Height of Cofferdams,
W74-07304 8A

Volatility of DDT Residues in Soil as Affected by Flooding and Organic Matter Applications,
W74-07424 5B

FLOODPROOFING
Flood Proofing Decisions with Uncertain Events,
W74-07299 6A

FLOODS
Flood Plain Information: Burdens and Two Bottle Creeks at Research Triangle Area, Durham County, North Carolina.
W74-07075 4A

An Investigation of Floods in Hawaii Through September 30, 1973,
W74-07185 2E

Effect of Agnes Floods on Annual Series in Pennsylvania,
W74-07455 2E

FLORA
The Past and Present Flora and Vegetation of the Hackensack Meadows,
W74-07476 2I

FLORIDA
Hydrologic Conditions in the Lakeland Ridge Area of Polk County, Florida,
W74-07318 4B

FLOTATION
Process of Separation of Emulsified or Dispersed Matter From Water,
W74-07197 5D

System and Method for Separating Heavier and Lighter Components of Liquid Mixtures,
W74-07203 5D

Foam Flotation Concentration of Sewage,
W74-07214 5D

Screening/Dissolved-Air Flotation Treatment of Combined Sewer Overflows,
W74-07262 5D

Modular Wastewater Treatment System Demonstration For The Textile Maintenance Industry,
W74-07343 5D

How Polyacrylamides can Help Effluent Problems,
W74-07391 5D

FLOTSAM
Apparatus for Removing Surface Pollutants from Water and Other Liquids,
W74-07223 5G

FLOW AUGMENTATION
Application of a Large Scale Nonlinear Programming Problem to Pollution Control,
W74-07461 5D

FLOW NETS
Ground-Water Flow Patterns in Confined Aquifers and Pollution,
W74-07510 5B

FLUOROCARBON
Fluorocarbon and Oxygen-Providing Compound Treatment of Waste Waters,
W74-07200 5D

FOOD CANNERIES
In-Plant, Continuous Hot-Gas Blanching of Spinach,
W74-07368 3E

FOOD HABITS
The Food Habits and Age and Growth of Goldeye, Hiodon alosoides (Rafinesque), in Beaver Creek, Lake Oahe, North Dakota, 1971-72,
W74-07474 8I

FOOD PROCESSING INDUSTRY
The Plankton of Ponds Enriched with Wastes from Beet Sugar Factories,
W74-07478 5C

FORAGE GRASSES
Study on the Pasture Establishment Technique VI. Effect of Different Spacings and Weedings on Establishment and Forage Production of Cenchrus ciliaris Linn., Lasiurus sindicus Henr. and Panicum antidotale Retz under Arid Conditions,
W74-07107 3F

FORAGE LEGUMES
Effect of Seeding Rates and Row Spacings on Fodder Production of Moth Bean (Phaseolus aconitifolius),
W74-07091 3F

FORECASTING
An Irrigation Scheduling Model Which Incorporates Rainfall Predictions,
W74-07440 3F

FOREST MANAGEMENT
Potential of Westland's Morainic Soils for Forest Management,
W74-07594 4A

FORESTS
Phenology of a Tropical Rain Forest in Malaya,
W74-07482 2I

Snow Accumulation and Snowmelt as Influenced by a Small Clearing in a Lodgepole Pine Forest,
W74-07526 2C

The Age Dynamics and the Economic Selection Cuttings in Broad Leaved Dark Coniferous Forests of the Water Protective Shelterbelt of the UFA River Within the Sverdlovsk Region, (In Russian),
W74-07600 4A

RACTURES (GEOLOGIC)
Groundwater Geology of Fort Valley, Coconino County, Arizona,
W74-07092 4B

Steady State Flow in Rigid Networks of Fractures,
W74-07521 2F

RANCE
Vertical Movements in the Nonsaturated Zone and the Specific Yield of a Water-Table Aquifer (Etude des transferts verticaux dans la zone non saturee et de l'emmagasinement d'une nappe libre, dans le cas d'un pompage, dans les conditions na turelles),
W74-07182 2F

REON
Fluorocarbon and Oxygen-Providing Compound Treatment of Waste Waters,
W74-07200 5D

REQUENCY ANALYSIS
Simulation--A Tool for Water Resource Management,
W74-07300 6A

RESHWATER FISH
The Food Habits and Age and Growth of Goldeye, Hiodon alosoides (Rafinesque), in Beaver Creek, Lake Oahe, North Dakota, 1971-72,
W74-07474 8I

ROTH FLOTATION
Water Purification Apparatus,
W74-07209 5D

Waste water treatment,
W74-07219 5D

ULVIC ACIDS
Comparison of Conditional Stability Constants of North Carolina Humic and Fulvic Acids with Co(II) and Fe(III),
W74-07228 5B

UNGI
Annotated Checklist and Host Index for Arizona Wood-Rotting Fungi,
W74-07097 2I

Effect of Irrigation on Dynamics of Microorganism Quantity in Dark-Brown Soils in Southern Ukraine, (In Ukrainian),
W74-07279 2G

GADOLINIUM
Removal of Phosphates from Wastewaters with Electro-Chemically Generated Gadolinium Ions,
W74-07271 5D

GAMBUSIA-AFFINIS
Biochemistry of Selective Toxicity and Biodegradability: Comparative O-Dealkylation by Aquatic Organisms,
W74-07126 5C

GAMMA RAYS
Micro-Determination of Cation-Exchange Capacity by Neutron Activation Analysis,
W74-07439 2G

GAS CHROMATOGRAPHY
Multiple Organochlorine Pesticide Residues in Japan,
W74-07560 5A

Solvent Extraction of Sulfur From Marine Sediment and Its Determination by Gas Chromatography,
W74-07565 5A

Acid Ammonium Acetate Extraction and Electron Capture Gas Chromatographic Determination of Carbofuran in Soils,
W74-07574 5A

Observations on the Gas Chromatography of Kelthane (Dicofol),
W74-07575 5A

Gas Chromatographic Studies of Mixed-Ligand Complexes of Divalent Cations,
W74-07582 5A

GASES
Land Disposal of Waste Gases: III. Sorption Patterns From Buried Gas Injection Pipes,
W74-07422 5B

GEOCHEMISTRY
Application of Geochemistry to the Search for Crude Oil and Natural Gas,
W74-07161 4B

Mechanism of Element Distribution in the Pacific Ocean (Japanese Profile) (K poznaniyu mekhanizma raspredeleniya elementov v Tikhom okeane (Yaponskiy profil')),
W74-07503 2J

Bromine in Groundwater of Uzbekistan (Brom v podzemnykh vodakh Uzbekistana),
W74-07505 2K

GEOHYDROLOGIC UNITS
Groundwater Geology of Fort Valley, Coconino County, Arizona,
W74-07092 4B

GEOMORPHOLOGIC DATA
A Computer Atlas of Hydrologic and Geomorphologic Data for Small Watersheds in Indiana,
W74-07432 2A

GEOMORPHOLOGY
Drainage Density and Effective Precipitation,
W74-07155 2A

Karst Processes of the Eastern Upper Galilee, Northern Israel,
W74-07157 2F

A New Look at River Capture and At The Denudation History of the Weald,
W74-07324 2J

A Computer Atlas of Hydrologic and Geomorphologic Data for Small Watersheds in Indiana,
W74-07432 2A

GERMANY
Possibilities of Effluent Clarification (Moeglichkeiten der Abwasserklaerung),
W74-07382 5D

GERMINATION
An Investigation of Propagation and the Mineral Nutrition of Spartina alterniflora,
W74-07486 5C

GLACIAL DRIFT
Ground-Water Resources of McLean County, North Dakota,
W74-07313 2F

A Scanning Electron Microscope Study of Surface Textures of Quartz Grains from Glacial Environments,
W74-07331 2J

GLUCOSE
Effects of Thickness on Bacterial Film,
W74-07545 5C

GLUTARALDEHYDE COAGULATION
Waste Water Treatment in Commercial Fish Processing: Reducing Stick Water Loadings,
W74-07270 5D

GLYCEROL
Effect of Light Intensity and Glycerol on the Growth, Pigment Composition, and Ultrastructure of Chroomonas Sp.,
W74-07548 5C

GOLD ELECTRODES
Rotating Ring-Disk Electrode Study of the Adsorption of Lead on Gold in 0.5M Potassium Chloride,
W74-07555 2K

GOLDEYE
The Food Habits and Age and Growth of Goldeye, Hiodon alosoides (Rafinesque), in Beaver Creek, Lake Oahe, North Dakota, 1971-72,
W74-07474 8I

GRADIENTS (STREAMS)
A New Look at River Capture and At The Denudation History of the Weald,
W74-07324 2J

GRADING
Control of Grading Practices in the City and County of Honolulu,
W74-07139 4D

GRAND CANYON NATIONAL PARK
Chemical and Biological Problems in the Grand Canyon,
W74-07093 5B

GRASSES
An Investigation of Propagation and the Mineral Nutrition of Spartina alterniflora,
W74-07486 5C

GRASSLANDS
Effect of Contour Furrows and Contour Bunds on Water Conservation in Grasslands of Western Rajasthan,
W74-07090 3F

Drainage Density and Effective Precipitation,
W74-07155 2A

GRAVITY SEPARATION
System and Method for Separating Heavier and Lighter Components of Liquid Mixtures,
W74-07203 5D

GRAZING
Intensive Infiltrometer Studies on A Plowed Big Sagebrush Site,
W74-07166 2G

A Study of the Intake of Drinking Water by Dairy Cows at Grass,
W74-07358 3F

Effect of Grazing on Runoff from Two Small Watersheds in Southwestern Wisconsin,
W74-07525 4C

GRAZING ANIMALS
Short-Term Response in Ungulate Numbers to Rainfall in the Nossob River of the Kalahari Gemsbok National Park,
W74-07535 2I

GREAT BRITAIN (ENGLAND)
A Synthetic Model for Daily Streamflow,
W74-07179 2E

A New Look at River Capture and At The Denudation History of the Weald,
W74-07324 2J

GREAT BRITAIN (JERSEY-CHANNEL ISLANDS)

GREAT BRITAIN (JERSEY-CHANNEL ISLANDS)
Planning and Operational Studies in the Integrated Use of Desalination. Case Studies for Cyprus and Jersey,
W74-07308 3A

GREAT PLAINS
Coal-Energy Development in the Northern Great Plains.
W74-07056 6D

GROUNDWATER
Groundwater Geology of Fort Valley, Coconino County, Arizona,
W74-07092 4B

Quality of Well Waters of Jaipur District,
W74-07106 4B

Public Groundwater Supplies in Adams County,
W74-07172 4B

Aquifers in the Sokoto Basin, Northwestern Nigeria, with a Description of the General Hydrogeology of the Region,
W74-07184 2F

Water Resources of the Taunton River Basin Southeastern Massachusetts,
W74-07190 7C

Long-Term Trends in Groundwater Level Fluctuations (Mnogoletniye tendentsii v kolebaniyakh urovney poszemnykh vod),
W74-07191 2F

Interdisciplinary Modeling in the Analysis of the Salinity Problems of the Safford Valley,
W74-07297 5B

Ground-Water Resources of McLean County, North Dakota,
W74-07313 2F

Strontium and Other Notable Chemical Constituents of Well-Water of Allen County, Indiana,
W74-07400 2K

Public Groundwater Supplies in Bond County,
W74-07429 4B

A Groundwater Profile Sampler,
W74-07523 2F

Investigation of the Relation of Groundwater Evaporation to Lithological Structure of the Zone of Aeration (K izucheniyu zavisimosti ispareniya gruntovykh vod ot litologicheskogo stroyeniya zony aeratsii),
W74-07529 2D

GROUNDWATER AVAILABILITY
Sandstone Aquifers in Eastern Sullivan County, Indiana,
W74-07401 4B

GROUNDWATER BASINS
Bromine in Groundwater of Uzbekistan (Brom v podzemnykh vodakh Uzbekistana),
W74-07505 2K

GROUNDWATER MOVEMENT
Critical Analysis of the Alternating Direction Implicit Method of Aquifer Analysis,
W74-07154 2F

Long-Term Trends in Groundwater Level Fluctuations (Mnogoletniye tendentsii v kolebaniyakh urovney poszemnykh vod),
W74-07191 2F

Underflow in River Valleys of the Carpatho-Ukraine (Podruslovyy stok v rechnykh dolinakh Zakarpat'ya),
W74-07504 2F

Ground-Water Flow Patterns in Confined Aquifers and Pollution,
W74-07510 5B

Effect of Partial Penetration on Flow in Unconfined Aquifers Considering Delayed Gravity Response,
W74-07514 2F

A Numerical Model Based on Coupled One-Dimensional Richards and Boussinesq Equations,
W74-07515 2F

Seepage Through a Hillside: The Steady Water Table,
W74-07517 2G

Steady State Flow in Rigid Networks of Fractures,
W74-07521 2F

An Experimental Study of Immiscible Displacement with an Unfavorable Mobility Ratio in Porous Media,
W74-07524 2F

GROUNDWATER RESOURCES
Long-Term Trends in Groundwater Level Fluctuations (Mnogoletniye tendentsii v kolebaniyakh urovney poszemnykh vod),
W74-07191 2F

GROWTH RATES
A Continuous Culture Study of Phosphate Uptake, Growth Rate and Polyphosphate in Scenedesmus Sp.,
W74-07549 5C

GUAM (AGANA)
Agana Small Boat Harbor, Agana, Guam (Final Environmental Impact Statement).
W74-07294 4A

GYPSUM
Effect of Gypsum in Reducing Boron Hazard of Saline Waters and Soils,
W74-07095 3C

Leaching Losses of Sulfur During Winter Months When Applied as Gypsum, Elemental S or Prilled S,
W74-07449 5B

HABITATS
Kelp Habitat Improvement Project, Annual Report July 1, 1970 - June 30, 1971.
W74-07489 5C

Kelp Habitat Improvement Project, Annual Report July 1, 1971 - June 30, 1972.
W74-07490 5C

HARBORS
Planning and Developing Waterfront Property,
W74-07072 6B

Agana Small Boat Harbor, Agana, Guam (Final Environmental Impact Statement).
W74-07294 4A

Possible Effects of Construction and Operation of a Supertanker Terminal on the Marine Environment in New York Bight,
W74-07488 5C

HAWAII
Water Resources Seminar Series No. 2.
W74-07133 6B

Hydrogeology of Carbonate and Volcanic Rocks--Similarities and Contrasts,
W74-07134 2F

Current Thinking in Water Resources Research and Their Applicability to Hawaii Conditions,
W74-07135 6B

Development of Dike Stored Water By Drilling, Waihee, Oahu,
W74-07137 2F

Hawaii's Statewide Land Classification Proves Adaptability as Land Use and Environmental Concerns Change,
W74-07138 4A

Control of Grading Practices in the City and County of Honolulu,
W74-07139 4D

An Investigation of Floods in Hawaii Through September 30, 1973,
W74-07185 2E

Burleigh V. Calloway (Injunction Action Against a Beach Erosion Project).
W74-07288 6E

Volcanic Air Pollution: Deleterious Effects on Tomatoes,
W74-07430 5C

Evaluation of Methods of Pumping Test Analyses for Application to Hawaiian Aquifers,
W74-07531 5C

HEAT FLUX
The Heat Flux Density in a Non-Homogeneous Bare Loessial Soil,
W74-07346 2G

HEAT TRANSFER
Heat Dispersion Effect on Thermal Convection in a Porous Medium Layer,
W74-07156 2F

HEAT TREATMENT
Subsurface Heating and Irrigation of Soils: Its Effect on Temperature and Water Content and on Plant Growth,
W74-07054 2G

HEATED WATER
An Economic Analysis of Selected Agricultural Uses of Warm Water in the Pacific Northwest Resulting from Electric Power Generation,
W74-07125 3C

HEIGHT
Optimum Design Height of Cofferdams,
W74-07304 8A

Economic Evaluation and Determination of Plant Capacity and Dam Height,
W74-07305 8A

HERBICIDES
Erosional Losses of S-Triazine Herbicides,
W74-07421 5B

HERBIVORES
Herbivorous Fish for Aquatic Plant Control,
W74-07470 4A

HETEROTROPHIC BACTERIA
The Bacterial Flora of the Atlantic Salmon (Salmo salar L.) in Relation to its Environment,
W74-07567 5A

HIGHWAYS
Sediment Discharge in the Lake Tahoe Basin, California, 1972 Water Year,
W74-07326 2J

TORIC FLOODS
ffect of Agnes Floods on Annual Series in ennsylvania,
74-07455 2E

NOLULU (HAWAII)
ontrol of Grading Practices in the City and ounty of Honolulu,
74-07139 4D

OSON RIVER
Study of Potential Institutional Arrangeents for Water Quality and Water Resources uantity) Planning and Management,
74-07051 6B

MAN POPULATION
he Geology of Water: The Limiting Factor in rban Development,
74-07402 3D

MIC ACIDS
omparison of Conditional Stability Constants North Carolina Humic and Fulvic Acids with o(II) and Fe(III),
74-07228 5B

RRICANE AGNES (1972)
ffect of Agnes Floods on Annual Series in ennsylvania,
74-07455 2E

RRICANES
lood Plain Information-Neuse and Trent ivers and Jack Smith Creek, New Bern, orth Carolina.
74-07073 4A

ffect of Agnes Floods on Annual Series in ennsylvania,
74-07455 2E

RST PHENOMENON
treamflow Simulation: 3. The Broken Line rocess and Operational Hydrology,
74-07520 2A

DRAULIC CONDUCTIVITY
Experimental Evaluation of a Method for Determining Unsaturated Hydraulic Conductivity,
74-07088 2G

DROELECTRIC POWER
Hydroelectric Power Resources of the United States, Developed and Undeveloped, January , 1972.
74-07189 8C

DROELECTRIC POWER RESOURCES
Hydroelectric Power Resources of the United States, Developed and Undeveloped, January , 1972.
74-07189 8C

DROGEN PEROXIDE
Hydrogen Peroxide Cures Filamentous Growth n Activated Sludge,
74-07253 5D

DROGEN SULFIDE
Microbiological Purification of Hydrogen Sulfide-Containing Kraft Mill Effluents (Mikrobiologicheskaya ochistka serovodorodnykh stochnykh vod sul'fatno-tsellyuloznogo proizvodstva),
74-07387 5D

Hydrogen Sulfide Production by Synechococcus lividus Y52-si,
74-07546 5C

HYDROGEOLOGY
Hydrogeology of Carbonate and Volcanic Rocks--Similarities and Contrasts,
74-07134 2F

Hydrogeology of the Sasso Lungo Group, a Dolomitic Reef Stock in the Alpine Dolomites of North Italy,
74-07153 2F

Aquifers in the Sokoto Basin, Northwestern Nigeria, with a Description of the General Hydrogeology of the Region,
74-07184 2F

Hydrologic Conditions in the Lakeland Ridge Area of Polk County, Florida,
74-07318 4B

Hydrology of the Dunes Area North of Coos Bay, Oregon,
74-07325 2L

HYDROGRAPH ANALYSIS
Generation Models for Synthetic Annual and Monthly Flows for Some Indiana Watersheds,
74-07431 2A

HYDROGRAPHS
A Rainfall-Runoff Model Based on the Watershed Stream Network,
74-07464 2A

First Characterization of the Runoff From the Watershed of the Manso Superior River and its Basins (Argentina), (In Spanish),
74-07536 2E

HYDROLOGIC DATA
Aquifers in the Sokoto Basin, Northwestern Nigeria, with a Description of the General Hydrogeology of the Region,
74-07184 2F

An Investigation of Floods in Hawaii Through September 30, 1973,
74-07185 2E

Records of Ground-Water Levels in Wyoming, 1940-1971,
74-07186 4B

Data for Municipal Wells in the City of Modesto, California,
74-07320 4B

Annual Compilation and Analysis of Hydrologic Data for Urban Studies in the San Antonio, Texas Metropolitan Area, 1971,
74-07323 2E

Parameter Identification in Field Problems,
74-07428 7C

HYDROLYSIS
Water Reuse in Protein Feed Process Utilizing Lumber Mill Wastes,
74-07409 5D

HYDROLYSIS PLANTS
Effect of Effluents from Hydrolysis Plant on the Survival of Typhoid Fever and Dysentery Bacteria, (In Russian),
74-07367 5C

ICE
Studies on Organisms Found in Arctic Sea Ice,
74-07487 5C

ICE COVER
Winter-Regime Thermal Response of Heated Streams,
74-07511 5B

IDAHO
Evapotranspiration on a Palouse Watershed,
74-07087 2D

Intensive Infiltrometer Studies on A Plowed Big Sagebrush Site,
74-07166 2G

Environmental Impact Analysis: An Examination of Three Methodologies,
74-07339 6G

Mathematical Simulation of Subsurface Flow Contributions to Snowmelt Runoff, Reynolds Creek Watershed, Idaho,
74-07516 2F

IDAHO BATHOLITH
Water Retention of Granitic Soils in the Idaho Batholith,
74-07170 2G

ILLINOIS
Background Survey. Surface Drainage Program, Madison, Saint Clair, Monroe and Randolph Counties, Illinois.
74-07066 4A

Study Design. Surface Drainage Program, Madison, St. Clair, Monroe and Randolph Counties, Illinois.
74-07083 4A

Study Design. Surface Drainage Program, Madison, St. Clair, Monroe and Randolph Counties, Illinois.
74-07083 4A

Research Activities of the Illinois State Water Survey,
74-07136 6B

Public Groundwater Supplies in Adams County,
74-07172 4B

Network Approach to Management of Conjunctively Operated Ground Water - Surface Water Systems,
74-07335 4A

Public Groundwater Supplies in Bond County,
74-07429 4B

IN VITRO SYNTHESIS
In Vitro Formation of Nitrate Reductase Using Extracts of the Nitrate Reductase Mutant of Neurospora crassa, Nit-1, and Rhodospirillum rubrum,
74-07577 5B

INCOME DISTRIBUTION
Urban Impacts of Rural Resource Development Expenditures in the Interlake Area of Manitoba,
74-07068 6B

INCUBATORS
A New Type of Incubator Used in the Induced Spawning of Phytophagous Fishes, (In Rumanian),
74-07434 8I

INDIA (RAJASTHAN)
Effect of Contour Furrows and Contour Bunds on Water Conservation in Grasslands of Western Rajasthan,
74-07090 3F

Effect of Seeding Rates and Row Spacings on Fodder Production of Moth Bean (Phaseolus aconitifolius),
74-07091 3F

INDIA (RAJASTHAN)

Agroclimatic Regions of Rajasthan,
W74-07102 3F

Population, Land Use and Livestock Composition in India and Its Arid Zone,
W74-07105 3F

Quality of Well Waters of Jaipur District,
W74-07106 4B

Study on the Pasture Establishment Technique VI. Effect of Different Spacings and Weedings on Establishment and Forage Production of Cenchrus ciliaris Linn., Lasiurus sindicus Henr. and Panicum antidotale Retz under Arid Conditions,
W74-07107 3F

INDIA (RAJATHAN)

A Contribution to the Botany of Ganganagar District, North Rajasthan,
W74-07357 3F

INDIANA

Cost Sharing for Recreation: Efficiency and Equity,
W74-07307 6B

Strontium and Other Notable Chemical Constituents of Well-Water of Allen County, Indiana,
W74-07400 2K

Sandstone Aquifers in Eastern Sullivan County, Indiana,
W74-07401 4B

A Preliminary Description of the Physico-Chemical Characteristics and Biota of Three Strip Mine Lakes, Spencer County, Indiana,
W74-07403 5B

Quantitative Chemical Analysis of Specific Components of the Waters of Lost Creek and the Wabash River, Vigo County, Indiana,
W74-07405 5A

Generation Models for Synthetic Annual and Monthly Flows for Some Indiana Watersheds,
W74-07431 2A

A Computer Atlas of Hydrologic and Geomorphologic Data for Small Watersheds in Indiana,
W74-07432 2A

Nutrient Cycling and Productivity of Dystrophic Lake-Bog Systems (Part B),
W74-07466 5C

INDIRECT BENEFIT

The Impact of Sport Angling on the Yaquina Bay Economy,
W74-07144 6B

INDUSTRIAL WASTES

Economic Study of the Effect of Municipal Sewer Surcharges on Industrial Wastes and Water Usage,
W74-07057 5G

Pollution and Industry: Pros, Cons of Growing Fight.
W74-07112 5G

The Interlake Affair,
W74-07120 5G

A Systems Analysis of Water Quality Survey Design,
W74-07310 5B

Organization of the Collection and Decontamination of Industrial and Domestic Radioactive Sewage, (In Russian),
W74-07362 5D

Determination of Pentachlorophenol in Natural and Waste Waters,
W74-07385 5A

Study of the Adaptation of an Activated Sludge to the Purification of an Industrial Effluent (Etude de l'adaptation d'une boue activee a l'epuration d'un effluent industriel),
W74-07389 5D

Water Reuse and Recycle in Kraft Bleacheries,
W74-07394 5D

INDUSTRIAL WATER

Economic Study of the Effect of Municipal Sewer Surcharges on Industrial Wastes and Water Usage,
W74-07057 5G

User Charges and Industrial Cost Recovery, Denver SMSA,
W74-07370 5D

Water Reuse in Protein Feed Process Utilizing Lumber Mill Wastes,
W74-07409 5D

An Overview of Water Reuse Potential in Pulp and Paper Manufacturing,
W74-07410 5D

INFILTRATION

Experimental Evaluation of a Method for Determining Unsaturated Hydraulic Conductivity,
W74-07088 2G

Intensive Infiltrometer Studies on A Plowed Big Sagebrush Site,
W74-07166 2G

Prevention and Control of Infiltration and Inflow,
W74-07257 5D

Infiltration and Water Table Effects of Soil Air Pressure Under Border Irrigation,
W74-07301 3F

INFILTROMETERS

Intensive Infiltrometer Studies on A Plowed Big Sagebrush Site,
W74-07166 2G

INFLOW

Prevention and Control of Infiltration and Inflow,
W74-07257 5D

INHIBITORS

The Effect of Lack of a Carbon Source on Nitrate-Reductase Activity in Aspergillus nidulans,
W74-07581 5C

INJUNCTION

Sierra Club V. Froehlke (Injunction Action Against Reservoir Project).
W74-07113 6E

United States V. Pot-Nets, Inc. (Violation of Rivers and Harbors Act),
W74-07287 6E

INLETS (WATERWAYS)

The Influence of Wind on the Surface Waters of Alberni Inlet,
W74-07497 2L

INPUT-OUTPUT ANALYSIS

Urban Impacts of Rural Resource Developme
Expenditures in the Interlake Area
Manitoba,
W74-07068

Multi-Disciplinary Study of Water Quali
Relationships: A Case Study of Yaquina Ba
Oregon,
W74-07142

The Impact of Sport Angling on the Yaqui
Bay Economy,
W74-07144

A Note on the Use of Spectral Analysis to D
tect Leads and Lags in Annual Cycles of Wa
Quality,
W74-07522

Environmental Planning: An Economic Anal
sis. Applications for the Coastal Zone,
W74-07534

INSECTICIDES

Determination of Chlorinated Insecticides
Suspended Sediment and Bottom Material,
W74-07317

Use of Amberlite XAD-4 for Extraction a
Recovery of Chlorinated Insecticides a
Polychlorinated Biphenyls from Water,
W74-07383

INSTANTANEOUS UNIT HYDROGRAPH

Comparison of Rainfall-Runoff Models f
Urban Areas,
W74-07463

INSTITUTIONAL CONSTRAINTS

Institutional Considerations,
W74-07147

INSTITUTIONS

A Study of Potential Institutional Arran
ments for Water Quality and Water Resour
(Quantity) Planning and Management,
W74-07051

Institutional Arrangements and Alternative F
tures.
W74-07081

INSTRUMENTATION

An Innovative Automatic Stream Gag
Method,
W74-07181

Instrumentation for Engineering Managem
of a Multi-Purpose River Basin System (Trin
River Basin, Texas) Real-Time Engineeri
Management of a Multi-Purpose River Ba
System,
W74-07369

A Practical and Trouble-Free Sewer Spill Mo
tor,
W74-07404

INTERMEDIATE REGIONAL FLOOD

Flood Plain Information - Glade Creek, Vint
Virginia.
W74-07076

INTERNATIONAL LAW

Law Affecting the Quality of the Marine E
vironment,
W74-07282

INVERTEBRATES

Taxonomic Composition of Aquatic Inv
tebrates of the Don Basin in Comparison w

Fauna of the Other Rivers of the Black Sea Caspian Basin, (In Russian),
W74-07537 2I

A Study of the Communities of Invertebrates of Plants of Lake Chad: Preliminary Inquires, (In French),
W74-07538 2H

IVESTIGATIONS
Water Resources Investigations in New York, 1973.
W74-07188 7C

Water-Resources Investigations in Texas, Fiscal Year 1974.
W74-07321 2E

IVESTMENT
Public Investment Criteria: Application to a Project in the Souris River Basin,
W74-07070 6B

ON TRANSPORT
Removal of Phosphates from Wastewaters with Electro-Chemically Generated Gadolinium Ions,
W74-07271 5D

OWA
Minutes, Iowa State Water Resources Research Institute Advisory Board and Council, Eighth Annual Meeting.
W74-07456 9A

Quality of Water Discharged from Two Agricultural Watersheds in Southwestern Iowa,
W74-07528 5B

PSWICH RIVER BASIN (MASS)
Ipswich River Basin Model Study,
W74-07302 6D

RAQ
Sand Dune Reclamation in Iraq -- Present Status and Future Prospects,
W74-07104 2J

RON
Manganese and Iron Solubility Changes as a Factor in Tile Drain Clogging: I. Observations During Flooding and Drying,
W74-07151 2G

Manganese and Iron Solubility Changes as a Factor in Tile Drain Clogging: II. Observations During the Growth of Cotton,
W74-07152 2G

Comparison of Conditional Stability Constants of North Carolina Humic and Fulvic Acids with Co(II) and Fe(III),
W74-07228 5B

Strontium and Other Notable Chemical Constituents of Well-Water of Allen County, Indiana,
W74-07400 2K

RON SULFATE
Use and Production of Iron Salts for Phosphorus Removal,
W74-07269 5D

RRIGATION
Problems in Distribution of Water Resources in the Arid Zone of the Amudar'ya River Basin (Voprosy raspredeleniya vodnykh resursov v arisnoy zone (na primere Amudar'i)),
W74-07192 4A

Effect of Irrigation on Dynamics of Microorganism Quantity in Dark-Brown Soils in Southern Ukraine, (In Ukrainian),
W74-07279 2G

The Bittersweet Waters of the Lower Colorado,
W74-07292 3F

Interdisciplinary Modeling in the Analysis of the Salinity Problems of the Safford Valley,
W74-07297 5B

Land Disposal of Wastewater--Literature Review for 1973,
W74-07327 5D

Solutions for Lateral Outflow in Perforated Conduits,
W74-07433 8B

Water Relations of Wheat as Affected by Irrigation and Nitrogen Fertilization,
W74-07596 3F

IRRIGATION (BORDER)
Infiltration and Water Table Effects of Soil Air Pressure Under Border Irrigation,
W74-07301 3F

IRRIGATION EFFICIENCY
Public Investment Criteria: Application to a Project in the Souris River Basin,
W74-07070 6B

A Model of Irrigated Agriculture and Regional Development in Southern Argentina: The Rio Negro Basin,
W74-07306 6A

IRRIGATION PRACTICES
An Irrigation Scheduling Model Which Incorporates Rainfall Predictions,
W74-07440 3F

Trickle Irrigation in Australia,
W74-07450 3F

Irrigation Survey.
W74-07451 3F

Plant and Irrigation Water Requirements,
W74-07452 3F

Effect of Irrigation with Thermal Water on Trace-Element Content in Some Soils of Georgia (Vliyaniye orosheniya termal'nymi vodami na soderzhaniye mikroelementov v nekotorykh pochvakh Gruzii),
W74-07508 3F

IRRIGATION SCHEDULING
An Irrigation Scheduling Model Which Incorporates Rainfall Predictions,
W74-07440 3F

Plant and Irrigation Water Requirements,
W74-07452 3F

IRRIGATION SYSTEM
Irrigation and Sprinkler System,
W74-07212 3F

IRRIGATION SYSTEMS
Solar Evaporation Controlled Irrigation System,
W74-07211 2D

IRRIGATION WATER
Structural Changes in Tropical Soils Due to Anions in Irrigation Water,
W74-07348 2G

IRRIGATION WELLS
Quality of Well Waters of Jaipur District,
W74-07106 4B

ISOLATION
Psychrophilic Yeasts Isolated From Marine Fish,
W74-07563 5A

ISOPODA
Population Density, Biomass and Maximum Natality Rate and Food Conditions in Ligidium Hypnorum L. (Isopoda),
W74-07590 8I

ISOPODS
Preliminary Diagnosis of a New Species of Marine Isopod From Stewart Island,
W74-07570 2I

ISRAEL
Mineralogical Composition of Clays in Soil Profiles of Israel: I. The Soils of the Mediterranean Zone,
W74-07099 2G

Mineralogical Composition of Clays in Soil Profiles of Israel: II. The Soils of the Desert Zone,
W74-07100 2G

ISRAEL (GALILEE)
Karst Processes of the Eastern Upper Galilee, Northern Israel,
W74-07157 2F

ISRAEL (JORDON VALLEY)
Mineral Springs in the Suez Rift Valley--Comparison with Waters in the Jordan Rift Valley and Postulation of a Marine Origin,
W74-07167 2K

ITALY (SASSO LUNGO)
Hydrogeology of the Sasso Lungo Group, a Dolomitic Reef Stock in the Alpine Dolomites of North Italy,
W74-07153 2F

JAMES RIVER ESTUARY (VA)
Effect of Increasing Depth on Salinity in the James River Estuary,
W74-07250 2L

JAPAN
Avalanche Studies (1971-1972),
W74-07319 2C

JAPAN (KYUSHU DISTRICT)
Multiple Organochlorine Pesticide Residues in Japan,
W74-07560 5A

JAPAN (LAKE BIWA)
Distribution and Standing Crops of Chironomid-Larvae in Shiozu Bay of Lake Biwa (In Japanese),
W74-07101 5C

JAPAN (LAKE SUWA)
Vertical Migration of Spaniotoma akamusi Larvae (Diptera:Chironomidae) through the Bottom Deposits of Lake Suwa,
W74-07543 2H

JAPAN (MOGAMI RIVER BASIN)
Studies of the Ingredients Variation of the Sake-Gawa River, A Tributary of the Mogami River (In Japanese),
W74-07360 2K

JAPAN (WAKAYAMA)
An Epidemiological Study on Clonorchis sinensis at the Northern part of Wakayama Prefecture, Middle Japan, (In Japan),
W74-07540 5C

JELLY FISH
Biological Investigations of Noxious Coelenterates and Ctenophores in Coastal North Carolina,
W74-07479 2L

Investigation of the Biology and Control of Noxious Coelenterates Occurring in the Coastal Waters of Puerto Rico,
W74-07480 2L

JUDICIAL DECISIONS
United States V. Pot-Nets, Inc. (Violation of Rivers and Harbors Act),
W74-07287 6E

KAEMPFEROL
Kaempferol (3,5,7,4'-Tetrahydroxyflavone) as a Chromogenic Reagent for Tin(IV),
W74-07579 5A

KANAMYCIN
Incidence of Resistance to Tetracycline, Chloramphenicol and Ampicillin Among Salmonella Species Isolated in the Netherlands in 1969, 1970 and 1971,
W74-07562 5C

KARST
Karst Processes of the Eastern Upper Galilee, Northern Israel,
W74-07157 2F

KARST HYDROLOGY
Karst Processes of the Eastern Upper Galilee, Northern Israel,
W74-07157 2F

KASKASKIA RIVER BASIN (ILL)
Network Approach to Management of Conjunctively Operated Ground Water - Surface Water Systems,
W74-07335 4A

KELP BEDS IMPROVEMENT
Kelp Habitat Improvement Project, Annual Report July 1, 1970 - June 30, 1971.
W74-07489 5C

Kelp Habitat Improvement Project, Annual Report July 1, 1971 - June 30, 1972.
W74-07490 5C

KELPS
Kelp Habitat Improvement Project, Annual Report July 1, 1970 - June 30, 1971.
W74-07489 5C

Kelp Habitat Improvement Project, Annual Report July 1, 1971 - June 30, 1972.
W74-07490 5C

KELTHANE
Observations on the Gas Chromatography of Kelthane (Dicofol),
W74-07575 5A

KENTUCKY
Variables Affecting Well Success in a Kentucky Limestone Aquifer,
W74-07176 4B

Mussel Fishery Investigations, Tennessee, Ohio, and Green Rivers,
W74-07187 8I

Calibrating a Water Yield Model for Small Ungaged Watersheds,
W74-07519 2A

KENTUCKY RIVER
Water Quality Management Element for the Kentucky River Area Development District Comprehensive Water and Sewer Program
W74-07077 5D

KINETICS
Catalytic Oxidation of Phenol in Dilute Concentration in Air,
W74-07086 5D

Mass and Charge Transfer Kinetics and Coulometric Current Efficiencies. Part VII. Conditional Potentials, and Single-Scan Voltammetry of Pure Vanadium(V) - Vanadium(IV) Systems in Various Media at Platinum Elec trodes Pre-Treated By Five Methods,
W74-07557 2K

Mass and Charge Transfer Kinetics and Coulometric Current Efficiencies. Part VIII. Single-Scan Voltammetry of Vanadium(V) - Vanadium(IV) in the Presence of Chromium, Manganese and Iron, and the Kinetic Parameters of the Vanadium System, at Platinum Electrodes Pre-Treated by Five Methods,
W74-07558 5A

LABORATORY TESTS
Effects of Temperature on Activity and Mortality of the Scyphozoan Medusa, Chrysaora quinquecirrha,
W74-07561 5C

In Vitro Formation of Nitrate Reductase Using Extracts of the Nitrate Reductase Mutant of Neurospora crassa, Nit-1, and Rhodospirillum rubrum,
W74-07577 5B

LAKE-BOG SYSTEMS
Nutrient Cycling and Productivity of Dystrophic Lake-Bog Systems (Part B),
W74-07466 5C

LAKE ERIE
Surface Temperatures of Lake Erie,
W74-07415 2H

LAKE MICHIGAN
The Interlake Affair,
W74-07120 5G

Waste Water Treatment in Commercial Fish Processing: Reducing Stick Water Loadings,
W74-07270 5D

LAKE PERRIS (CALIF)
Lake Perris Recreation Development Plan.
W74-07128 6B

LAKE STAGES
A Preliminary Description of the Physico-Chemical Characteristics and Biota of Three Strip Mine Lakes, Spencer County, Indiana,
W74-07403 5B

LAKE SUPERIOR
Summertime Temperature and Circulation Patterns in Lake Superior,
W74-07338 2H

LAKE TAHOE (CALIF)
Sediment Discharge in the Lake Tahoe Basin, California, 1972 Water Year,
W74-07326 2J

LAKE WALLOWA (ORE)
Wallowa Lake Basin Comprehensive Plan
W74-07065 5D

LAKES
Arizona State Lake Improvement Fund Plan
W74-07108 6B

Components of the Water Balance of the Aral Sea and Their Effect on Its Long-Term Level Fluctuations (Sostavlyayushchiye vodnogo balansa Aral'skogo morya i ikh vliyaniye na mmnogoletniye kolebaniya yego urovnya),
W74-07194 2H

Optimal Linear Extrapolation of Level Fluctuations of Closed Water Bodies (Optimal'naya lineynaya ekstrapolyatsiya kolebaniy urovnya zamknutykh vodoyemov),
W74-07195 4A

On The Determination of Turbulent Diffusivity in Shallow Waters by Aerial Photography of Floating Markers,
W74-07316 2H

LAMINAR FLOW
Steady State Flow in Rigid Networks of Fractures,
W74-07521 2F

LANCASTER (PENN)
The EPA Stormwater Management Model: A Current Overview,
W74-07265 5D

LAND ACQUISITION
Wild and Scenic Rivers.
W74-07290 6E

LAND CATEGORIES
Hawaii's Statewide Land Classification Proves Adaptability as Land Use and Environmental Concerns Change,
W74-07138 4A

LAND CLASSIFICATION
Land Use In California.
W74-07131 6B

Hawaii's Statewide Land Classification Proves Adaptability as Land Use and Environmental Concerns Change,
W74-07138 4A

LAND CLEARING
Snow Accumulation and Snowmelt as Influenced by a Small Clearing in a Lodgepole Pine Forest,
W74-07526 2C

LAND DEVELOPMENT
Utilities and Facilities for New Residential Development: A Survey of Municipal Policy,
W74-07071 5D

LAND DISPOSAL (WASTES)
Land Disposal of Wastewater--Literature Review for 1973,
W74-07327 5D

LAND MANAGEMENT
Land Application of Sewage Sludge,
W74-07266 5D

LAND RECLAMATION
Ecology and Productivity of Strip-Mine Areas in Mercer County, Pennsylvania,
W74-07055 5B

Effect of Irrigation with Thermal Water on Trace-Element Content in Some Soils of Geor-

gia (Vliyaniye orosheniya termal'nymi vodami na soderzhaniye mikroelementov v nekotorykh pochvakh Gruzii),
W74-07508 3F

LAND TYPES
Hawaii's Statewide Land Classification Proves Adaptability as Land Use and Environmental Concerns Change,
W74-07138 4A

LAND USE
Landscape Compartmentalization: An Ecological Approach to Land Use Planning,
W74-07053 6G

Wallowa Lake Basin Comprehensive Plan.
W74-07065 5D

The Relationship of Land Use to Water Use in San Antonio, Texas,
W74-07067 4A

Public Investment Criteria: Application to a Project in the Souris River Basin,
W74-07070 6B

Population, Land Use and Livestock Composition in India and Its Arid Zone,
W74-07105 3F

Land Use In California.
W74-07131 6B

Hawaii's Statewide Land Classification Proves Adaptability as Land Use and Environmental Concerns Change,
W74-07138 4A

A Computer Simulation Model for Flood Plain Development. Part II: Model Description and Applications,
W74-07296 6A

LANDSCAPE COMPARTMENTALIZATION
Landscape Compartmentalization: An Ecological Approach to Land Use Planning,
W74-07053 6G

LASER RADIATION
Response of Aquatic Weeds to Laser Radiation,
W74-07475 5G

LAUNDERING
Laundry Detergents and Environmental Quality,
W74-07122 5C

LEACHING
Relative Movement of Bromide and Nitrate Through Soils,
W74-07423 5B

Effectiveness of Two Nitrification Inhibitors for Anhydrous Ammonia Under Irrigated and Dryland Conditions,
W74-07436 5G

Leaching Losses of Sulfur During Winter Months When Applied as Gypsum, Elemental S or Prilled S,
W74-07449 5B

Salt Displacement into Drain Tiles under Ponded Leaching,
W74-07518 2G

LEAD
Rotating Ring-Disk Electrode Study of the Adsorption of Lead on Gold in 0.5M Potassium Chloride,
W74-07555 2K

LEAKAGE
Safety Device Against Leakage from Ships, Especially Tankers,
W74-07205 5G

LEAVES
Portable Reflectance Meter for Estimating Chlorophyll Concentrations in Leaves,
W74-07437 7B

LEECHES (HIRUDINEA)
Leech Communities (Hirudinea) in the Mazurian and Bialystok Regions and the Pomeranian Lake District,
W74-07542 5C

LEGAL ASPECTS
Pollution and Industry: Pros, Cons of Growing Fight.
W74-07112 5G

The Interlake Affair,
W74-07120 5G

LEGISLATION
Metallic Mineral Mining Operations, (Acquisition of Surface Lands for Water Quality Control).
W74-07119 6E

Control of Grading Practices in the City and County of Honolulu,
W74-07139 4D

Stream Pollution.
W74-07275 6E

Sanitary Districts for Sewage Disposal.
W74-07276 6E

West Virginia Water Development Authority.
W74-07277 6E

River Regulation--Reservoirs.
W74-07278 6E

Law Affecting the Quality of the Marine Environment,
W74-07282 5G

Riparian Rights in Certain Counties.
W74-07283 6E

A Bill to Authorize the Secretary of the Interior to Engage in Feasibility Investigations of Certain Potential Water Resource Developments.
W74-07284 6E

Protection of the Environment.
W74-07289 6E

National Pollutant Discharge Elimination System.
W74-07293 6E

Environmental Impact Analysis: An Examination of Three Methodologies,
W74-07339 6G

Laws and Regulations of Pollution and Navigation in Pacific Northwest Estuaries,
W74-07499 5G

Pacific Northwest Coastal Zone Management as it Relates to Estuary Protection,
W74-07500 6E

LEWES (DEL)
Small Beach Erosion Control Project, Lewes, Delaware (Final Environmental Impact Statement).
W74-07295 4A

LIGANDS
Gas Chromatographic Studies of Mixed-Ligand Complexes of Divalent Cations,
W74-07582 5A

LIGHT INTENSITY
Effect of Light Intensity and Glycerol on the Growth, Pigment Composition, and Ultrastructure of Chroomonas Sp.,
W74-07548 5C

LIGHT TRANSMITTANCE
Determination of Oil Concentration and Size Distribution in Ship Ballast Waters. Method and Representative Results,
W74-07564 5B

LIMNOLOGY
The Estimation of Vertical Eddy Diffusivities Below the Thermocline in Lakes,
W74-07416 2H

LINE INTERSECTION METHOD
Line Intersection Method for Estimating Drainage Density,
W74-07174 2J

LINEAR PROGRAMMING
A Model of Irrigated Agriculture and Regional Development in Southern Argentina: The Rio Negro Basin,
W74-07306 6A

Cost Sharing for Recreation: Efficiency and Equity,
W74-07307 6B

Planning and Operation of Urban Water Quality Management Systems,
W74-07334 5D

LITTLE ROCK METROPOLITAN AREA (ARK)
Interim Storm Drainage Plan Report-Little Rock-North Little Rock Metropolitan Area.
W74-07082 5D

LIVESTOCK
Population, Land Use and Livestock Composition in India and Its Arid Zone,
W74-07105 3F

LOESSIAL SOIL
The Heat Flux Density in a Non-Homogeneous Bare Loessial Soil,
W74-07346 2G

LONG ISLAND (NY)
Technology Transfer in the Marine Environment of Long Island,
W74-07059 6B

LONG-TERM PLANNING
Ipswich River Basin Model Study,
W74-07302 6D

Planning and Operational Studies in the Integrated Use of Desalination. Case Studies for Cyprus and Jersey,
W74-07308 3A

LOST CREEK (IND)
Quantitative Chemical Analysis of Specific Components of the Waters of Lost Creek and the Wabash River, Vigo County, Indiana,
W74-07405 5A

LOUISIANA
Calcasieu River at Coon Island, Louisiana, Ship Channel (Final Environmental Impact Statement).
W74-07118 8A

LUCERNE
Performance of Lucerne (Medicago sativa) Lines in Pure Stands Under Irrigated and Rain Grown Conditions in Sub-Coastal Central Queensland,
W74-07359 3F

LUMBERING
Relationship Between Logging Activities and Salmon Production,
W74-07468 4C

LUMBRINERIS
Taxonomic Position of Two Lumbrineris Spp.,
W74-07568 2L

MACROCYSTIS
Kelp Habitat Improvement Project, Annual Report July 1, 1970 - June 30, 1971.
W74-07489 5C

Kelp Habitat Improvement Project, Annual Report July 1, 1971 - June 30, 1972.
W74-07490 5C

MAGNETIC STUDIES
Remanent Magnetization of Modern Tidal Flat Sediments from San Francisco Bay, California,
W74-07173 2L

MALAWI
The Micro-Meteorology of an Extended Area of Tea Before and After Rain,
W74-07354 3F

MALAYA
Phenology of a Tropical Rain Forest in Malaya,
W74-07482 2I

MANAGEMENT
A Study of Potential Institutional Arrangements for Water Quality and Water Resources (Quantity) Planning and Management,
W74-07051 6B

Technology Transfer in the Marine Environment of Long Island,
W74-07059 6B

Measures to Reduce Water Consumption in Southeastern New York.
W74-07079 6D

Proposed Water Supply Projects for Southeastern New York.
W74-07080 6D

Institutional Arrangements and Alternative Futures.
W74-07081 6D

Wild and Scenic Rivers.
W74-07290 6E

Interdisciplinary Modeling in the Analysis of the Salinity Problems of the Safford Valley,
W74-07297 5B

Simulation--A Tool for Water Resource Management,
W74-07300 6A

Ipswich River Basin Model Study,
W74-07302 6D

Regional Water Quality Management by the Generalized Reduced Gradient Method,
W74-07311 5B

Management of South Westland Terrace Podocarp Forest Under a Selection Logging System,
W74-07347 4A

Development of a Decision Room for Environntal Studies, (Feasibility Study),
W74-07371 6G

MANGANESE
Manganese and Iron Solubility Changes as a Factor in Tile Drain Clogging: I. Observations During Flooding and Drying,
W74-07151 2G

Manganese and Iron Solubility Changes as a Factor in Tile Drain Clogging: II. Observations During the Growth of Cotton,
W74-07152 2G

Photometric Determination of Manganese in Water by Using O-Tolidine,
W74-07315 2K

MAPPING
Surface Temperatures of Lake Erie,
W74-07415 2H

The Past and Present Flora and Vegetation of the Hackensack Meadows,
W74-07476 2I

MAPS
Line Intersection Method for Estimating Drainage Density,
W74-07174 2J

Water Resources of the Taunton River Basin Southeastern Massachusetts,
W74-07190 7C

A Computer Atlas of Hydrologic and Geomorphologic Data for Small Watersheds in Indiana,
W74-07432 2A

MARINAS
Planning and Developing Waterfront Property,
W74-07072 6B

MARINE ALGAE
Field and Experimental Studies on the Systematics and Ecology of Ulva curvata and Ulva rotundata,
W74-07473 5C

The Marine Diatom Ethmodiscus rex: Its Morphology and Occurrence in the Plankton of the Sargasso Sea,
W74-07547 5A

MARINE FISH
The Chemical Form and Bodily Distribution of Mercury in Marine Fish,
W74-07551 5A

Psychrophilic Yeasts Isolated From Marine Fish,
W74-07563 5A

MARINE FUNGI
Marine Fungi Isolated from a Kraft Pulp Mill Outfall Area,
W74-07396 5B

MARSHES
Nematode Fishe Parasites from Sangalkam, Senegal,
W74-07589 2H

MARYLAND
Sediment Control.
W74-07115 6E

Natural Resources--Waste Control.
W74-07116 6E

Riparian Rights in Certain Counties.
W74-07283 6E

Eighth Annual Report, Program Activities, Ju 1, 1971-Jun 30, 1972
W74-07332 9

An Investigation of the Physical Impact Sewage Outflow on a River-Estuarine Enviro ment,
W74-07477 5

Effects of Temperature on Activity and Mo tality of the Scyphozoan Medusa, Chrysao quinquecirrha,
W74-07561 5

MASS TRANSFER
Evaporation of Water from Sand: 5. The Effe of Evaporation on the Concentration of Sa Dissolved in Water Stored in Sand,
W74-07169 2

Mass and Charge Transfer Kinetics and Co lometric Current Efficiencies. Part VII. Con tional Potentials, and Single-Scan Voltammet of Pure Vanadium(V) - Vanadium(IV) Syste in Various Media at Platinum Elec trodes P Treated By Five Methods,
W74-07557 2

Mass and Charge Transfer Kinetics and Co lometric Current Efficiencies. Part VIII. Sing Scan Voltammetry of Vanadium(V) - Vana um(IV) in the Presence of Chromium, Ma ganese and Iron, and the Kinetic Parameters the Vanadium System, at Platinum Electroc Pre-Treated by Five Methods,
W74-07558 2

MASSACHUSETTS
Water Resources of the Taunton River Ba Southeastern Massachusetts,
W74-07190 7C

Ipswich River Basin Model Study,
W74-07302 6D

MATHEMATICAL MODELS
Critical Analysis of the Alternating Direct Implicit Method of Aquifer Analysis,
W74-07154 2F

The EPA Stormwater Management Model: Current Overview,
W74-07265 5G

Planar and Axisymmetric Bottom Withdra from a Density-Stratified Reservoir,
W74-07340 8B

Predicting the Quality of Stream Water Un Conditions of Oxygen Deficiency (O progn kachetva vody vodotokov pri bol'shikh de sitakh kisloroda),
W74-07388 5B

Predicting Pesticide Runoff From Agricult Land: A Conceptual Model,
W74-07427 5B

An Investigation of the Physical Impact Sewage Outflow on a River-Estuarine Envi ment,
W74-07477 5

A Strategy for Modeling Primary Productio Stratified Fjords,
W74-07494 5C

Calibrating a Water Yield Model for Sm Ungaged Watersheds,
W74-07519 2A

CKINLEYVILLE-TRINIDAD (CALIF)
North Coastal Area Action Program. A Study of the McKinleyville-Trinidad Area: Public Hearing Comments.
W74-07129 6B

EADOWS
The Past and Present Flora and Vegetation of the Hackensack Meadows,
W74-07476 2I

EANDERS
Depositional Features of Braided-Meandering Stream,
W74-07163 2J

EASUREMENT
Portable Reflectance Meter for Estimating Chlorophyll Concentrations in Leaves,
W74-07437 7B

A Direct Comparison of Satellite and Aircraft Infrared (10 Micrometers-12 Micrometers) Remote Measurements of Surface Temperature,
W74-07578 7B

EDITERRANEAN (EASTERN BASIN)
Basin Plains in the Eastern Mediterranean: Significance in Interpreting Ancient Marine Deposits: 1. Basin Depth and Configuration,
W74-07158 2J

EDITERRANEAN ZONE
Mineralogical Composition of Clays in Soil Profiles of Israel: I. The Soils of the Mediterranean Zone,
W74-07099 2G

ELTING
Winter-Regime Thermal Response of Heated Streams,
W74-07511 5B

EMBRANE PROCESSES
The Influence of Geological Membranes on the Geochemistry of Subsurface Waters from Miocene Sediments at Kettleman North Dome in California,
W74-07513 2K

ERCER COUNTY (PENN)
Ecology and Productivity of Strip-Mine Areas in Mercer County, Pennsylvania,
W74-07055 5B

ERCURY
Methylmercury Formation in Mercury-Treated River Sediments During in Situ Equilibration,
W74-07425 5B

The Chemical Form and Bodily Distribution of Mercury in Marine Fish,
W74-07551 5A

Reduction in Mercury Content of Fish Protein Concentrate by Enzymatic Digestion,
W74-07576 5A

ERISTEMATIC ACTIVITY
Effects of Water Stress on Growth and Nitrogen-Fixing Activity of Trifolium repens,
W74-07352 3F

ETABOLISM
Study of Metabolism of Nickel Entering the Body with Drinking Water, (In Russian),
W74-07361 5C

ETABOLITES
Residues of Atrazine, Cyanazine, and Their Phytotoxic Metabolites in a Clay Loam Soil,
W74-07585 5A

METAL FINISHING WASTE TREATMENT
Regeneration of Chromated Aluminum Deoxidizers, Phase I Report,
W74-07254 5D

METAL-ORGANIC COMPLEXES
Comparison of Conditional Stability Constants of North Carolina Humic and Fulvic Acids with Co(II) and Fe(III),
W74-07228 5B

METHODOLOGY
Evaluation of Methods of Pumping Test Analyses for Application to Hawaiian Aquifers,
W74-07531 5C

Environmental Planning: An Economic Analysis. Applications for the Coastal Zone,
W74-07534 6B

METHYL MERCURY
Methylmercury Formation in Mercury-Treated River Sediments During in Situ Equilibration,
W74-07425 5B

Pharmacodynamics of Methyl Mercury in the Rainbow Trout (Salmo Gairdneri): Tissue Uptake, Distribution and Excretion,
W74-07597 5C

MICHIGAN
Metallic Mineral Mining Operations, (Acquisition of Surface Lands for Water Quality Control).
W74-07119 6E

Utilization of ERTS-1 Data to monitor and Classify Eutrophication of Inland Lakes,
W74-07484 5C

MICROCLIMATES
The Micro-Meteorology of an Extended Area of Tea Before and After Rain,
W74-07354 3F

MICROMORPHOLOGY
Research on the Micromorphology of the Flooded Poszolic Soils of Shallow Water Reservoirs, (In Russian),
W74-07235 2G

MICROORGANISMS
Plastic Moving-Surface Treatment of Sewage,
W74-07198 5D

Activity of the Microorganisms and the Mineralization of the Organic Matter Peat Soils with a Varying Level of Sub Soil Waters, (In Russian),
W74-07230 2G

MICROSCOPIC PHOTOGRAPHY
Determination of Oil Concentration and Size Distribution in Ship Ballast Waters. Method and Representative Results,
W74-07564 5B

MICROSTRAINERS
Application of Microstraining to Combined Sewer Overflow,
W74-07260 5D

MICROWAVES
Broad Spectrum Microwave Systems for Remotely Measuring Soil Moisture Content,
W74-07052 2G

MIGRATION
Some Estuarine Factors Influencing Ascent of Anadromous Cutthroat Trout in Oregon,
W74-07493 2L

MILWAUKEE (WISC)
Combined Sewer Overflow Treatment by the Rotating Biological Contactor Process.
W74-07374 5D

MINE WASTES
Acid Neutralization Doesn't Cost Much,
W74-07124 5D

MINERAL NUTRIENTS
The Effect of Waterlogging on the Mineral Nutrient Content of Trifolium Subterraneum,
W74-07355 3F

MINERAL WATER
Mineral Springs in the Suez Rift Valley--Comparison with Waters in the Jordan Rift Valley and Postulation of a Marine Origin,
W74-07167 2K

MINERALIZATION
Activity of the Microorganisms and the Mineralization of the Organic Matter Peat Soils with a Varying Level of Sub Soil Waters, (In Russian),
W74-07230 2G

Phosphorus Supply Characteristics of Acid Organic Soils as Measured by Desorption and Mineralization,
W74-07345 2G

MINING
Metallic Mineral Mining Operations, (Acquisition of Surface Lands for Water Quality Control).
W74-07119 6E

MINNESOTA
Wild and Scenic Rivers.
W74-07290 6E

MISSISSIPPI
Preliminary Water and Sewer Plan for Alcorn, Benton, Marshall, Prentiss, Tippah, Tishomingo Counties.
W74-07062 5D

MIXING
Recent Investigations in Stratified Flows Related to Estuarial Hydraulics,
W74-07226 2L

Amazon River Estuarine System,
W74-07229 2L

Summertime Temperature and Circulation Patterns in Lake Superior,
W74-07338 2H

The Estimation of Vertical Eddy Diffusivities Below the Thermocline in Lakes,
W74-07416 2H

An Experimental Study of Immiscible Displacement with an Unfavorable Mobility Ratio in Porous Media,
W74-07524 2F

A Mixing Cell Model for Longitudinal Dispersion in Open Channels,
W74-07527 8B

MOBILE BAY (ALA)
Marine Geology and Estuarine History of Mobile Bay, Alabama: Part 1. Contemporary Sediments,
W74-07248 2L

MODEL STUDIES
Program Development Plan for the Mesa-New York Bight Regional Project.
W74-07078 6B

MODEL STUDIES

Nonlinear Programming in River Basin Modeling,
W74-07298 5B

Generation Models for Synthetic Annual and Monthly Flows for Some Indiana Watersheds,
W74-07431 2A

Application of Nonlinear Programming to Water Quality Control,
W74-07462 5D

Physical Modeling of Residence Times in Tidal Basins,
W74-07496 2L

Environmental Planning: An Economic Analysis. Applications for the Coastal Zone,
W74-07534 6B

MOINA
Moina Sp. (Cladocera: Moinidae) in a Sewage Plant, Wellington, Referred to Moina tenuicornis Sars, 1896 (Note),
W74-07569 5A

MOISTURE AVAILABILITY
Water Reuse in Protein Feed Process Utilizing Lumber Mill Wastes,
W74-07409 5D

MOISTURE RETENTION
Water Retention of Granitic Soils in the Idaho Batholith,
W74-07170 2G

MOISTURE STRESS
Productivity and Water Stress in Cacti,
W74-07109 2I

Effects of Moisture Stress at Early Heading and of Nitrogen Fertilizer on Three Spring Wheat Cultivars,
W74-07351 3F

MOISTURE TENSION
Water Retention of Granitic Soils in the Idaho Batholith,
W74-07170 2G

MONITORING
A Systems Analysis of Water Quality Survey Design,
W74-07310 5B

A Practical and Trouble-Free Sewer Spill Monitor,
W74-07404 5D

MONOCOTS
A Contribution to the Botany of Ganganagar District, North Rajasthan,
W74-07357 3F

MONOMOLECULAR FILMS
Model Tests with Thin Sheets to Reduce Evaporation,
W74-07103 3B

MONTE CARLO METHOD
Just a Moment,
W74-07414 2A

MONTEREY BAY (CALIF
Some Aspects of the Temperature, Oxygen and Nutrient Distributions in Monterey Bay, California. Annual Report, Part 1, 1973,
W74-07469 5C

MONTMORILLONITE
Mineralogical Composition of Clays in Soil Profiles of Israel: I. The Soils of the Mediterranean Zone,
W74-07099 2G

Mineralogical Composition of Clays in Soil Profiles of Israel: II. The Soils of the Desert Zone,
W74-07100 2G

MORAINIC SOILS
Potential of Westland's Moraine Soils for Forest Management,
W74-07594 4A

MORTALITY
Effects of Temperature on Activity and Mortality of the Scyphozoan Medusa, Chrysaora quinquecirrha,
W74-07561 5C

Abundance and Mortality of the Perch Fry (Perca Fluviatilis, Linnacus, 1758) in the Klicava Reservoir,
W74-07588 8I

MOTIVATION
Determinants of Use of Water-Based Recreational Facilities,
W74-07058 6B

MUD
The Chemistry of Cadmium in Natural Water--II. The Adsorption of Cadmium on River Muds and Naturally Occurring Solids,
W74-07420 2K

MUD FLATS
Remanent Magnetization of Modern Tidal Flat Sediments from San Francisco Bay, California,
W74-07173 2L

MULLICA RIVER BASIN (N
Cross-Spectral Analysis of Rainfall and Runoff for Raritan and Mullica River Basins in New Jersey,
W74-07183 2A

MULTIPLE PURPOSE RESERVOIRS
Instrumentation for Engineering Management of a Multi-Purpose River Basin System (Trinity River Basin, Texas) Real-Time Engineering Management of a Multi-Purpose River Basin System,
W74-07369 4A

MUSSELS
Mussel Fishery Investigations, Tennessee, Ohio, and Green Rivers,
W74-07187 8I

NARRAGANSETT BAY (R
Spatial and Temporal Distribution of Suspended Sediment in Narragansett Bay and Rhode Island Sound,
W74-07232 2L

NATALITY RATE
Population Density, Biomass and Maximum Natality Rate and Food Conditions in Ligidium Hypnorum L. (Isopoda),
W74-07590 8I

NATIONAL ENVIRONMENTAL POLICY ACT
Procedures and Programs to Assist in the Environmental Impact Statement Process,
W74-07061 6B

Sierra Club V. Froehlke (Injunction Action Against Reservoir Project).
W74-07113 6E

Burleigh V. Calloway (Injunction Action Against a Beach Erosion Project).
W74-07288 6E

NAVIGABLE WATERS
United States V. Pot-Nets, Inc (Violation of Rivers and Harbors Act),
W74-07287 6E

NEMATODES
Nematode Fishe Parasites from Sangalkam, Senegal,
W74-07589 2H

NETHERLANDS
Size and Shape Sorting in a Dutch Tidal Inlet,
W74-07329 2L

NETWORK ANALYSIS
Network Approach to Management of Conjunctively Operated Ground Water - Surface Water Systems,
W74-07335 4A

NETWORKS
Capital Cost Minimization of Drainage Networks,
W74-07309 4A

NEUTRALIZATION
Acid Neutralization Doesn't Cost Much,
W74-07124 5D

NEUTRON ACTIVATION ANALYSIS
Micro-Determination of Cation-Exchange Capacity by Neutron Activation Analysis,
W74-07439 2G

NEW BERN (N
Flood Plain Information-Neuse and Trent Rivers and Jack Smith Creek, New Bern, North Carolina.
W74-07073 4A

NEW JERSEY
Cross-Spectral Analysis of Rainfall and Runoff for Raritan and Mullica River Basins in New Jersey,
W74-07183 2A

NEW JERSEY (HACKENSACK MEADOWS)
The Past and Present Flora and Vegetation of the Hackensack Meadows,
W74-07476 2I

NEW YORK
A Study of Potential Institutional Arrangements for Water Quality and Water Resources (Quantity) Planning and Management,
W74-07051 6B

Technology Transfer in the Marine Environment of Long Island,
W74-07059 6B

Proposed Water Supply Projects for Southeastern New York.
W74-07080 6D

Water Uses and Water Development in Fall Creek--Possible Conflicts,
W74-07149 6B

Water Resources Investigations in New York, 1973.
W74-07188 7C

Combined Sewer Overflow Seminar Papers.
W74-07255 5D

River Regulation--Reservoirs.
W74-07278 6E

Wild, Scenic River Systems.
W74-07280 6E

Classification of Water and Water Standards.
W74-07281 6E

Losses of Inorganic Nitrogen From Aquatic Systems,
W74-07426 5B

Effect of Restricted Use of Phosphate-Based Detergents on Onondaga Lake,
W74-07566 5C

EW YORK BIGHT
Program Development Plan for the Mesa-New York Bight Regional Project.
W74-07078 6B

Geologic Aspects of Waste Solids and Marine Waste Deposits, New York Metropolitan Region,
W74-07171 5B

Possible Effects of Construction and Operation of a Supertanker Terminal on the Marine Environment in New York Bight,
W74-07488 5C

EW YORK CITY
Measures to Reduce Water Consumption in Southeastern New York.
W74-07079 6D

Institutional Arrangements and Alternative Futures.
W74-07081 6D

EW ZEALAND
Taxonomic Position of Two Lumbrineris Spp.,
W74-07568 2L

Moina Sp. (Cladocera: Moinidae) in a Sewage Plant, Wellington, Referred to Moina tenuicornis Sars, 1896 (Note),
W74-07569 5A

EW ZEALAND (STEWART ISLAND)
Preliminary Diagnosis of a New Species of Marine Isopod From Stewart Island,
W74-07570 2I

EW ZEALAND (WESTLAND)
Management of South Westland Terrace Podocarp Forest Under a Selection Logging System,
W74-07347 4A

Potential of Westland's Morainic Soils for Forest Management,
W74-07594 4A

ICKEL
Study of Metabolism of Nickel Entering the Body with Drinking Water, (In Russian),
W74-07361 5C

IGERIA (SOKOTO RIVER BASIN)
Aquifers in the Sokoto Basin, Northwestern Nigeria, with a Description of the General Hydrogeology of the Region,
W74-07184 2F

ITRATE REDUCTASE
In Vitro Formation of Nitrate Reductase Using Extracts of the Nitrate Reductase Mutant of Neurospora crassa, Nit-1, and Rhodospirillum rubrum,
W74-07577 5B

The Effect of Lack of a Carbon Source on Nitrate-Reductase Activity in Aspergillus nidulans,
W74-07581 5C

ITRATES
Relative Movement of Bromide and Nitrate Through Soils,
W74-07423 5B

Determination of Nitrates in Soil Extracts,
W74-07443 2G

Nitrate Concentrations in the Unsaturated Zone Beneath Irrigated Fields in Southern California,
W74-07445 5G

Ammonium and Nitrate Uptake by Corn (Zea mays L.) as Influenced by Nitrogen Concentration and NH4(+)/NO3(-) Ratio,
W74-07459 3F

NITRIFICATION
Rotating Biological Disk Wastewater Treatment Process - Pilot Plant Evaluation,
W74-07373 5D

Effectiveness of Two Nitrification Inhibitors for Anhydrous Ammonia Under Irrigated and Dryland Conditions,
W74-07436 5G

Ammonium and Nitrate Uptake by Corn (Zea mays L.) as Influenced by Nitrogen Concentration and NH4(+)/NO3(-) Ratio,
W74-07459 3F

NITROGEN
Effects of Moisture Stress at Early Heading and of Nitrogen Fertilizer on Three Spring Wheat Cultivars,
W74-07351 3F

Losses of Inorganic Nitrogen From Aquatic Systems,
W74-07426 5B

Effectiveness of Two Nitrification Inhibitors for Anhydrous Ammonia Under Irrigated and Dryland Conditions,
W74-07436 5G

NITROGEN COMPOUNDS
Evaluation of Current Techniques for Nutrient Removal from Wastewaters,
W74-07441 5D

NITROGEN FERTILIZATION
Water Relations of Wheat as Affected by Irrigation and Nitrogen Fertilization,
W74-07596 3F

NITROGEN FIXATION
Effects of Water Stress on Growth and Nitrogen-Fixing Activity of Trifolium repens,
W74-07352 3F

Acetylene Reduction by Beijerinckia Under Various Partial Pressures of Oxygen and Acetylene,
W74-07572 5C

NITROGEN FIXING BACTERIA
Acetylene Reduction by Beijerinckia Under Various Partial Pressures of Oxygen and Acetylene,
W74-07572 5C

NITROGEN *PHOSPHORUS
Function of Marshes in Reducing Eutrophication of Estuaries of the Middle Atlantic Region,
W74-07336 5C

NOMOGRAPHS
Economic Size Selection for PVC Pipelines,
W74-07303 8A

NON-LINEAR PROGRAMMING
Application of a Large Scale Nonlinear Programming Problem to Pollution Control,
W74-07461 5D

NON-STRUCTURAL ALTERNATIVES
Economic Study of the Effect of Municipal Sewer Surcharges on Industrial Wastes and Water Usage,
W74-07057 5G

NONLINEAR PROGRAMMING
Nonlinear Programming in River Basin Modeling,
W74-07298 5B

Regional Water Quality Management by the Generalized Reduced Gradient Method,
W74-07311 5B

NORTH CAROLINA
Landscape Compartmentalization: An Ecological Approach to Land Use Planning,
W74-07053 6G

Water and Wastewater Systems Inventory - Region H, North Carolina,
W74-07063 5D

Flood Plain Information-Neuse and Trent Rivers and Jack Smith Creek, New Bern, North Carolina.
W74-07073 4A

Flood Plain Information-Neuse River and Buffalo Creek, Smithfield, North Carolina.
W74-07074 4A

Flood Plain Information: Burdens and Two Bottle Creeks at Research Triangle Area, Durham County, North Carolina.
W74-07075 4A

Comparison of Conditional Stability Constants of North Carolina Humic and Fulvic Acids with Co(II) and Fe(III),
W74-07228 5B

Recent Estuarine Sediment History of the Roanoke Island Area, North Carolina,
W74-07245 2L

Field and Experimental Studies on the Systematics and Ecology of Ulva curvata and Ulva rotundata,
W74-07473 5C

Biological Investigations of Noxious Coelenterates and Ctenophores in Coastal North Carolina,
W74-07479 2L

An Investigation of Propagation and the Mineral Nutrition of Spartina alterniflora,
W74-07486 5C

NORTH CAROLINA (COVE SOUND)
Seasonal Abundance and Distribution of Juvenile Blue Crabs in Core Sound, N.C. 1965-1966,
W74-07350 2L

NORTH CAROLINA (TIDEWATER REGION)
Phosphorus Supply Characteristics of Acid Organic Soils as Measured by Desorption and Mineralization,
W74-07345 2G

NORTH DAKOTA
Ground-Water Resources of McLean County, North Dakota,
W74-07313 2F

The Food Habits and Age and Growth of Goldeye, Hiodon alosoides (Rafinesque), in Beaver Creek, Lake Oahe, North Dakota, 1971-72,
W74-07474 8I

NORTH PLATTE BASIN (WYO)
Ninth Annual Report of the Water Resources Research Institute of the University of Wyoming (Activities During FY 1973).
W74-07457 9A

NORWAY
Pollution Caused by Agriculture,
W74-07366 5B

NORWAY (BYGLANDSFJORDEN)
Byglandsfjorden. Primary Production and Other Limnological Features in an Oligotrophic Norwegian Lake,
W74-07554 5C

NUISANCE (LEGAL ASPECTS)
United States v. Ira S. Bushey and Sons, Inc. (Injunction Against Oil Spills).
W74-07291 6E

NUMERICAL ANALYSIS
Numerical Studies of Two-Dimensional Saturated-Unsaturated Drainage Models,
W74-07168 2G

A Numerical Model Based on Coupled One-Dimensional Richards and Boussinesq Equations,
W74-07515 2F

Numerical Analysis of Hansenula, Pichia and Related Yeast Genera,
W74-07583 5A

NUTRIENT REMOVAL
Evaluation of Current Techniques for Nutrient Removal from Wastewaters,
W74-07441 5D

Nitrate Concentrations in the Unsaturated Zone Beneath Irrigated Fields in Southern California,
W74-07445 5G

Reactions of Chloramines with Active Carbon,
W74-07544 5B

NUTRIENTS
Distillation-Condensation of Water and Nutrient Movement in a Desert Ecosystem,
W74-07110 2I

Factors Affecting Phytoplankton Production in a Eutrophic Reservoir,
W74-07121 5C

Some Aspects of the Temperature, Oxygen and Nutrient Distributions in Monterey Bay, California. Annual Report, Part 1, 1973,
W74-07469 5C

Nutritive Importance and Structure of Detritus,
W74-07471 5C

Utilization of Fibrous Wastes as Sources of Nutrients,
W74-07472 5D

Effects of Thickness on Bacterial Film,
W74-07545 5C

Bacteria-Assimilable Organic Compounds, Phosphate, and Enhanced Growth of Bacteria-Associated Blue-Green Algae,
W74-07587 5C

NUTRIENTS REMOVAL
Systems simulation of the effect of tertiary treatment for carbon, nitrogen, and phosphorus removal upon primary productivity, standing crop, and community structure of autotrophic and hetertrophic communities in receiving model streams.
W74-07337 5C

OAHU (HAWAII)
Development of Dike Stored Water By Drilling, Waihee, Oahu,
W74-07137 2F

OCEAN WAVES
State of the Art of Floating Breakwaters,
W74-07498 8A

OCEANOGRAPHY
Problem of Calculating Depth of the Quasiuniform Layer of the Ocean (K voprosu o raschete tolshchiny kvaziodnorodnogo sloya okeana),
W74-07506 2A

OCEANS
Law Affecting the Quality of the Marine Environment,
W74-07282 5G

OFFSHORE PLATFORMS
Possible Effects of Construction and Operation of a Supertanker Terminal on the Marine Environment in New York Bight,
W74-07488 5C

OHIO
High-Rate Multi-Media Filtration,
W74-07261 5D

Habitat Distribution of the Shore Flies of Northeastern Ohio (Diptera: Ephydridae),
W74-07556 5C

OHIO RIVER
Mussel Fishery Investigations, Tennessee, Ohio, and Green Rivers,
W74-07187 8I

OIL
Application of Geochemistry to the Search for Crude Oil and Natural Gas,
W74-07161 4B

OIL FIELDS
Application of Geochemistry to the Search for Crude Oil and Natural Gas,
W74-07161 4B

The Influence of Geological Membranes on the Geochemistry of Subsurface Waters from Miocene Sediments at Kettleman North Dome in California,
W74-07513 2K

OIL INDUSTRY
Petroleum Refinery Effluent Regulations and Guidelines.
W74-07274 5G

OIL POLLUTION
Method of and Apparatus for the Recovery of Oil from Water,
W74-07201 5G

Apn aratus for Separating Oil and SolidsfFrm m Water,
W74-07202 5D

System and Method for Separating Heavier and Lighter Components of Liquid Mixtures,
W74-07203 5D

Safety Device Against Leakage from Ships, Especially Tankers,
W74-07205 5G

Oil Reclaiming Device for Removing Oil fro the Surface of Water,
W74-07206 5

Containing and Removing Oil Spills on Water,
W74-07208 5

Method and Apparatus for Collecting a Flo ing Liquid,
W74-07215 5

Method for the Elimination and Possibl Recovery of the Floating Polluting Substance Mineral Oils in Particular, From Sheets Water and Boat Fitted to This Aim,
W74-07220 5

Method of Removing Oil Spills,
W74-07222 5

Apparatus for Removing Surface Pollutan from Water and Other Liquids,
W74-07223 5

Petroleum Refinery Effluent Regulations an Guidelines.
W74-07274 5

United States v. Ira S. Bushey and Sons, In (Injunction Against Oil Spills).
W74-07291 6

An Oil Recovery System Utilizing Polyu rethane Foam--A Feasibility Study,
W74-07341 5

OIL SKIMMER
An Oil Recovery System Utilizing Polyu rethane Foam--A Feasibility Study,
W74-07341 5

OIL SPILL RECOVERY
An Oil Recovery System Utilizing Polyu rethane Foam--A Feasibility Study,
W74-07341 5

OIL SPILLS
Method of and Apparatus for the Recovery Oil from Water,
W74-07201 5

Safety Device Against Leakage from Ship Especially Tankers,
W74-07205 5

Oil Reclaiming Device for Removing Oil fro the Surface of Water,
W74-07206 5

Containing and Removing Oil Spills on Water,
W74-07208 5

Method and Apparatus for Collecting a Floa ing Liquid,
W74-07215 5

Method for the Elimination and Possib Recovery of the Floating Polluting Substance Mineral Oils in Particular, From Sheets Water and Boat Fitted to This Aim,
W74-07220 5

Method of Removing Oil Spills,
W74-07222 5

Apparatus for Removing Surface Pollutan from Water and Other Liquids,
W74-07223 5

United States v. Ira S. Bushey and Sons, In (Injunction Against Oil Spills).
W74-07291 6

An Oil Recovery System Utilizing Polyurethane Foamt-A Feasibility Study,
W74-07341 5G

Aerial Spill Prevention Surveillance During Sub-Optimim Weather,
W74-07342 5A

OIL WASTES
Study of the Adaptation of an Activated Sludge to the Purification of an Industrial Effluent (Etude de l'adaptation d'une boue activee a l'epuration d'un effluent industriel),
W74-07389 5D

OILY WATER
Determination of Oil Concentration and Size Distribution in Ship Ballast Waters. Method and Representative Results,
W74-07564 5B

OKLAHOMA
Depositional Features of Braided-Meandering Stream,
W74-07163 2J

OLIGOTROPHY
Byglandsfjorden. Primary Production and Other Limnological Features in an Oligotrophic Norwegian Lake,
W74-07554 5C

ON-SITE TESTS
Effects of Temperature on Activity and Mortality of the Scyphozoan Medusa, Chrysaora quinquecirrha,
W74-07561 5C

ONONDAGA LAKE (NY)
Effect of Restricted Use of Phosphate-Based Detergents on Onondaga Lake,
W74-07566 5C

OPEN CHANNEL FLOW
A Mixing Cell Model for Longitudinal Dispersion in Open Channels,
W74-07527 8B

OPERATING COSTS
High-Rate Multi-Media Filtration,
W74-07261 5D

OPTIMIZATION
Water and Effluent Treatment Plants - Cost Considerations and Client, Contractor, Consultant Relationships, The Consultant's View,
W74-07312 5D

Application of Nonlinear Programming to Water Quality Control,
W74-07462 5D

OPTIMUM DEVELOPMENT PLANS
Program Development Plan for the Mesa-New York Bight Regional Project.
W74-07078 6B

Network Approach to Management of Conjunctively Operated Ground Water - Surface Water Systems,
W74-07335 4A

Production Function Theory for Use in Optimal Planning Decisions,
W74-07460 5D

OREGON
Wallowa Lake Basin Comprehensive Plan.
W74-07065 5D

Nonlinear Programming in River Basin Modeling,
W74-07298 5B

Hydrology of the Dunes Area North of Coos Bay, Oregon,
W74-07325 2L

Some Estuarine Factors Influencing Ascent of Anadromous Cutthroat Trout in Oregon,
W74-07493 2L

Pacific Northwest Coastal Zone Management as it Relates to Estuary Protection,
W74-07500 6E

ORGANIC CARBON
Texture and Organic Carbon Content of Bottom Sediments in some Estuaries of the United States,
W74-07243 2L

ORGANIC COMPOUNDS
Extracellular Products of Algae in Freshwater,
W74-07353 5C

ORGANIC MATTER
Water Retention of Granitic Soils in the Idaho Batholith,
W74-07170 2G

Activity of the Microorganisms and the Mineralization of the Organic Matter Peat Soils with a Varying Level of Sub Soil Waters, (In Russian),
W74-07230 2G

Techniques for use of Organic and Amorphous Materials in Source Investigations of Estuary Sediments,
W74-07241 2L

Texture and Organic Carbon Content of Bottom Sediments in some Estuaries of the United States,
W74-07243 2L

Ultra-Violet Absorption Characteristics of Natural Waters,
W74-07419 2K

The Chemistry of Cadmium in Natural Water--II. The Adsorption of Cadmium on River Muds and Naturally Occurring Solids,
W74-07420 2K

Volatility of DDT Residues in Soil as Affected by Flooding and Organic Matter Applications,
W74-07424 5B

ORGANIC WASTES
Regional Water Quality Management by the Generalized Reduced Gradient Method,
W74-07311 5B

OVERFLOW
Combined Sewer Overflow Seminar Papers.
W74-07255 5D

Stormflow Pollution Control in the U.S.,
W74-07256 5D

Combined Sewer Overflow Regulator Facilities,
W74-07258 5D

Application of Microstraining to Combined Sewer Overflow,
W74-07260 5D

High-Rate Multi-Media Filtration,
W74-07261 5D

Screening/Dissolved-Air Flotation Treatment of Combined Sewer Overflows,
W74-07262 5D

High-Rate Disinfection of Combined Sewer Overflow,
W74-07263 5D

The Swirl Concentrator as a Combined Sewer Overflow Regulator,
W74-07264 5D

Combined Sewer Overflow Treatment by the Rotating Biological Contactor Process.
W74-07374 5D

OVERLAND FLOW
A Rainfall-Runoff Model Based on the Watershed Stream Network,
W74-07464 2A

OXIDATION
Catalytic Oxidation of Phenol in Dilute Concentration in Air,
W74-07086 5D

Ozone in Water and Waste Water Treatment, a Bibliography.
W74-07251 5D

Regeneration of Chromated Aluminum Deoxidizers, Phase I Report,
W74-07254 5D

Cyanide Waste Treatment Utilizing Catalytic Oxidation,
W74-07272 5D

The Identification of the Reaction Products Formed by the Oxidation of Aqueous Ammonia with Potassium Ferrate VI,
W74-07333 5D

An Explanatory Work on the Oxidation of Ammonia by Potassium Ferrate (VI),
W74-07454 5D

OXYCHLORDANE
Nature and Toxicity of Two Oxychlordane Photoisomers,
W74-07584 5C

OXYGEN
A Comparison of Effluent Characteristics from Conventional and Oxygen Bleaching Sequences: Results of a Laboratory Study,
W74-07375 5D

Oxygen Bleaching -- A Flexible Process for Pollution Abatement,
W74-07376 5D

Acetylene Reduction by Beijerinckia Under Various Partial Pressures of Oxygen and Acetylene,
W74-07572 5C

OXYGEN BLEACHING
A Comparison of Effluent Characteristics from Conventional and Oxygen Bleaching Sequences: Results of a Laboratory Study,
W74-07375 5D

OXYGEN SAG
Predicting the Quality of Stream Water Under Conditions of Oxygen Deficiency (O prognoze kachetva vody vodotokov pri bol'shikh defitsitakh kisloroda),
W74-07388 5B

OXYGENATION
Method of and Apparatus for the Purification of Water Containing Organic Contaminants,
W74-07199 5D

Sewage Treatment System,
W74-07217 5D

OXYGENATION

Rotating Biological Disk Wastewater Treatment Process - Pilot Plant Evaluation,
W74-07373 5D

OZONE
Ozone in Water and Waste Water Treatment, a Bibliography.
W74-07251 5D

PACIFIC NORTHWEST U
Proceedings 2nd Annual Technical Conference on Estuaries of the Pacific Northwest.
W74-07491 2L

Laws and Regulations of Pollution and Navigation in Pacific Northwest Estuaries,
W74-07499 5G

PACIFIC OCEAN
Th-234/U-238 Activity Ratios in Pacific Ocean Bottom Waters,
W74-07322 2K

Mechanism of Element Distribution in the Pacific Ocean (Japanese Profile) (K poznaniyu mekhanizma raspredeleniya elementov v Tikhom okeane (Yaponskiy profil')),
W74-07503 2J

PALOUSE WATERSHED (IDA-WASH)
Evapotranspiration on a Palouse Watershed,
W74-07087 2D

PARAMETRIC HYDROLOGY
Parameter Identification in Field Problems,
W74-07428 7C

PARAVIREIA
Preliminary Diagnosis of a New Species of Marine Isopod From Stewart Island,
W74-07570 2I

PARTICLE SHAPE
Size and Shape Sorting in a Dutch Tidal Inlet,
W74-07329 2L

PARTICLE SIZE
Size and Shape Sorting in a Dutch Tidal Inlet,
W74-07329 2L

Determination of Mean Cell Size of Tetrahymena in Growing Cultures,
W74-07586 5A

PASTURE MANAGEMENT
Study on the Pasture Establishment Technique VI. Effect of Different Spacings and Weedings on Establishment and Forage Production of Cenchrus ciliaris Linn., Lasiurus sindicus Henr. and Panicum antidotale Retz under Arid Conditions,
W74-07107 3F

PASTURES
Liveweight Gains of Shorthorn Steers on Native and Improved Pastures at Adelaide River Northern Territory,
W74-07453 3F

PATENTS
Water Treatment Apparatus,
W74-07196 5D

Process of Separation of Emulsified or Dispersed Matter From Water,
W74-07197 5D

Plastic Moving-Surface Treatment of Sewage,
W74-07198 5D

Method of and Apparatus for the Purification of Water Containing Organic Contaminants,
W74-07199 5D

Fluorocarbon and Oxygen-Providing Compound Treatment of Waste Waters,
W74-07200 5D

Method of and Apparatus for the Recovery of Oil from Water,
W74-07201 5G

Apn aratus for Separating Oil and SolidsfFrm m Water,
W74-07202 5D

System and Method for Separating Heavier and Lighter Components of Liquid Mixtures,
W74-07203 5D

Attenuation of Water Waves and Control and Utilization of Wave-Induced Water Movements,
W74-07204 8B

Safety Device Against Leakage from Ships, Especially Tankers,
W74-07205 5G

Oil Reclaiming Device for Removing Oil from the Surface of Water,
W74-07206 5G

Self Cleaning, Tubular Solar Still,
W74-07207 3A

Containing and Removing Oil Spills on Water,
W74-07208 5G

Water Purification Apparatus,
W74-07209 5D

Inflatable Dams and Dam Units,
W74-07210 8A

Solar Evaporation Controlled Irrigation System,
W74-07211 2D

Irrigation and Sprinkler System,
W74-07212 3F

Water Purification System,
W74-07213 5D

Foam Flotation Concentration of Sewage,
W74-07214 5D

Method and Apparatus for Collecting a Floating Liquid,
W74-07215 5G

Waste Water Process Tank Control Facility,
W74-07216 5D

Sewage Treatment System,
W74-07217 5D

Treatment Apparatus,
W74-07218 5D

Waste water treatment,
W74-07219 5D

Method for the Elimination and Possible Recovery of the Floating Polluting Substances, Mineral Oils in Particular, From Sheets of Water and Boat Fitted to This Aim,
W74-07220 5G

Agitating and Aerating Apparatus,
W74-07221 5D

Method of Removing Oil Spills,
W74-07222 5G

Apparatus for Removing Surface Pollutants from Water and Other Liquids,
W74-07223 5G

Apparatus for Recording Swell Frequency and Propagation Direction of Waves,
W74-07224 8B

PATH OF POLLUTANTS
Source and Budget of Sulfate in Precipitation from Central Alberta, Canada,
W74-07164 5B

Erosional Losses of S-Triazine Herbicides,
W74-07421 5B

Land Disposal of Waste Gases: III. Sorption Patterns From Buried Gas Injection Pipes,
W74-07422 5B

Relative Movement of Bromide and Nitrate Through Soils,
W74-07423 5B

Predicting Pesticide Runoff From Agricultural Land: A Conceptual Model,
W74-07427 5B

Dispersion of Contaminated Sediment Bed Load,
W74-07446 5B

Ground-Water Flow Patterns in Confined Aquifers and Pollution,
W74-07510 5B

Distribution and Chemistry of Phosphorus in an Albaqualf Soil After 82 Years of Phosphate Fertilization,
W74-07532 5B

A Continuous Culture Study of Phosphate Uptake, Growth Rate and Polyphosphate in Scenedesmus Sp.,
W74-07549 5C

PATHOGENIC FUNGI
Annotated Checklist and Host Index for Arizona Wood-Rotting Fungi,
W74-07097 2I

Psychrophilic Yeasts Isolated From Marine Fish,
W74-07563 5A

PEAT CYLINDERS
Extruded Peat Cylinders: Their Physical Characteristics as Affecting Tree Seedling Growth and Greenhouse Drought Tolerance,
W74-07180 2I

PEAT SOILS
Activity of the Microorganisms and the Mineralization of the Organic Matter Peat Soils with a Varying Level of Sub Soil Waters, (In Russian),
W74-07230 2G

PENALTIES (LEGAL)
Pollution Sanctions--New Alternatives to Civil Liability,
W74-07123 5G

PENNSYLVANIA
Ecology and Productivity of Strip-Mine Areas in Mercer County, Pennsylvania,
W74-07055 5B

Scenic Rivers.
W74-07114 6E

The EPA Stormwater Management Model: A Current Overview,
W74-07265 5D

Effect of Agnes Floods on Annual Series in Pennsylvania,
W74-07455 2E

PERCH FRY
Abundance and Mortality of the Perch Fry (Perca Fluviatilis, Linnacus, 1758) in the Klicava Reservoir,
W74-07588 8I

PERCHED WATER
Groundwater Geology of Fort Valley, Coconino County, Arizona,
W74-07092 4B

PERMITS
Sediment Control.
W74-07115 6E

Protection of the Environment.
W74-07289 6E

National Pollutant Discharge Elimination System.
W74-07293 6E

PERSONNEL MANAGEMENT
Pollution Control Through Training, Education, and Rigorous Follow-Up,
W74-07408 5G

PESTICIDE REMOVAL
Volatility of DDT Residues in Soil as Affected by Flooding and Organic Matter Applications,
W74-07424 5B

PESTICIDE RESIDUES
Erosional Losses of S-Triazine Herbicides,
W74-07421 5B

Multiple Organochlorine Pesticide Residues in Japan,
W74-07560 5A

Acid Ammonium Acetate Extraction and Electron Capture Gas Chromatographic Determination of Carbofuran in Soils,
W74-07574 5A

Residues of Atrazine, Cyanazine, and Their Phytotoxic Metabolites in a Clay Loam Soil,
W74-07585 5A

PESTICIDE TOXICITY
Nature and Toxicity of Two Oxychlordane Photoisomers,
W74-07584 5C

PESTICIDES
Predicting Pesticide Runoff From Agricultural Land: A Conceptual Model,
W74-07427 5B

PETROLOGY
Investigation of the Relation of Groundwater Evaporation to Lithological Structure of the Zone of Aeration (K izucheniyu zavisimosti ispareniya gruntovykh vod ot litologicheskogo stroyeniya zony aeratsii),
W74-07529 2D

PHENOLOGY
Phenology of a Tropical Rain Forest in Malaya,
W74-07482 2I

PHENOLS
Catalytic Oxidation of Phenol in Dilute Concentration in Air,
W74-07086 5D

Determination of Pentachlorophenol in Natural and Waste Waters,
W74-07385 5A

Study of the Adaptation of an Activated Sludge to the Purification of an Industrial Effluent (Etude de l'adaptation d'une boue activee a l'epuration d'un effluent industriel),
W74-07389 5D

Microdetermination of Resorcinol in Presence of Phenol,
W74-07580 5A

PHORMIDIUM LURIDUM VAR
The Effect of Selenite on the Physiological and Morphological Properties of the Blue-Green Alga Phormidium luridum Var. Olivacea,
W74-07550 5C

PHOSPHATE REMOVAL
Use and Production of Iron Salts for Phosphorus Removal,
W74-07269 5D

Removal of Phosphates from Wastewaters with Electro-Chemically Generated Gadolinium Ions,
W74-07271 5D

PHOSPHATES
Laundry Detergents and Environmental Quality,
W74-07122 5C

The Effects of Household Sanitary Systems on Effluent Phosphate Levels,
W74-07267 5D

Use and Production of Iron Salts for Phosphorus Removal,
W74-07269 5D

Removal of Phosphates from Wastewaters with Electro-Chemically Generated Gadolinium Ions,
W74-07271 5D

Distribution and Chemistry of Phosphorus in an Albaqualf Soil After 82 Years of Phosphate Fertilization,
W74-07532 5B

A Continuous Culture Study of Phosphate Uptake, Growth Rate and Polyphosphate in Scenedesmus Sp.,
W74-07549 5C

Effect of Restricted Use of Phosphate-Based Detergents on Onondaga Lake,
W74-07566 5C

PHOSPHORUS
Aerobic Digestion of Organic Sludges Containing Inorganic Phosphorus Precipitates: Phase I,
W74-07268 5D

Phosphorus Supply Characteristics of Acid Organic Soils as Measured by Desorption and Mineralization,
W74-07345 2G

A Study of the Movement of Phosphorous in the Little River Estuary, N.S.W.,
W74-07483 5B

PHOSPHORUS COMPOUNDS
Evaluation of Current Techniques for Nutrient Removal from Wastewaters,
W74-07441 5D

Distribution and Chemistry of Phosphorus in an Albaqualf Soil After 82 Years of Phosphate Fertilization,
W74-07532 5B

PHOSPHORUS REMOVAL
Phosphorus Removal Treatability Studies at C.F.B. Bordon, Petawawa, Trenton and Uplands,
W74-07273 5D

PHOTODECOMPOSITION
The Photochemistry of Carbamates. 1. The Photodecomposition of Zectran: 4-Dimethylamino-3,5-XYLYL-N-Methyl Carbamate,
W74-07552 5B

Nature and Toxicity of Two Oxychlordane Photoisomers,
W74-07584 5C

PHOTOISOMERS
Nature and Toxicity of Two Oxychlordane Photoisomers,
W74-07584 5C

PHOTOPRODUCTION
Hydrogen Sulfide Production by Synechococcus lividus Y52-si,
W74-07546 5C

PHOTOPRODUCTS
The Photochemistry of Carbamates. 1. The Photodecomposition of Zectran: 4-Dimethylamino-3,5-XYLYL-N-Methyl Carbamate,
W74-07552 5B

PHYLLOXERA-VITIFOLIAE
Occurrence and Distribution of the Vine Phylloxera, Phylloxera vitifoliae (Fitch), in the Olifants River Irrigation Area, Northwestern Cape Province,
W74-07356 3F

PHYTOPHAGOUS FISH
A New Type of Incubator Used in the Induced Spawning of Phytophagous Fishes, (In Rumanian),
W74-07434 8I

PHYTOPLANKTON
Factors Affecting Phytoplankton Production in a Eutrophic Reservoir,
W74-07121 5C

PILOT PLANTS
High-Rate Disinfection of Combined Sewer Overflow,
W74-07263 5D

PINUS-CONTORTA-VAR-LATIFOLIA
Extruded Peat Cylinders: Their Physical Characteristics as Affecting Tree Seedling Growth and Greenhouse Drought Tolerance,
W74-07180 2I

PIPE FLOW
Solutions for Lateral Outflow in Perforated Conduits,
W74-07433 8B

PIPELINES
Economic Size Selection for PVC Pipelines,
W74-07303 8A

PIPES
Land Disposal of Waste Gases: III. Sorption Patterns From Buried Gas Injection Pipes,
W74-07422 5B

PLANKTON
The Plankton of Ponds Enriched with Wastes from Beet Sugar Factories,
W74-07478 5C

PLANNING
A Study of Potential Institutional Arrangements for Water Quality and Water Resources (Quantity) Planning and Management,
W74-07051 6B

Preliminary Water and Sewer Plan for Alcorn, Benton, Marshall, Prentiss, Tippah, Tishomingo Counties.
W74-07062 5D

Utilities and Facilities for New Residential Development: A Survey of Municipal Policy,
W74-07071 5D

North Coastal Area Action Program: A Study Of The Smith River Basin And Plain.
W74-07132 6B

Current Thinking in Water Resources Research and Their Applicability to Hawaii Conditions,
W74-07135 6B

Water Uses and Water Development in Fall Creek--Possible Conflicts,
W74-07149 6B

Simulation--A Tool for Water Resource Management,
W74-07300 6A

Environmental Impact Analysis: An Examination of Three Methodologies,
W74-07339 6G

Production Function Theory for Use in Optimal Planning Decisions,
W74-07460 5D

PLANT CELL MODELS
Stomatal Mechanics,
W74-07593 2I

PLANT DISEASES
Annotated Checklist and Host Index for Arizona Wood-Rotting Fungi,
W74-07097 2I

PLANT GROWTH
Subsurface Heating and Irrigation of Soils: Its Effect on Temperature and Water Content and on Plant Growth,
W74-07054 2G

Study on the Pasture Establishment Technique VI. Effect of Different Spacings and Weedings on Establishment and Forage Production of Cenchrus ciliaris Linn., Lasiurus sindicus Henr. and Panicum antidotale Retz under Arid Conditions,
W74-07107 3F

An Investigation of Propagation and the Mineral Nutrition of Spartina alterniflora,
W74-07486 5C

Effect of Light Intensity and Glycerol on the Growth, Pigment Composition, and Ultrastructure of Chroomonas Sp.,
W74-07548 5C

PLANT MORPHOLOGY
The Marine Diatom Ethmodiscus rex: Its Morphology and Occurrence in the Plankton of the Sargasso Sea,
W74-07547 5A

The Effect of Selenite on the Physiological and Morphological Properties of the Blue-Green Alga Phormidium luridum Var. Olivacea,
W74-07550 5C

PLANT PHYSIOLOGY
The Saguaro Giant Cactus, A Bibliography,
W74-07098 2I

PLANT PIGMENTS
Effect of Light Intensity and Glycerol on the Growth, Pigment Composition, and Ultrastructure of Chroomonas Sp.,
W74-07548 5C

PLANTING MANAGEMENT
Effect of Seeding Rates and Row Spacings on Fodder Production of Moth Bean (Phaseolus aconitifolius),
W74-07091 3F

PLASTIC PIPES
Pressure Sewers,
W74-07259 5D

PLATINUM ELECTRODES
Mass and Charge Transfer Kinetics and Coulometric Current Efficiencies. Part VII. Conditional Potentials, and Single-Scan Voltammetry of Pure Vanadium(V) - Vanadium(IV) Systems in Various Media at Platinum Elec trodes Pre-Treated By Five Methods,
W74-07557 2K

Mass and Charge Transfer Kinetics and Coulometric Current Efficiencies. Part VIII. Single-Scan Voltammetry of Vanadium(V) - Vanadium(IV) in the Presence of Chromium, Manganese and Iron, and the Kinetic Parameters of the Vanadium System, at Platinum Electrodes Pre-Treated by Five Methods,
W74-07558 5A

PLOWING
Intensive Infiltrometer Studies on A Plowed Big Sagebrush Site,
W74-07166 2G

PODOCARP FORESTS
Management of South Westland Terrace Podocarp Forest Under a Selection Logging System,
W74-07347 4A

PODZOLIC SOILS
Research on the Micromorphology of the Flooded Poszolic Soils of Shallow Water Reservoirs, (In Russian),
W74-07235 2G

POLAND
The Plankton of Ponds Enriched with Wastes from Beet Sugar Factories,
W74-07478 5C

POLAND (POMERANIAN)
Leech Communities (Hirudinea) in the Mazurian and Bialystok Regions and the Pomeranian Lake District,
W74-07542 5C

POLAND (RIVER NIDA)
Structure of Fish Groupings in the Rivers and Streams of the River Nida Drainage Basin,
W74-07539 2I

POLLUTANT IDENTIFICATION
Determination of Chlorinated Insecticides in Suspended Sediment and Bottom Material,
W74-07317 5A

Aerial Spill Prevention Surveillance During Sub-Optimim Weather,
W74-07342 5A

Use of Amberlite XAD-4 for Extraction and Recovery of Chlorinated Insecticides and Polychlorinated Biphenyls from Water,
W74-07383 5D

Determination of Pentachlorophenol in Natural and Waste Waters,
W74-07385 5A

Quantitative Chemical Analysis of Specific Components of the Waters of Lost Creek and the Wabash River, Vigo County, Indiana,
W74-07405 5A

More Heat Than Light Thermal Pollution Versus Heat Energy Utilization,
W74-07465 5B

The Chemical Form and Bodily Distribution of Mercury in Marine Fish,
W74-07551 5A

The Photochemistry of Carbamates 1. The Photodecomposition of Zectran 4-Dimethylamino-3,5-XYLYL-N-Methyl Carbamate,
W74-07552 5B

A New Colorimetric Procedure for the Determination of Benomyl,
W74-07559 5A

The Bacterial Flora of the Atlantic Salmon (Salmo salar L.) in Relation to its Environment,
W74-07567 5A

Acid Ammonium Acetate Extraction and Electron Capture Gas Chromatographic Determination of Carbofuran in Soils,
W74-07574 5A

Kaempferol (3,5,7,4'-Tetrahydroxyflavone) as a Chromogenic Reagent for Tin(IV),
W74-07579 5A

POLLUTANTS
Pollution, Production, and Compensation,
W74-07064 5G

Protection of the Environment.
W74-07289 6E

National Pollutant Discharge Elimination System.
W74-07293 6E

POLLUTION
Waste Water Process Tank Control Facility,
W74-07216 5D

Stream Pollution.
W74-07275 6E

POLLUTION ABATEMENT
Pollution Sanctions--New Alternatives to Civil Liability,
W74-07123 5G

Possible Impact of Costs of Selected Pollution Control Equipment on the Electric Utility Industry and Certain Power Intensive Consumer Industries. Executive Summary.
W74-07140 5G

Water Treatment Apparatus,
W74-07196 5D

Method of and Apparatus for the Recovery of Oil from Water,
W74-07201 5G

Attenuation of Water Waves and Control and Utilization of Wave-Induced Water Movements,
W74-07204 8B

Safety Device Against Leakage from Ships, Especially Tankers,
W74-07205 5G

Oil Reclaiming Device for Removing Oil from the Surface of Water,
W74-07206 5G

Containing and Removing Oil Spills on Water,
W74-07208 5G

Method and Apparatus for Collecting a Floating Liquid,
W74-07215 5G

Method for the Elimination and Possible Recovery of the Floating Polluting Substances, Mineral Oils in Particular, From Sheets of Water and Boat Fitted to This Aim,
W74-07220 5G

Agitating and Aerating Apparatus,
W74-07221 5D

Method of Removing Oil Spills,
W74-07222 5G

Apparatus for Removing Surface Pollutants from Water and Other Liquids,
W74-07223 5G

Combined Sewer Overflow Seminar Papers.
W74-07255 5D

Stormflow Pollution Control in the U.S.,
W74-07256 5D

The Effects of Household Sanitary Systems on Effluent Phosphate Levels,
W74-07267 5D

The Effluent-Free Bleached Kraft Pulp Mill. Part IV. The Salt Recovery Process,
W74-07379 5D

Environmental Protection Techniques to be Applied in a Bleached Kraft Pulp Mill in Sweden,
W74-07392 5D

Pollution Control Through Training, Education, and Rigorous Follow-Up,
W74-07408 5G

An Overview of Water Reuse Potential in Pulp and Paper Manufacturing,
W74-07410 5D

Application of a Large Scale Nonlinear Programming Problem to Pollution Control,
W74-07461 5D

POLLUTION CONTROL

Pollution and Industry: Pros, Cons of Growing Fight.
W74-07112 5G

The Demand for Sport Fishing at Yaquina Bay,
W74-07143 6B

POLLUTION TAXES (CHARGES)

Economic Study of the Effect of Municipal Sewer Surcharges on Industrial Wastes and Water Usage,
W74-07057 5G

User Charges and Industrial Cost Recovery, Denver SMSA,
W74-07370 5D

POLYCHLORINATED BIPHENYLS

Use of Amberlite XAD-4 for Extraction and Recovery of Chlorinated Insecticides and Polychlorinated Biphenyls from Water,
W74-07383 5D

POLYELECTROLYTES

How Polyacrylamides can Help Effluent Problems,
W74-07391 5D

POLYPHOSPHATES

A Continuous Culture Study of Phosphate Uptake, Growth Rate and Polyphosphate in Scenedesmus Sp.,
W74-07549 5C

POLYURETHANE FOAM

An Oil Recovery System Utilizing Polyurethane Foam--A Feasibility Study,
W74-07341 5G

PONDS

Losses of Inorganic Nitrogen From Aquatic Systems,
W74-07426 5B

Diseases of Pond Fishes,
W74-07481 8I

POPULATION DENSITY (ISOPODS)

Population Density, Biomass and Maximum Natality Rate and Food Conditions in Ligidium Hypnorum L. (Isopoda),
W74-07590 8I

POPULATION DYNAMICS

Population Dynamics of Protozoa Associated with the Decay of Organic Materials in Fresh Water,
W74-07541 5C

POPULATIONS

Determination of Mean Cell Size of Tetrahymena in Growing Cultures,
W74-07586 5A

POROSITY

The Relationship of Porosity and Angle of Repose to Mixture Proportions in Assemblages of Different Sized Materials,
W74-07330 2J

POROUS MEDIA

Heat Dispersion Effect on Thermal Convection in a Porous Medium Layer,
W74-07156 2F

An Experimental Study of Immiscible Displacement with an Unfavorable Mobility Ratio in Porous Media,
W74-07524 2F

POTABLE WATER

A Study of the Intake of Drinking Water by Dairy Cows at Grass,
W74-07358 3F

Study of Metabolism of Nickel Entering the Body with Drinking Water, (In Russian),
W74-07361 5C

Hygienic Features of Silicate Anticorrosion Coatings for Water Reservoirs, (In Russian),
W74-07364 5F

Hygienic Evaluation of Means of Enrichment with Salts and Decontamination of Demineralized Water, (In Russian),
W74-07365 5F

POTASSIUM FERRATE

An Explanatory Work on the Oxidation of Ammonia by Potassium Ferrate (VI),
W74-07454 5D

POTENTIAL WATER SUPPLY

A Bill to Authorize the Secretary of the Interior to Engage in Feasibility Investigations of Certain Potential Water Resource Developments.
W74-07284 6E

POULTRY

Recovery of Arsenic by Dry Ashing from Animal Tissue Fortified with Organoarsenicals or Arsenic Trioxide,
W74-07573 5A

POWERPLANTS

Economic Evaluation and Determination of Plant Capacity and Dam Height,
W74-07305 8A

PRECIPITATION (ATMOSPHERIC)

Source and Budget of Sulfate in Precipitation from Central Alberta, Canada,
W74-07164 5B

PRECIPITATION EXCESS

Comparison of Rainfall-Runoff Models for Urban Areas,
W74-07463 2A

PRESERVATION

Landscape Compartmentalization: An Ecological Approach to Land Use Planning,
W74-07053 6G

PRESSURE SEWERS

Pressure Sewers,
W74-07259 5D

PRIMARY PRODUCTIVITY

Systems simulation of the effect of tertiary treatment for carbon, nitrogen, and phosphorus removal upon primary productivity, standing crop, and community structure of autotrophic and hetertrophic communities in receiving model streams.
W74-07337 5C

A Strategy for Modeling Primary Production in Stratified Fjords,
W74-07494 5C

Byglandsfjorden. Primary Production and Other Limnological Features in an Oligotrophic Norwegian Lake,
W74-07554 5C

PROBABILITY

Probability Distribution of Snow Course Data for Central Arizona,
W74-07094 2C

PRODUCTION FUNCTIONS

Production Function Theory for Use in Optimal Planning Decisions,
W74-07460 5D

PRODUCTIVITY

Productivity and Water Stress in Cacti,
W74-07109 2I

Factors Affecting Phytoplankton Production in a Eutrophic Reservoir,
W74-07121 5C

Nutrient Cycling and Productivity of Dystrophic Lake-Bog Systems (Part B),
W74-07466 5C

PRODUCTIVITY

Relationship Between Logging Activities and Salmon Production,
W74-07468 4C

An Ecosystem Study in the Inside Passage of Southeastern Alaska,
W74-07495 5C

PROGRAM DEVELOPMENT PLAN
Program Development Plan for the Mesa-New York Bight Regional Project.
W74-07078 6B

PROJECT BENEFITS
A Framework for Economic Planning of Watershed Drainage,
W74-07069 4A

PROJECT PLANNING
Procedures and Programs to Assist in the Environmental Impact Statement Process,
W74-07061 6B

A Framework for Economic Planning of Watershed Drainage,
W74-07069 4A

State Flood Control Program.
W74-07111 4A

Sediment Control.
W74-07115 6E

PROJECTIONS
Preliminary Water and Sewer Plan for Alcorn, Benton, Marshall, Prentiss, Tippah, Tishomingo Counties.
W74-07062 5D

Possible Effects of Construction and Operation of a Supertanker Terminal on the Marine Environment in New York Bight,
W74-07488 5C

PROJECTS
Water and Effluent Treatment Plants - Cost Considerations and Client, Contractor, Consultant Relationships, The Consultant's View,
W74-07312 5D

Eighth Annual Report, Program Activities, July 1, 1971-Jun 30, 1972.
W74-07332 9D

PROTECTION
Pacific Northwest Coastal Zone Management as it Relates to Estuary Protection,
W74-07500 6E

PROTEINS
Water Reuse in Protein Feed Process Utilizing Lumber Mill Wastes,
W74-07409 5D

PROTEOLYSIS
Reduction in Mercury Content of Fish Protein Concentrate by Enzymatic Digestion,
W74-07576 5A

PROTOZOA (CILIATES)
Population Dynamics of Protozoa Associated with the Decay of Organic Materials in Fresh Water,
W74-07541 5C

PROVENANCE
Regional Clay Mineral Facies in Estuaries and Continental Margin of the United States East Coast,
W74-07237 2L

Source of Recent Nearshore Marine Clays, Southeastern United States,
W74-07238 2L

PSYCHROPHILIC FUNGI
Psychrophilic Yeasts Isolated From Marine Fish,
W74-07563 5A

PTERIDOPHYTES
A Contribution to the Botany of Ganganagar District, North Rajasthan,
W74-07357 3F

PUBLIC HEALTH
Hygienic Features of Silicate Anticorrosion Coatings for Water Reservoirs, (In Russian),
W74-07364 5F

Hygienic Evaluation of Means of Enrichment with Salts and Decontamination of Demineralized Water, (In Russian),
W74-07365 5F

PUBLIC HEARINGS
North Coastal Area Action Program. A Study of the McKinleyville-Trinidad Area: Public Hearing Comments.
W74-07129 6B

PUBLIC LANDS
Scenic Rivers.
W74-07114 6E

PUERTO RICO
Investigation of the Biology and Control of Noxious Coelenterates Occurring in the Coastal Waters of Puerto Rico,
W74-07480 2L

PUGET SOUND (WASH)
A Strategy for Modeling Primary Production in Stratified Fjords,
W74-07494 5C

PULP AND PAPER INDUSTRY
Residuals in Manufacture of Paper,
W74-07399 5B

The Pulp and Paper Industry and the Environment,
W74-07411 5D

PULP WASTES
A Comparison of Effluent Characteristics from Conventional and Oxygen Bleaching Sequences: Results of a Laboratory Study,
W74-07375 5D

Oxygen Bleaching -- A Flexible Process for Pollution Abatement,
W74-07376 5D

Water Reuse and Recycle in the D(C)EDED Bleach Sequence,
W74-07377 5D

The Effluent-Free Bleached Kraft Pulp Mill. Part V. The R4 Process for Chlorine Dioxide Manufacture to Decrease Production of Sodium Sulphate,
W74-07378 5D

The Effluent-Free Bleached Kraft Pulp Mill. Part IV. The Salt Recovery Process,
W74-07379 5D

New Effluent Plant at Colthrop Board Mills.
W74-07380 5D

Mechanical Waste Water Clarification and Biological-Chemical Waste Water Purification Using the Attisholz and Ruthner System (Mechanische Abwasserklaerung und biologisch-chemische Abwasserreinigung nach System Attisholz und Ruthner),
W74-07381 5D

Possibilities of Effluent Clarification (Moeglichkeiten der Abwasserklaerung),
W74-07382 5D

Reduction of the Volume of Pollutants Discharged and of Fresh Water Consumption (Sokrashchenie sbrosa zagryaznenu i umen'shenie raskhoda svezhei vody),
W74-07384 5D

Determination of Pentachlorophenol in Natural and Waste Waters,
W74-07385 5A

On Some Special Problems of Sulfite Pulp Waste Water Purification (Zu einigen speziellen Problemen der Sulfitzellstoff-Abwasserreinigung),
W74-07386 5D

Microbiological Purification of Hydrogen Sulfide-Containing Kraft Mill Effluents (Mikrobiologicheskaya ochistka serovodorodnykh stochnykh vod sul'fatno-tsellyuloznogo proizvodstva),
W74-07387 5D

Predicting the Quality of Stream Water Under Conditions of Oxygen Deficiency (O prognoze kachetva vody vodotokov pri bol'shikh defitsitakh kisloroda),
W74-07388 5B

Some Equipment Used in Fibre Recovery and Effluent Treatment Operations.
W74-07390 5D

How Polyacrylamides can Help Effluent Problems,
W74-07391 5D

Environmental Protection Techniques to be Applied in a Bleached Kraft Pulp Mill in Sweden,
W74-07392 5D

Biodegradation of Resin Acid Sodium Salts,
W74-07393 5D

Water Reuse and Recycle in Kraft Bleacheries,
W74-07394 5D

Effluent - Fibre Recovery - Water Savings; Case History of a Recent Plant Installation,
W74-07395 5D

Marine Fungi Isolated from a Kraft Pulp Mill Outfall Area,
W74-07396 5B

Utilization of White Water in Board Mills (Ispol'zovanie oborotnoi vody na kartonnykh fabrikakh),
W74-07397 5D

Pilot Application of the Rotating Biological Surface Concept for Secondary Treatment of Insulating Board Mill Effluents,
W74-07398 5D

Residuals in Manufacture of Paper,
W74-07399 5B

A Practical and Trouble-Free Sewer Spill Monitor,
W74-07404 5D

A Review of Colour Reduction Technology in Pulp and Paper Mill Effluents,
W74-07406 5D

Pollution Control by Recycling Effluent,
W74-07407 5D

Pollution Control Through Training, Education, and Rigorous Follow-Up,
W74-07408 5G

An Overview of Water Reuse Potential in Pulp and Paper Manufacturing,
W74-07410 5D

The Pulp and Paper Industry and the Environment,
W74-07411 5D

PUMPED STORAGE
Hydroelectric Power Resources of the United States, Developed and Undeveloped, January 1, 1972.
W74-07189 8C

PUMPING
Evaluation of Methods of Pumping Test Analyses for Application to Hawaiian Aquifers,
W74-07531 5C

QUARTZ
A Scanning Electron Microscope Study of Surface Textures of Quartz Grains from Glacial Environments,
W74-07331 2J

RACINE (WIS)
Screening/Dissolved-Air Flotation Treatment of Combined Sewer Overflows,
W74-07262 5D

RADAR
Broad Spectrum Microwave Systems for Remotely Measuring Soil Moisture Content,
W74-07052 2G

RADIATION
Response of Aquatic Weeds to Laser Radiation,
W74-07475 5G

RADIATION SAFETY
Radiation Safety Problems in the Operation of Atomic Electric Power Stations, (In Russian),
W74-07363 5B

RADIOACTIVE SEWAGE
Organization of the Collection and Decontamination of Industrial and Domestic Radioactive Sewage, (In Russian),
W74-07362 5D

RADIOACTIVITY TECHNIQUES
Summary of the State of the Art in Radiochromatography,
W74-07571 5A

RADIOCHROMATOGRAPHY
Summary of the State of the Art in Radiochromatography,
W74-07571 5A

RADIOISOTOPES
A Study of the Movement of Phosphorous in the Little River Estuary, N.S.W.,
W74-07483 5B

RADIOMETERS
Surface Temperatures of Lake Erie,
W74-07415 2H

RADIOMETRIC TEMPERATURE
Broad Spectrum Microwave Systems for Remotely Measuring Soil Moisture Content,
W74-07052 2G

RAIN FORESTS
Phenology of a Tropical Rain Forest in Malaya,
W74-07482 2I

RAINBOW TROUT
Pharmacodynamics of Methyl Mercury in the Rainbow Trout (Salmo Gairdneri): Tissue Uptake, Distribution and Excretion,
W74-07597 5C

RAINFALL
An Irrigation Scheduling Model Which Incorporates Rainfall Predictions,
W74-07440 3F

RAINFALL-RUNOFF RELATIONSHIPS
Cross-Spectral Analysis of Rainfall and Runoff for Raritan and Mullica River Basins in New Jersey,
W74-07183 2A

The EPA Stormwater Management Model: A Current Overview,
W74-07265 5D

Comparison of Rainfall-Runoff Models for Urban Areas,
W74-07463 2A

A Rainfall-Runoff Model Based on the Watershed Stream Network,
W74-07464 2A

Effect of Grazing on Runoff from Two Small Watersheds in Southwestern Wisconsin,
W74-07525 4C

RANGE MANAGEMENT
Intensive Infiltrometer Studies on A Plowed Big Sagebrush Site,
W74-07166 2G

RAPPAHANNOCK ESTUARY
Biogeochemical Variables in Bottom Sediments of the Rapphannock River Estuary,
W74-07244 2L

RARITAN RIVER BASIN (N
Cross-Spectral Analysis of Rainfall and Runoff for Raritan and Mullica River Basins in New Jersey,
W74-07183 2A

RATES OF APPLICATION
Effect of Seeding Rates and Row Spacings on Fodder Production of Moth Bean (Phaseolus aconitifolius),
W74-07091 3F

RECIRCULATED WATER
Water Reuse and Recycle in the D(C)EDED Bleach Sequence,
W74-07377 5D

Reduction of the Volume of Pollutants Discharged and of Fresh Water Consumption (Sokrashchenie sbrosa zagryaznenii i umen'shenie raskhoda svezhei vody),
W74-07384 5D

RECREATION
Scenic Rivers.
W74-07114 6E

Problems in Recreational Use of Reservoirs (Problemy rekreatsionnogo ispol' zovaniya vodokhranilishch),
W74-07193 6B

Cost Sharing for Recreation: Efficiency and Equity,
W74-07307 6B

RECREATION DEMAND
Determinants of Use of Water-Based Recreational Facilities,
W74-07058 6B

Bethany Reservoir Recreation Development Plan.
W74-07127 6B

Utility Analysis in the Valuation of Extra-Market Benefits with Particular Reference to Water-Based Recreation,
W74-07150 6B

Problems in Recreational Use of Reservoirs (Problemy rekreatsionnogo ispol' zovaniya vodokhranilishch),
W74-07193 6B

RECREATION FACILITIES
Planning and Developing Waterfront Property,
W74-07072 6B

Arizona State Lake Improvement Fund Plan.
W74-07108 6B

Bethany Reservoir Recreation Development Plan.
W74-07127 6B

Lake Perris Recreation Development Plan.
W74-07128 6B

Silverwood Lake Recreation Development Plan.
W74-07130 6B

Problems in Recreational Use of Reservoirs (Problemy rekreatsionnogo ispol' zovaniya vodokhranilishch),
W74-07193 6B

Small Beach Erosion Control Project, Lewes, Delaware (Final Environmental Impact Statement).
W74-07295 4A

RECREATIONAL DEMAND
The Demand for Sport Fishing at Yaquina Bay,
W74-07143 6B

RECYCLED WATER
An Overview of Water Reuse Potential in Pulp and Paper Manufacturing,
W74-07410 5D

RECYCLING
Pollution Control by Recycling Effluent,
W74-07407 5D

RED SEA RIFT
Mineral Springs in the Suez Rift Valley - Comparison With Waters in the Jordan Rift Valley and Postulation of a Marine Origin,
W74-07444 2K

REDUCTION (CHEMICAL)
Reduction in Mercury Content of Fish Protein Concentrate by Enzymatic Digestion,
W74-07576 5A

REGENERATION
Regeneration of Chromated Aluminum Deoxidizers, Phase I Report,
W74-07254 5D

REGIONAL ANALYSIS
Program Development Plan for the Mesa-New York Bight Regional Project.
W74-07078 6B

Agroclimatic Regions of Rajasthan,
W74-07102 3F

Population, Land Use and Livestock Composition in India and Its Arid Zone,
W74-07105 3F

REGIONAL DEVELOPMENT
Institutional Arrangements and Alternative Futures.
W74-07081 6D

REGIONAL ECONOMICS
Urban Impacts of Rural Resource Development Expenditures in the Interlake Area of Manitoba,
W74-07068 6B

REGIONAL ENVIRONMENTAL REFERENCES
Regional Environmental Reference.
W74-07085 6G

REGIONAL PLANNING
Water and Wastewater Systems Inventory - Region H, North Carolina,
W74-07063 5D

Background Survey. Surface Drainage Program, Madison, Saint Clair, Monroe and Randolph Counties, Illinois.
W74-07066 4A

Public Investment Criteria: Application to a Project in the Souris River Basin,
W74-07070 6B

REGRESSION ANALYSIS
Economic Study of the Effect of Municipal Sewer Surcharges on Industrial Wastes and Water Usage,
W74-07057 5G

Determinants of Use of Water-Based Recreational Facilities,
W74-07058 6B

REGULATION
Combined Sewer Overflow Regulator Facilities,
W74-07258 5D

The Swirl Concentrator as a Combined Sewer Overflow Regulator,
W74-07264 5D

Petroleum Refinery Effluent Regulations and Guidelines.
W74-07274 5G

Environmental Impact Analysis: An Examination of Three Methodologies,
W74-07339 6G

User Charges and Industrial Cost Recovery, Denver SMSA,
W74-07370 5D

Laws and Regulations of Pollution and Navigation in Pacific Northwest Estuaries,
W74-07499 5G

REGULATIONS
Protection of the Environment.
W74-07289 6E

National Pollutant Discharge Elimination System.
W74-07293 6E

REMOTE SENSING
Broad Spectrum Microwave Systems for Remotely Measuring Soil Moisture Content,
W74-07052 2G

On The Determination of Turbulent Diffusivity in Shallow Waters by Aerial Photography of Floating Markers,
W74-07316 2H

Aerial Spill Prevention Surveillance During Sub-Optimim Weather,
W74-07342 5A

Surface Temperatures of Lake Erie,
W74-07415 2H

A Rainfall-Runoff Model Based on the Watershed Stream Network,
W74-07464 2A

Utilization of ERTS-1 Data to monitor and Classify Eutrophication of Inland Lakes,
W74-07484 5C

A Direct Comparison of Satellite and Aircraft Infrared (10 Micrometers-12 Micrometers) Remote Measurements of Surface Temperature,
W74-07578 7B

RESEARCH
Annual Report/Fiscal Year 1973.
W74-07252 9D

Annotated Bibliography of Explosive Excavation Related Research.
W74-07314 8H

RESEARCH AND DEVELOPMENT
Research Activities of the Illinois State Water Survey,
W74-07136 6B

Ninth Annual Report of the Water Resources Research Institute of the University of Wyoming (Activities During FY 1973).
W74-07457 9A

RESEARCH FACILITIES
Development of a Decision Room for Environntal Studies, (Feasibility Study),
W74-07371 6G

RESEARCH PRIORITIES
Technology Transfer in the Marine Environment of Long Island,
W74-07059 6B

Minutes, Iowa State Water Resources Research Institute Advisory Board and Council, Eighth Annual Meeting.
W74-07456 9A

RESERVOIR OPERATION
Problems in Recreational Use of Reservoirs (Problemy rekreatsionnogo ispol' zovaniya vodokhranilishch),
W74-07193 6B

Instrumentation for Engineering Management of a Multi-Purpose River Basin System (Trinity River Basin, Texas) Real-Time Engineering Management of a Multi-Purpose River Basin System,
W74-07369 4A

RESERVOIR USAGE
Determinants of Use of Water-Based Recreational Facilities,
W74-07058 6B

RESERVOIRS
Bethany Reservoir Recreation Development Plan.
W74-07127 6B

Lake Perris Recreation Development Plan.
W74-07128 6B

Silverwood Lake Recreation Development Plan.
W74-07130 6B

Problems in Recreational Use of Reservoirs (Problemy rekreatsionnogo ispol' zovaniya vodokhranilishch),
W74-07193 6B

RESEVOIR RELEASES
Planar and Axisymmetric Bottom Withdrawal from a Density-Stratified Reservoir,
W74-07340 4A

RESIDENCE TIME
Physical Modeling of Residence Times in Tidal Basins,
W74-07496 2L

RESINS
Biodegradation of Resin Acid Sodium Salts,
W74-07393 5D

RESORCINOL
Microdetermination of Resorcinol in Presence of Phenol,
W74-07580 5A

RESOURCES DEVELOPMENT
Kelp Habitat Improvement Project, Annual Report July 1, 1970 - June 30, 1971.
W74-07489 5C

Kelp Habitat Improvement Project, Annual Report July 1, 1971 - June 30, 1972.
W74-07490 5C

RETENTION
Physical Modeling of Residence Times in Tidal Basins,
W74-07496 2L

REVERSE OSMOSIS
Water Purification System,
W74-07213 5D

REVIEWS
Prevention and Control of Infiltration and Inflow,
W74-07257 5D

Land Application of Sewage Sludge,
W74-07266 5D

Land Disposal of Wastewater--Literature Review for 1973,
W74-07327 5D

Extracellular Products of Algae in Freshwater,
W74-07353 5C

Possibilities of Effluent Clarification (Moeglichkeiten der Abwasserklaerung),
W74-07382 5D

Summary of the State of the Art in Radiochromatography,
W74-07571 5A

RICE
Evaporation from an Irrigated Rice Crop in a Semi-Arid Region,
W74-07096 2D

RIPARIAN RIGHTS
Riparian Rights in Certain Counties.
W74-07283 6E

RISKS
Flood Proofing Decisions with Uncertain Events,
W74-07299 6A

Optimum Design Height of Cofferdams,
W74-07304 8A

RIVER BASINS
Nonlinear Programming in River Basin Modeling,
W74-07298 5B

A Model of Irrigated Agriculture and Regional Development in Southern Argentina: The Rio Negro Basin,
W74-07306 6A

Regional Water Quality Management by the Generalized Reduced Gradient Method,
W74-07311 5B

RIVER BEDS
Wild and Scenic Rivers.
W74-07290 6E

RIVER REGULATION
Flood Plain Information-Neuse River and Buffalo Creek, Smithfield, North Carolina.
W74-07074 4A

RIVER SYSTEMS
Instrumentation for Engineering Management of a Multi-Purpose River Basin System (Trinity River Basin, Texas) Real-Time Engineering Management of a Multi-Purpose River Basin System,
W74-07369 4A

RIVERS
Scenic Rivers.
W74-07114 6E

Dissolved-Solids Discharge to the Oceans from the Conterminous United States,
W74-07162 5B

River Regulation--Reservoirs.
W74-07278 6E

Wild and Scenic Rivers.
W74-07290 6E

An Investigation of the Physical Impact of Sewage Outflow on a River-Estuarine Environment,
W74-07477 5C

Winter-Regime Thermal Response of Heated Streams,
W74-07511 5B

RIVERS AND HARBORS ACT
United States V. Pot-Nets, Inc. (Violation of Rivers and Harbors Act),
W74-07287 6E

United States v. Ira S. Bushey and Sons, Inc. (Injunction Against Oil Spills).
W74-07291 6E

RIVERS SYSTEMS
Wild, Scenic River Systems.
W74-07280 6E

ROANOKE ISLAND (NC)
Recent Estuarine Sediment History of the Roanoke Island Area, North Carolina,
W74-07245 2L

ROCKY MOUNTAIN REGION
Water Yield, Annual peaks and Exposure in Mountainous Terrain,
W74-07165 2A

ROOT SYSTEMS
Effects of Subsurface Asphalt Layers on Corn and Tomato Root Systems,
W74-07447 3F

ROOT ZONE
Effects of Subsurface Asphalt Layers on Corn and Tomato Root Systems,
W74-07447 3F

ROTATING BIOLOGICAL SURFACE
Pilot Application of the Rotating Biological Surface Concept for Secondary Treatment of Insulating Board Mill Effluents,
W74-07398 5D

ROTATING DISKS
Rotating Biological Disk Wastewater Treatment Process - Pilot Plant Evaluation,
W74-07373 5D

ROTS
Annotated Checklist and Host Index for Arizona Wood-Rotting Fungi,
W74-07097 2I

ROUGH SURFACE DISTORTION
Broad Spectrum Microwave Systems for Remotely Measuring Soil Moisture Content,
W74-07052 2G

ROW SPACING
Effect of Seeding Rates and Row Spacings on Fodder Production of Moth Bean (Phaseolus aconitifolius),
W74-07091 3F

RUMINOCOCCUS ALBUS
Utilization of Fibrous Wastes as Sources of Nutrients,
W74-07472 5D

RUNOFF
Erosional Losses of S-Triazine Herbicides,
W74-07421 5B

Predicting Pesticide Runoff From Agricultural Land: A Conceptual Model,
W74-07427 5B

First Characterization of the Runoff From the Watershed of the Manso Superior River and its Basins (Argentina), (In Spanish),
W74-07536 2E

RUNOFF FORECASTING
Water Yield, Annual peaks and Exposure in Mountainous Terrain,
W74-07165 2A

RURAL DEVELOPMENT
Urban Impacts of Rural Resource Development Expenditures in the Interlake Area of Manitoba,
W74-07068 6B

SAFETY
Arizona State Lake Improvement Fund Plan.
W74-07108 6B

SAGUARO CACTUS
The Saguaro Giant Cactus, A Bibliography,
W74-07098 2I

SALAMANDERS
In Comparison of the Food of Salamanders and Fish in Marion Lake, British Columbia,
W74-07349 2H

SALINE SOILS
Effect of Gypsum in Reducing Boron Hazard of Saline Waters and Soils,
W74-07095 3C

SALINE WATER
Effect of Gypsum in Reducing Boron Hazard of Saline Waters and Soils,
W74-07095 3C

SALINE WATER BARRIERS
Flood Plain Information-Neuse and Trent Rivers and Jack Smith Creek, New Bern, North Carolina.
W74-07073 4A

SALINE WATER INTRUSION
Recent Investigations in Stratified Flows Related to Estuarial Hydraulics,
W74-07226 2L

SALINITY
Quality of Well Waters of Jaipur District,
W74-07106 4B

Effects of Man-Made Works on the Hydraulic, Salinity, and Shoaling Regimens of Estuaries,
W74-07249 5C

Effect of Increasing Depth on Salinity in the James River Estuary,
W74-07250 2L

The Bittersweet Waters of the Lower Colorado,
W74-07292 3F

Interdisciplinary Modeling in the Analysis of the Salinity Problems of the Safford Valley,
W74-07297 5B

Ultra-Violet Absorption Characteristics of Natural Waters,
W74-07419 2K

SALMON
Relationship Between Logging Activities and Salmon Production,
W74-07468 4C

SALMONELLA
Incidence of Resistance to Tetracycline, Chloramphenicol and Ampicillin Among Salmonella Species Isolated in the Netherlands in 1969, 1970 and 1971,
W74-07562 5C

SALT MARSHES
Function of Marshes in Reducing Eutrophication of Estuaries of the Middle Atlantic Region,
W74-07336 5C

SALTS
Evaporation of Water from Sand: 5. The Effect of Evaporation on the Concentration of Salts Dissolved in Water Stored in Sand,
W74-07169 2D

Use and Production of Iron Salts for Phosphorus Removal,
W74-07269 5D

Biodegradation of Resin Acid Sodium Salts,
W74-07393 5D

SAMPLE PREPARATION
Observations on the Gas Chromatography of Kelthane (Dicofol),
W74-07575 5A

SAMPLING
An Improved Core Catcher for the Kiel Box Corer ('Kastenlot'),
W74-07159 7B

A Groundwater Profile Sampler,
W74-07523 2F

Elemental Variability Within a Sampling Unit,
W74-07598 2K

SAN ANTONIO (TEX)
The Relationship of Land Use to Water Use in San Antonio, Texas,
W74-07067 4A

Annual Compilation and Analysis of Hydrologic Data for Urban Studies in the San Antonio, Texas Metropolitan Area, 1971,
W74-07323 2E

SAN FRANCISCO BAY
Remanent Magnetization of Modern Tidal Flat Sediments from San Francisco Bay, California,
W74-07173 2L

SAND WAVES
Sand-Wave Fields in Taiwan Strait,
W74-07175 2J

SANDSTONES
Sandstone Aquifers in Eastern Sullivan County, Indiana,
W74-07401 4B

SANITARY SERVICES INVENTORY
Sanitary Services in Tennessee, 1972.
W74-07060 5D

SANTEE RIVER (SO
Santee Submergence, Example of Cyclic Submerged and Emerged Sequences,
W74-07247 2L

SARGASSO SEA
The Marine Diatom Ethmodiscus rex: Its Morphology and Occurrence in the Plankton of the Sargasso Sea,
W74-07547 5A

SATELLITES (ARTIFICIAL)
Utilization of ERTS-1 Data to monitor and Classify Eutrophication of Inland Lakes,
W74-07484 5C

A Direct Comparison of Satellite and Aircraft Infrared (10 Micrometers-12 Micrometers) Remote Measurements of Surface Temperature,
W74-07578 7B

SATURATED FLOW
Numerical Studies of Two-Dimensional Saturated-Unsaturated Drainage Models,
W74-07168 2G

SAW MILLS
Water Reuse in Protein Feed Process Utilizing Lumber Mill Wastes,
W74-07409 5D

SCANNING ELECTRON MICROSCOPY
The Marine Diatom Ethmodiscus rex: Its Morphology and Occurrence in the Plankton of the Sargasso Sea,
W74-07547 5A

SCENEDESMUS
A Continuous Culture Study of Phosphate Uptake, Growth Rate and Polyphosphate in Scenedesmus Sp.,
W74-07549 5C

SCENIC EASEMENTS
Scenic Rivers.
W74-07114 6E

SCHEDULING
An Irrigation Scheduling Model Which Incorporates Rainfall Predictions,
W74-07440 3F

SEA NETTLES
Effects of Temperature on Activity and Mortality of the Scyphozoan Medusa, Chrysaora quinquecirrha,
W74-07561 5C

SEA URCHINS CONTROL
Kelp Habitat Improvement Project, Annual Report July 1, 1970 - June 30, 1971.
W74-07489 5C

SEA WATER
Th-234/U-238 Activity Ratios in Pacific Ocean Bottom Waters,
W74-07322 2K

A Direct Comparison of Satellite and Aircraft Infrared (10 Micrometers-12 Micrometers) Remote Measurements of Surface Temperature,
W74-07578 7B

SEASONAL
Seasonal Abundance and Distribution of Juvenile Blue Crabs in Core Sound, N.C. 1965-1966,
W74-07350 2L

SEDIMENT CONTROL
Sediment Control.
W74-07115 6E

SEDIMENT DISCHARGE
Sediment Discharge in the Lake Tahoe Basin, California, 1972 Water Year,
W74-07326 2J

Suspended-Sediment Yield in Rivers of Gor'kiy Oblast as an Indication of Recent Erosion Processes (Stok vzveshennykh nanosov v rekakh Gor'kovskoy obl. kak pokazatel' razvitiya sovremennykh erozionnykh protsessov),
W74-07507 2J

SEDIMENT LOAD
Spatial and Temporal Distribution of Suspended Sediment in Narragansett Bay and Rhode Island Sound,
W74-07232 2L

Supply of Terrigenous Material to the Baltic Sea (Pitaniye Baltiyskogo morya terrigennym materialom),
W74-07501 2J

SEDIMENT SORTING
Size and Shape Sorting in a Dutch Tidal Inlet,
W74-07329 2L

SEDIMENT TRANSPORT
Sand-Wave Fields in Taiwan Strait,
W74-07175 2J

Suspended Sediment Transport in Delaware Bay,
W74-07233 2L

Distribution and Transportation of Suspended Sediment in Upper Cheasapeake Bay,
W74-07234 2L

Supply of Terrigenous Material to the Baltic Sea (Pitaniye Baltiyskogo morya terrigennym materialom),
W74-07501 2J

SEDIMENT YIELD
A Note on the Areal Distribution of Suspended Sediment Yield in South Africa,
W74-07177 2J

Sediment Discharge in the Lake Tahoe Basin, California, 1972 Water Year,
W74-07326 2J

Suspended-Sediment Yield in Rivers of Gor'kiy Oblast as an Indication of Recent Erosion Processes (Stok vzveshennykh nanosov v rekakh Gor'kovskoy obl. kak pokazatel' razvitiya sovremennykh erozionnykh protsessov),
W74-07507 2J

Quality of Water Discharged from Two Agricultural Watersheds in Southwestern Iowa,
W74-07528 5B

SEDIMENTARY STRUCTURES
Depositional Features of Braided-Meandering Stream,
W74-07163 2J

SEDIMENTATION
Sedimentation by Non-Tidal Currents Around Northern Denmark,
W74-07160 2L

Environmental Framework of Coastal Plain Estuaries.
W74-07225 2L

Biodeposition as a Factor in Sedimentation of Fine Suspended Solids in Estuaries,
W74-07231 2L

Spatial and Temporal Distribution of Suspended Sediment in Narragansett Bay and Rhode Island Sound,
W74-07232 2L

Distribution and Transportation of Suspended Sediment in Upper Cheasapeake Bay,
W74-07234 2L

Rio De La Plata Estuary Environments,
W74-07236 2L

Regional Clay Mineral Facies in Estuaries and Continental Margin of the United States East Coast,
W74-07237 2L

Source of Recent Nearshore Marine Clays, Southeastern United States,
W74-07238 2L

Texture and Organic Carbon Content of Bottom Sediments in some Estuaries of the United States,
W74-07243 2L

Recent Estuarine Sediment History of the Roanoke Island Area, North Carolina,
W74-07245 2L

Erosional and Depositional Estuarine 'Terraces,' Southeastern United States,
W74-07246 2L

Santee Submergence, Example of Cyclic Submerged and Emerged Sequences,
W74-07247 2L

Marine Geology and Estuarine History of Mobile Bay, Alabama: Part 1. Contemporary Sediments,
W74-07248 2L

Effects of Man-Made Works on the Hydraulic, Salinity, and Shoaling Regimens of Estuaries,
W74-07249 5C

Effect of Increasing Depth on Salinity in the James River Estuary,
W74-07250 2L

Dispersion of Contaminated Sediment Bed Load,
W74-07446 5B

Relationship Between Logging Activities and Salmon Production,
W74-07468 4C

Supply of Terrigenous Material to the Baltic Sea (Pitaniye Baltiyskogo morya terrigennym materialom),
W74-07501 2J

Role of Turbidity Currents in Sedimentary Processes (O roli mut'yevykh potokov v protsessakh osadkonakopleniya),
W74-07502 2J

EDIMENTOLOGY
Mass Physical and Engineering Properties of Some York River Sediments,
W74-07239 2L

Strontium Isotope Composition and Sediment Transport in the Rio de la Plata Estuary,
W74-07240 2L

The Relationship of Porosity and Angle of Repose to Mixture Proportions in Assemblages of Different Sized Materials,
W74-07330 2J

EDIMENTS
A Scanning Electron Microscope Study of Surface Textures of Quartz Grains from Glacial Environments,
W74-07331 2J

Mechanism of Element Distribution in the Pacific Ocean (Japanese Profile) (K poznaniyu mekhanizma raspredeleniya elementov v Tikhom okeane (Yaponskiy profil')),
W74-07503 2J

Solvent Extraction of Sulfur From Marine Sediment and Its Determination by Gas Chromatography.
W74-07565 5A

SEEDS
An Investigation of Propagation and the Mineral Nutrition of Spartina alterniflora,
W74-07486 5C

SEEPAGE
Numerical Studies of Two-Dimensional Saturated-Unsaturated Drainage Models,
W74-07168 2G

Seepage Through a Hillside: The Steady Water Table,
W74-07517 2G

SELENITE
The Effect of Selenite on the Physiological and Morphological Properties of the Blue-Green Alga Phormidium luridum Var. Olivacea,
W74-07550 5C

SELF-PURIFICATION
Predicting the Quality of Stream Water Under Conditions of Oxygen Deficiency (O prognoze kachetva vody vodotokov pri bol'shikh defitsitakh kisloroda),
W74-07388 5B

SEMICONDUCTORS
Special Report: Semiconductor Memories are Taking Over Data-Storage Applications,
W74-07553 7B

SENEGAL (SANGALKAM MARSH)
Nematode Fishe Parasites from Sangalkam, Senegal,
W74-07589 2H

SEPARATION TECHNIQUES
Method of and Apparatus for the Recovery of Oil from Water,
W74-07201 5G

Apn aratus for Separating Oil and SolidsfFrm m Water,
W74-07202 5D

System and Method for Separating Heavier and Lighter Components of Liquid Mixtures,
W74-07203 5D

Oil Reclaiming Device for Removing Oil from the Surface of Water,
W74-07206 5G

Containing and Removing Oil Spills on Water,
W74-07208 5G

Method and Apparatus for Collecting a Floating Liquid,
W74-07215 5G

Method for the Elimination and Possible Recovery of the Floating Polluting Substances, Mineral Oils in Particular, From Sheets of Water and Boat Fitted to This Aim,
W74-07220 5G

Method of Removing Oil Spills,
W74-07222 5G

Apparatus for Removing Surface Pollutants from Water and Other Liquids,
W74-07223 5G

Screening/Dissolved-Air Flotation Treatment of Combined Sewer Overflows,
W74-07262 5D

Determination of Oil Concentration and Size Distribution in Ship Ballast Waters. Method and Representative Results,
W74-07564 5B

Solvent Extraction of Sulfur From Marine Sediment and Its Determination by Gas Chromatography.
W74-07565 5A

SEPTIC TANKS
The Effects of Household Sanitary Systems on Effluent Phosphate Levels,
W74-07267 5D

SEWAGE
Organization of the Collection and Decontamination of Industrial and Domestic Radioactive Sewage, (In Russian),
W74-07362 5D

Effect of Effluents from Hydrolysis Plant on the Survival of Typhoid Fever and Dysentery Bacteria, (In Russian),
W74-07367 5C

SEWAGE DISTRICTS
Sanitary Districts for Sewage Disposal.
W74-07276 6E

SEWAGE EFFLUENTS
Natural Resources--Waste Control.
W74-07116 6E

SEWAGE LAGOONS
The Plankton of Ponds Enriched with Wastes from Beet Sugar Factories,
W74-07478 5C

SEWAGE SLUDGE
Land Application of Sewage Sludge,
W74-07266 5D

SEWAGE TREATMENT
Laundry Detergents and Environmental Quality,
W74-07122 5C

Plastic Moving-Surface Treatment of Sewage,
W74-07198 5D

Foam Flotation Concentration of Sewage,
W74-07214 5D

Sewage Treatment System,
W74-07217 5D

Land Application of Sewage Sludge,
W74-07266 5D

SEWERAGE
Sanitary Services in Tennessee, 1972.
W74-07060 5D

Preliminary Water and Sewer Plan for Alcorn, Benton, Marshall, Prentiss, Tippah, Tishomingo Counties.
W74-07062 5D

Utilities and Facilities for New Residential Development: A Survey of Municipal Policy,
W74-07071 5D

SEWERS
Pressure Sewers,
W74-07259 5D

The Effects of Household Sanitary Systems on Effluent Phosphate Levels,
W74-07267 5D

Capital Cost Minimization of Drainage Networks,
W74-07309 4A

A Practical and Trouble-Free Sewer Spill Monitor,
W74-07404 5D

SHEAR
The Relationship of Porosity and Angle of Repose to Mixture Proportions in Assemblages of Different Sized Materials,
W74-07330 2J

SHEAR STRENGTH
The Relationship of Porosity and Angle of Repose to Mixture Proportions in Assemblages of Different Sized Materials,
W74-07330 2J

SHORE FLIES
Habitat Distribution of the Shore Flies of Northeastern Ohio (Diptera: Ephydridae),
W74-07556 5C

SHORE PROTECTION
Attenuation of Water Waves and Control and Utilization of Wave-Induced Water Movements,
W74-07204 8B

SIERRA CLUB
Sierra Club V. Froehlke (Injunction Action Against Reservoir Project).
W74-07113 6E

SILVERWOOD LAKE (CALIF
Silverwood Lake Recreation Development Plan.
W74-07130 6B

SIMULATION ANALYSIS
The EPA Stormwater Management Model: A Current Overview,
W74-07265 5D

A Computer Simulation Model for Flood Plain Development. Part II: Model Description and Applications,
W74-07296 6A

Simulation--A Tool for Water Resource Management,
W74-07300 6A

Ipswich River Basin Model Study,
W74-07302 6D

Planning and Operational Studies in the Integrated Use of Desalination. Case Studies for Cyprus and Jersey,
W74-07308 3A

Planning and Operation of Urban Water Quality Management Systems,
W74-07334 5D

Systems simulation of the effect of tertiary treatment for carbon, nitrogen, and phosphorus removal upon primary productivity, standing crop, and community structure of autotrophic and hetertrophic communities in receiving model streams.
W74-07337 5C

Development of a Decision Room for Environntal Studies, (Feasibility Study),
W74-07371 6G

Some Generalized Beta Distributions of the Second Kind Having Desirable Application Features in Hydrology and Meteorology,
W74-07412 2A

Algebraic Boundedness of Sample Statistics,
W74-07413 2A

Mathematical Simulation of Subsurface Flow Contributions to Snowmelt Runoff, Reynolds Creek Watershed, Idaho,
W74-07516 2F

Streamflow Simulation: 3. The Broken Line Process and Operational Hydrology,
W74-07520 2A

SINGLE SCAN VOLTAMMETRY
Mass and Charge Transfer Kinetics and Coulometric Current Efficiencies. Part VII. Conditional Potentials, and Single-Scan Voltammetry of Pure Vanadium(V) - Vanadium(IV) Systems in Various Media at Platinum Elec trodes Pre-Treated By Five Methods,
W74-07557 2K

Mass and Charge Transfer Kinetics and Coulometric Current Efficiencies. Part VIII. Single-Scan Voltammetry of Vanadium(V) - Vanadium(IV) in the Presence of Chromium, Manganese and Iron, and the Kinetic Parameters of the Vanadium System, at Platinum Electrodes Pre-Treated by Five Methods,
W74-07558 5A

SIZE
Economic Size Selection for PVC Pipelines,
W74-07303 8A

SKIMMING
Oil Reclaiming Device for Removing Oil from the Surface of Water,
W74-07206 5G

Containing and Removing Oil Spills on Water,
W74-07208 5G

SLIME
Effects of Thickness on Bacterial Film,
W74-07545 5C

SLOPES
A Rainfall-Runoff Model Based on the Watershed Stream Network,
W74-07464 2A

SLUDGE DIGESTION
Aerobic Digestion of Organic Sludges Containing Inorganic Phosphorus Precipitates: Phase I,
W74-07268 5D

SLUDGE TREATMENT
Mechanical Waste Water Clarification and Biological-Chemical Waste Water Purification Using the Attisholz and Ruthner System (Mechanische Abwasserklaerung und biologisch-chemische Abwasserreinigung nach System Attisholz und Ruthner),
W74-07381 5D

Some Equipment Used in Fibre Recovery and Effluent Treatment Operations.
W74-07390 5D

SMALL WASTE FLOWS
Selection and Operation of Small Wastewater Treatment Facilities - Training Manual.
W74-07485 5D

SMALL WATERSHEDS
A Computer Atlas of Hydrologic and Geomorphologic Data for Small Watersheds in Indiana,
W74-07432 2A

Calibrating a Water Yield Model for Small Ungaged Watersheds,
W74-07519 2A

Effect of Grazing on Runoff from Two Small Watersheds in Southwestern Wisconsin,
W74-07525 4C

SMITH RIVER (CALIF
North Coastal Area Action Program: A Study Of The Smith River Basin And Plain.
W74-07132 6B

SMITHFIELD (N
Flood Plain Information-Neuse River and Buffalo Creek, Smithfield, North Carolina.
W74-07074 4A

SNOW MANAGEMENT
Avalanche Studies (1971-1972),
W74-07319 2C

SNOWFALL
Probability Distribution of Snow Course Data for Central Arizona,
W74-07094 2C

SNOWMELT
Water Yield, Annual peaks and Exposure in Mountainous Terrain,
W74-07165 2A

Mathematical Simulation of Subsurface Flow Contributions to Snowmelt Runoff, Reynolds Creek Watershed, Idaho,
W74-07516 2F

Snow Accumulation and Snowmelt as Influenced by a Small Clearing in a Lodgepole Pine Forest,
W74-07526 2C

SNOWPACKS
Snow Accumulation and Snowmelt as Influenced by a Small Clearing in a Lodgepole Pine Forest,
W74-07526 2C

SOCIAL ASPECTS
Environmental Quality and its Evaluation,
W74-07533 5G

SOCIAL PARTICIPATION
North Coastal Area Action Program. A Study of the McKinleyville-Trinidad Area Public Hearing Comments.
W74-07129 6B

SODIUM CHLORIDE
The Effluent-Free Bleached Kraft Pulp Mill. Part IV. The Salt Recovery Process,
W74-07379 5D

SODIUM COMPOUNDS
Biodegradation of Resin Acid Sodium Salts,
W74-07393 5D

SOIL AIR PRESSURE
Infiltration and Water Table Effects of Soil Air Pressure Under Border Irrigation,
W74-07301 3F

SOIL ANALYSIS
Mineralogical Composition of Clays in Soil Profiles of Israel: II. The Soils of the Desert Zone,
W74-07100 2G

Acid Ammonium Acetate Extraction and Electron Capture Gas Chromatographic Determination of Carbofuran in Soils,
W74-07574 5A

SOIL CONSERVATION
Quality of Water Discharged from Two Agricultural Watersheds in Southwestern Iowa,
W74-07528 5B

SOIL CONTAMINATION
Pollution Caused by Agriculture,
W74-07366 5B

SOIL DISPOSAL FIELDS
Land Disposal of Waste Gases: III. Sorption Patterns From Buried Gas Injection Pipes,
W74-07422 5B

SOIL EROSION
Sediment Control.
W74-07115 6E

Sediment Discharge in the Lake Tahoe Basin, California, 1972 Water Year,
W74-07326 2J

Erosional Losses of S-Triazine Herbicides,
W74-07421 5B

SOIL HEAT
Subsurface Heating and Irrigation of Soils: Its Effect on Temperature and Water Content and on Plant Growth,
W74-07054 2G

SOIL MANAGEMENT
Reactivating Soil Ripping Treatments for Runoff and Erosion Control in the Southwestern U.S.,
W74-07089 2G

SOIL MOISTURE
Broad Spectrum Microwave Systems for Remotely Measuring Soil Moisture Content,
W74-07052 2G

Evapotranspiration on a Palouse Watershed,
W74-07087 2D

Effect of Contour Furrows and Contour Bunds on Water Conservation in Grasslands of Western Rajasthan,
W74-07090 3F

Water Retention of Granitic Soils in the Idaho Batholith,
W74-07170 2G

Soil Moisture Dynamics and Its Variations in Soils Under Field Crops (Dinamika vlazhnosti i stepen' yeye var'irovaniya v pochvakh pod polevymi kul'turami),
W74-07509 2G

SOIL PHYSICS
Soil Moisture Dynamics and Its Variations in Soils Under Field Crops (Dinamika vlazhnosti i stepen' yeye var'irovaniya v pochvakh pod polevymi kul'turami),
W74-07509 2G

SOIL PROFILES
Mineralogical Composition of Clays in Soil Profiles of Israel: I. The Soils of the Mediterranean Zone,
W74-07099 2G

Mineralogical Composition of Clays in Soil Profiles of Israel: II. The Soils of the Desert Zone,
W74-07100 2G

Application of the Spline Function to Soil Science,
W74-07344 2G

SOIL RIPPING
Reactivating Soil Ripping Treatments for Runoff and Erosion Control in the Southwestern U.S.,
W74-07089 2G

SOIL STABILIZATION
Sand Dune Reclamation in Iraq -- Present Status and Future Prospects,
W74-07104 2J

SOIL STRENGTH
Mass Physical and Engineering Properties of Some York River Sediments,
W74-07239 2L

SOIL TEMPERATURE
Subsurface Heating and Irrigation of Soils: Its Effect on Temperature and Water Content and on Plant Growth,
W74-07054 2G

SOIL THERMAL PROPERTIES
The Heat Flux Density in a Non-Homogeneous Bare Loessial Soil,
W74-07346 2G

SOIL TREATMENT
Subsurface Heating and Irrigation of Soils: Its Effect on Temperature and Water Content and on Plant Growth,
W74-07054 2G

Reactivating Soil Ripping Treatments for Runoff and Erosion Control in the Southwestern U.S.,
W74-07089 2G

Effect of Gypsum in Reducing Boron Hazard of Saline Waters and Soils,
W74-07095 3C

SOIL TREATMENTS
Effect of Contour Furrows and Contour Bunds on Water Conservation in Grasslands of Western Rajasthan,
W74-07090 3F

SOIL TYPES
Effect of Irrigation with Thermal Water on Trace-Element Content in Some Soils of Georgia (Vliyaniye orosheniya termal'nymi vodami na soderzhaniye mikroelementov v nekotorykh pochvakh Gruzii),
W74-07508 3F

SOIL WATER
Application of the Spline Function to Soil Science,
W74-07344 2G

SOIL WATER MOVEMENT
Numerical Studies of Two-Dimensional Saturated-Unsaturated Drainage Models,
W74-07168 2G

Soil Moisture Dynamics and Its Variations in Soils Under Field Crops (Dinamika vlazhnosti i stepen' yeye var'irovaniya v pochvakh pod polevymi kul'turami),
W74-07509 2G

Flux-Gradient Relationships and Soil-Water Diffusivity from Curves of Water Content Versus Time,
W74-07512 2G

A Numerical Model Based on Coupled One-Dimensional Richards and Boussinesq Equations,
W74-07515 2F

Salt Displacement into Drain Tiles under Ponded Leaching,
W74-07518 2G

SOIL-WATER-PLANT RELATIONSHIPS
Effect of Seeding Rates and Row Spacings on Fodder Production of Moth Bean (Phaseolus aconitifolius),
W74-07091 3F

Distillation-Condensation of Water and Nutrient Movement in a Desert Ecosystem,
W74-07110 2I

SOILS
Multiple Organochlorine Pesticide Residues in Japan,
W74-07560 5A

SOILS (ACID ORGANIC)
Phosphorus Supply Characteristics of Acid Organic Soils as Measured by Desorption and Mineralization,
W74-07345 2G

SOILS (DARK BROWN)
Effect of Irrigation on Dynamics of Microorganism Quantity in Dark-Brown Soils in Southern Ukraine, (In Ukrainian),
W74-07279 2G

SOLAR EVAPORATION
Solar Evaporation Controlled Irrigation System,
W74-07211 2D

SOLAR RADIATION
The Micro-Meteorology of an Extended Area of Tea Before and After Rain,
W74-07354 3F

SOLAR STILLS
Self Cleaning, Tubular Solar Still,
W74-07207 3A

SOLID WASTES
Geologic Aspects of Waste Solids and Marine Waste Deposits, New York Metropolitan Region,
W74-07171 5B

SOLIDS CONTACT PROCESSES
Sewage Treatment System,
W74-07217 5D

SOLUBILITY
Manganese and Iron Solubility Changes as a Factor in Tile Drain Clogging: I. Observations During Flooding and Drying,
W74-07151 2G

Manganese and Iron Solubility Changes as a Factor in Tile Drain Clogging: II. Observations During the Growth of Cotton,
W74-07152 2G

SOLVENT EX
Solvent Extraction of Sulfur From Marine Sediment and Its Determination by Gas Chromatography.
W74-07565 5A

SOLVENT EXTRACTIONS
Gas Chromatographic Studies of Mixed-Ligand Complexes of Divalent Cations,
W74-07582 5A

SONORAN DESERT
Productivity and Water Stress in Cacti,
W74-07109 2I

SORBENTS
An Oil Recovery System Utilizing Polyurethane Foam--A Feasibility Study,
W74-07341 5G

SORPTION
Land Disposal of Waste Gases: III. Sorption Patterns From Buried Gas Injection Pipes,
W74-07422 5B

SOURIS RIVER BASIN (MANITOBA-CANADA)
Public Investment Criteria: Application to a Project in the Souris River Basin,
W74-07070 6B

SOUTH AFRICA
A Note on the Areal Distribution of Suspended Sediment Yield in South Africa,
W74-07177 2J

SOUTH AFRICA (KALAHARI GEMSBOK NATIONAL PARK)
Short-Term Response in Ungulate Numbers to Rainfall in the Nossob River of the Kalahari Gemsbok National Park,
W74-07535 2I

SOUTH AFRICA (OLIFANTS RIVER)
Occurrence and Distribution of the Vine Phylloxera, Phylloxera vitifoliae (Fitch), in the Olifants River Irrigation Area, Northwestern Cape Province,
W74-07356 3F

SOUTH CAROLINA
Santee Submergence, Example of Cyclic Submerged and Emerged Sequences,
W74-07247 2L

Environmental Planning: An Economic Analysis. Applications for the Coastal Zone,
W74-07534 6B

SOUTHEAST U
Source of Recent Nearshore Marine Clays, Southeastern United States,
W74-07238 2L

Erosional and Depositional Estuarine 'Terraces,' Southeastern United States,
W74-07246 2L

Effects of Man-Made Works on the Hydraulic, Salinity, and Shoaling Regimens of Estuaries,
W74-07249 5C

SOUTHWEST U
Reactivating Soil Ripping Treatments for Runoff and Erosion Control in the Southwestern U.S.,
W74-07089 2G

SOVIET CENTRAL ASIA (AMUDAR'YA RIVER BASIN)
Problems in Distribution of Water Resources in the Arid Zone of the Amudar'ya River Basin (Voprosy raspredeleniya vodnykh resursov v arisnoy zone (na primere Amudar'i)),
W74-07192 4A

SOYBEAN
Effects of Water Stress on Growth and Nitrogen-Fixing Activity of Trifolium repens,
W74-07352 3F

SPARTINA ALTERNIFLORA
An Investigation of Propagation and the Mineral Nutrition of Spartina alterniflora,
W74-07486 5C

SPAWNING
A New Type of Incubator Used in the Induced Spawning of Phytophagous Fishes, (In Rumanian),
W74-07434 8I

SPECIATION
Numerical Analysis of Hansenula, Pichia and Related Yeast Genera,
W74-07583 5A

SPECIFICATIONS
Natural Resources--Waste Control.
W74-07116 6E

SPECTRAL ANALYSIS
A Note on the Use of Spectral Analysis to Detect Leads and Lags in Annual Cycles of Water Quality,
W74-07522 7C

SPECTROPHOTOMETRY
Kaempferol (3,5,7,4'-Tetrahydroxyflavone) as a Chromogenic Reagent for Tin(IV),
W74-07579 5A

SPECTROSCOPY (X-RAY)
Elemental Variability Within a Sampling Unit,
W74-07598 2K

SPHAEROTILUS
Hydrogen Peroxide Cures Filamentous Growth in Activated Sludge,
W74-07253 5D

SPINACH
In-Plant, Continuous Hot-Gas Blanching of Spinach,
W74-07368 3E

SPLINE FUNCTION
Application of the Spline Function to Soil Science,
W74-07344 2G

SPORT FISHING
The Demand for Sport Fishing at Yaquina Bay,
W74-07143 6B

The Impact of Sport Angling on the Yaquina Bay Economy,
W74-07144 6B

SPRINGS
Mineral Springs in the Suez Rift Valley--Comparison with Waters in the Jordan Rift Valley and Postulation of a Marine Origin,
W74-07167 2K

SPRINKLER IRRIGATION
Irrigation and Sprinkler System,
W74-07212 3F

Irrigation Survey.
W74-07451 3F

STANDARD PROJECT FLOOD
Flood Plain Information - Glade Creek, Vinton, Virginia.
W74-07076 4A

STANDING CROPS
Distribution and Standing Crops of Chironomid-Larvae in Shiozu Bay of Lake Biwa (In Japanese),
W74-07101 5C

Systems simulation of the effect of tertiary treatment for carbon, nitrogen, and phosphorus removal upon primary productivity, standing crop, and community structure of autotrophic and hetertrophic communities in receiving model streams.
W74-07337 5C

STATISTICAL METHODS
The Forecasting of Streamflow Using the Method of Characteristic Modes,
W74-07178 4A

Optimal Linear Extrapolation of Level Fluctuations of Closed Water Bodies (Optimal'naya lineynaya ekstrapolyatsiya kolebaniy urovnya zamknutykh vodoyemov),
W74-07195 4A

Some Generalized Beta Distributions of the Second Kind Having Desirable Application Features in Hydrology and Meteorology,
W74-07412 2A

Algebraic Boundedness of Sample Statistics,
W74-07413 2A

Just a Moment,
W74-07414 2A

STATISTICAL MODELS
A Synthetic Model for Daily Streamflow,
W74-07179 2E

Streamflow Simulation: 3. The Broken Line Process and Operational Hydrology,
W74-07520 2A

STATISTICS
Some Generalized Beta Distributions of the Second Kind Having Desirable Application Features in Hydrology and Meteorology,
W74-07412 2A

Algebraic Boundedness of Sample Statistics,
W74-07413 2A

Just a Moment,
W74-07414 2A

STERILIZATION
Water Treatment Apparatus,
W74-07196 5D

STOMATAL STUDIES
Stomatal Mechanics,
W74-07593 2I

STORAGE COEFFICIENT
Effect of Partial Penetration on Flow in Unconfined Aquifers Considering Delayed Gravity Response,
W74-07514 2F

STORM DRAINS
Interim Storm Drainage Plan Report-Little Rock-North Little Rock Metropolitan Area.
W74-07082 5D

STORM RUNOFF
Interim Storm Drainage Plan Report-Little Rock-North Little Rock Metropolitan Area.
W74-07082 5D

Combined Sewer Overflow Seminar Papers.
W74-07255 5D

Stormflow Pollution Control in the U.S.,
W74-07256 5D

The EPA Stormwater Management Model: A Current Overview,
W74-07265 5D

STORM WATER
Interim Storm Drainage Plan Report-Little Rock-North Little Rock Metropolitan Area.
W74-07082 5D

Stormflow Pollution Control in the U.S.,
W74-07256 5D

Combined Sewer Overflow Regulator Facilities,
W74-07258 5D

Application of Microstraining to Combined Sewer Overflow,
W74-07260 5D

The EPA Stormwater Management Model: A Current Overview,
W74-07265 5D

STRATIFICATION
Summertime Temperature and Circulation Patterns in Lake Superior,
W74-07338 2H

Planar and Axisymmetric Bottom Withdrawal from a Density-Stratified Reservoir,
W74-07340 4A

The Influence of Wind on the Surface Waters of Alberni Inlet,
W74-07497 2L

STRATIFIED FLOW
Recent Investigations in Stratified Flows Related to Estuarial Hydraulics,
W74-07226 2L

Amazon River Estuarine System,
W74-07229 2L

Planar and Axisymmetric Bottom Withdrawal from a Density-Stratified Reservoir,
W74-07340 4A

STREAM GAGES
An Innovative Automatic Stream Gaging Method,
W74-07181 7B

STREAM NETWORK
A Computer Atlas of Hydrologic and Geomorphologic Data for Small Watersheds in Indiana,
W74-07432 2A

A Rainfall-Runoff Model Based on the Watershed Stream Network,
W74-07464 2A

STREAM POLLUTION
Water Quality Management Element for the Kentucky River Area Development District Comprehensive Water and Sewer Program.
W74-07077 5D

STREAMFLOW FORECASTING
The Forecasting of Streamflow Using the Method of Characteristic Modes,
W74-07178 4A

A Synthetic Model for Daily Streamflow,
W74-07179 2E

STREAMS
Suspended-Sediment Yield in Rivers of Gor'kiy Oblast as an Indication of Recent Erosion Processes (Stok vzveshennykh nanosov v rekakh Gor'kovskoy obl. kak pokazatel' razvitiya sovremennykh erozionnykh protsessov),
W74-07507 2J

STRIP MINE LAKES
A Preliminary Description of the Physico-Chemical Characteristics and Biota of Three Strip Mine Lakes, Spencer County, Indiana,
W74-07403 5B

STRIP MINES
Ecology and Productivity of Strip-Mine Areas in Mercer County, Pennsylvania,
W74-07055 5B

Coal-Energy Development in the Northern Great Plains.
W74-07056 6D

STRONTIUM
Strontium and Other Notable Chemical Constituents of Well-Water of Allen County, Indiana,
W74-07400 2K

STRONTIUM RADIOSOTOPES
Strontium Isotope Composition and Sediment Transport in the Rio de la Plata Estuary,
W74-07240 2L

STRUCTURE OF DETRITUS
Nutritive Importance and Structure of Detritus,
W74-07471 5C

SUB-OPTIMUM WEATHER
Aerial Spill Prevention Surveillance During Sub-Optimim Weather,
W74-07342 5A

SUBSTRATE UTILIZATION
Effects of Thickness on Bacterial Film,
W74-07545 5C

SUBSURFACE DRAINAGE
Development of an Agricultural Drainage Guide,
W74-07438 4A

Shallow Drain Performance in a Heavy Soil,
W74-07442 4A

SUBSURFACE FLOW
Underflow in River Valleys of the Carpatho-Ukraine (Podruslovyy stok v rechnykh dolinakh Zakarpat'ya),
W74-07504 2F

SUBSURFACE RUNOFF
Mathematical Simulation of Subsurface Flow Contributions to Snowmelt Runoff, Reynolds Creek Watershed, Idaho,
W74-07516 2F

SUBSURFACE WATERS
Sandstone Aquifers in Eastern Sullivan County, Indiana,
W74-07401 4B

SUGAR BEET PROCESSING WASTES
The Plankton of Ponds Enriched with Wastes from Beet Sugar Factories,
W74-07478 5C

SULFATES
Source and Budget of Sulfate in Precipitation from Central Alberta, Canada,
W74-07164 5B

Strontium and Other Notable Chemical Constituents of Well-Water of Allen County, Indiana,
W74-07400 2K

Leaching Losses of Sulfur During Winter Months When Applied as Gypsum, Elemental S or Prilled S,
W74-07449 5B

SULFITE LIQUORS
On Some Special Problems of Sulfite Pulp Waste Water Purification (Zu einigen speziellen Problemen der Sulfitzellstoff-Abwasserreinigung),
W74-07386 5D

SULFUR
Leaching Losses of Sulfur During Winter Months When Applied as Gypsum, Elemental S or Prilled S,
W74-07449 5B

Solvent Extraction of Sulfur From Marine Sediment and Its Determination by Gas Chromatography.
W74-07565 5A

SULFUR BACTERIA
Microbiological Purification of Hydrogen Sulfide-Containing Kraft Mill Effluents (Mikrobiologicheskaya ochistka serovodorodnykh stochnykh vod sul'fatno-tsellyuloznogo proizvodstva),
W74-07387 5D

SULFUR COMPOUNDS
Study of the Adaptation of an Activated Sludge to the Purification of an Industrial Effluent (Etude de l'adaptation d'une boue activee a l'epuration d'un effluent industriel),
W74-07389 5D

SUPERTANKER TERMINALS
Possible Effects of Construction and Operation of a Supertanker Terminal on the Marine Environment in New York Bight,
W74-07488 5C

SURCHARGES (INDUSTRIAL WASTES)
Economic Study of the Effect of Municipal Sewer Surcharges on Industrial Wastes and Water Usage,
W74-07057 5G

SURFACE DRAINAGE PROGRAM
Study Design. Surface Drainage Program, Madison, St. Clair, Monroe and Randolph Counties, Illinois.
W74-07083 4A

SURFACE-GROUNDWATER RELATIONSHIPS
Hydrology of the Dunes Area North of Coos Bay, Oregon,
W74-07325 2L

Underflow in River Valleys of the Carpatho-Ukraine (Podruslovyy stok v rechnykh dolinakh Zakarpat'ya),
W74-07504 2F

SURFACE IRRIGATION
Trickle Irrigation in Australia,
W74-07450 3F

SURFACE RUNOFF
Study Design. Surface Drainage Program, Madison, St. Clair, Monroe and Randolph Counties, Illinois.
W74-07083 4A

SURFACE WATERS
Water Resources of the Taunton River Basin Southeastern Massachusetts,
W74-07190 7C

The Influence of Wind on the Surface Waters of Alberni Inlet,
W74-07497 2L

SURGES
Inflatable Dams and Dam Units,
W74-07210 8A

SURVEYS
Land Use In California.
W74-07131 6B

A Systems Analysis of Water Quality Survey Design,
W74-07310 5B

Irrigation Survey.
W74-07451 3F

SUSPENDED LOAD
A Note on the Areal Distribution of Suspended Sediment Yield in South Africa,
W74-07177 2J

Spatial and Temporal Distribution of Suspended Sediment in Narragansett Bay and Rhode Island Sound,
W74-07232 2L

Suspended Sediment Transport in Delaware Bay,
W74-07233 2L

Determination of Chlorinated Insecticides in Suspended Sediment and Bottom Material,
W74-07317 5A

SUSPENDED SOLIDS
Apn aratus for Separating Oil and SolidsfFrm m Water,
W74-07202 5D

Water Purification Apparatus,
W74-07209 5D

Suspended-Sediment Yield in Rivers of Gor'kiy Oblast as an Indication of Recent Erosion Processes (Stok vzveshennykh nanosov v rekakh Gor'kovskoy obl. kak pokazatel' razvitiya sovremennykh erozionnykh protsessov),
W74-07507 2J

SUSQUEHANNA RIVER
Distribution and Transportation of Suspended Sediment in Upper Cheasapeake Bay,
W74-07234 2L

SWEDEN
Environmental Protection Techniques to be Applied in a Bleached Kraft Pulp Mill in Sweden,
W74-07392 5D

SWELL FREQUENCY
Apparatus for Recording Swell Frequency and Propagation Direction of Waves,
W74-07224 8B

SWELL PROPAGATION
Apparatus for Recording Swell Frequency and Propagation Direction of Waves,
W74-07224 8B

SWIRL CONCENTRATOR
The Swirl Concentrator as a Combined Sewer Overflow Regulator,
W74-07264 5D

SWITZERLAND (FEEGLETSCHER)
A Scanning Electron Microscope Study of Surface Textures of Quartz Grains from Glacial Environments,
W74-07331 2J

SYNECHOCOCCUS LIVIDUS
Hydrogen Sulfide Production by Synechococcus lividus Y52-si,
W74-07546 5C

SYNTHETIC HYDROLOGY
A Synthetic Model for Daily Streamflow,
W74-07179 2E

Generation Models for Synthetic Annual and Monthly Flows for Some Indiana Watersheds,
W74-07431 2A

Streamflow Simulation: 3. The Broken Line Process and Operational Hydrology,
W74-07520 2A

SYSTEMATICS
Field and Experimental Studies on the Systematics and Ecology of Ulva curvata and Ulva rotundata,
W74-07473 5C

Taxonomic Position of Two Lumbrineris Spp.,
W74-07568 2L

Moina Sp. (Cladocera: Moinidae) in a Sewage Plant, Wellington, Referred to Moina tenuicornis Sars, 1896 (Note),
W74-07569 5A

Preliminary Diagnosis of a New Species of Marine Isopod From Stewart Island,
W74-07570 2I

Numerical Analysis of Hansenula, Pichia and Related Yeast Genera,
W74-07583 5A

SYSTEMS ANALYSIS
A Systems Analysis of Water Quality Survey Design,
W74-07310 5B

Parameter Identification in Field Problems,
W74-07428 7C

TAIWAN STRAIT
Sand-Wave Fields in Taiwan Strait,
W74-07175 2J

TAUNTON RIVER BASIN (MASS)
Water Resources of the Taunton River Basin Southeastern Massachusetts,
W74-07190 7C

TAXONOMIC STUDIES
Taxonomic Composition of Aquatic Invertebrates of the Don Basin in Comparison with Fauna of the Other Rivers of the Black Sea Caspian Basin, (In Russian),
W74-07537 2I

TEA
The Micro-Meteorology of an Extended Area of Tea Before and After Rain,
W74-07354 3F

TECHNOLOGY TRANSFER
Technology Transfer in the Marine Environment of Long Island,
W74-07059 6B

TEMPERATURE
Some Aspects of the Temperature, Oxygen and Nutrient Distributions in Monterey Bay, California. Annual Report, Part 1, 1973,
W74-07469 5C

Problem of Calculating Depth of the Quasiuniform Layer of the Ocean (K voprosu o raschete tolshchiny kvaziodnorodnogo sloya okeana),
W74-07506 2A

TENNESSEE
Sanitary Services in Tennessee, 1972.
W74-07060 5D

Stream Pollution.
W74-07275 6E

TENNESSEE RIVER
Mussel Fishery Investigations, Tennessee, Ohio, and Green Rivers,
W74-07187 8I

TERRACES (GEOLOGIC)
Erosional and Depositional Estuarine 'Terraces,' Southeastern United States,
W74-07246 2L

Santee Submergence, Example of Cyclic Submerged and Emerged Sequences,
W74-07247 2L

TERRAIN ANALYSIS
Line Intersection Method for Estimating Drainage Density,
W74-07174 2J

TERTIARY TREATMENT
Systems simulation of the effect of tertiary treatment for carbon, nitrogen, and phosphorus removal upon primary productivity, standing crop, and community structure of autotrophic and hetertrophic communities in receiving model streams.
W74-07337 5C

TETRACYCLINE
Incidence of Resistance to Tetracycline, Chloramphenicol and Ampicillin Among Salmonella Species Isolated in the Netherlands in 1969, 1970 and 1971,
W74-07562 5C

TEXAS
Determinants of Use of Water-Based Recreational Facilities,
W74-07058 6B

The Relationship of Land Use to Water Use in San Antonio, Texas,
W74-07067 4A

Ansley V. Tarrant County Water Control and Improvement District No. One (Liability for Flooding and Amount of Damage).
W74-07117 6E

Water-Resources Investigations in Texas, Fiscal Year 1974.
W74-07321 2E

Annual Compilation and Analysis of Hydrologic Data for Urban Studies in the San Antonio, Texas Metropolitan Area, 1971,
W74-07323 2E

Instrumentation for Engineering Management of a Multi-Purpose River Basin System (Trinity River Basin, Texas) Real-Time Engineering Management of a Multi-Purpose River Basin System,
W74-07369 4A

Effect of Anhydrous Ammonia on a Central Texas Pond, and a Review of Previous Research with Ammonia in Fisheries Management,
W74-07595 5C

THEORETICAL ANALYSIS
Pollution, Production, and Compensation,
W74-07064 5G

THERMAL POLLUTION
Regional Water Quality Management by the Generalized Reduced Gradient Method,
W74-07311 5B

More Heat Than Light: Thermal Pollution Versus Heat Energy Utilization,
W74-07465 5B

Winter-Regime Thermal Response of Heated Streams,
W74-07511 5B

THERMAL POWER
More Heat Than Light: Thermal Pollution Versus Heat Energy Utilization,
W74-07465 5B

THERMAL PROPERTIES
Instability of Water Cooled from Above,
W74-07458 2H

THERMAL STRATIFICATION
Instability of Water Cooled from Above,
W74-07458 2H

THERMAL WATER
Effect of Irrigation with Thermal Water on Trace-Element Content in Some Soils of Georgia (Vliyaniye orosheniya termal'nymi vodami na soderzhaniye mikroelementov v nekotorykh pochvakh Gruzii),
W74-07508 3F

THERMOCLINE
The Estimation of Vertical Eddy Diffusivities Below the Thermocline in Lakes,
W74-07416 2H

THERMOLINE
Instability of Water Cooled from Above,
W74-07458 2H

THORIUM
Th-234/U-238 Activity Ratios in Pacific Ocean Bottom Waters,
W74-07322 2K

DAL EFFECTS
United States V. Pot-Nets, Inc. (Violation of Rivers and Harbors Act),
W74-07287 6E

Physical Modeling of Residence Times in Tidal Basins,
W74-07496 2L

IDAL FLATS
Remanent Magnetization of Modern Tidal Flat Sediments from San Francisco Bay, California,
W74-07173 2L

IDAL FLOODS
Flood Plain Information-Neuse and Trent Rivers and Jack Smith Creek, New Bern, North Carolina.
W74-07073 4A

IDAL WATERS
Size and Shape Sorting in a Dutch Tidal Inlet,
W74-07329 2L

IDES
Inflatable Dams and Dam Units,
W74-07210 8A

ILE DRAINAGE
Salt Displacement into Drain Tiles under Ponded Leaching,
W74-07518 2G

ILE (DRAINS)
Manganese and Iron Solubility Changes as a Factor in Tile Drain Clogging: I. Observations During Flooding and Drying,
W74-07151 2G

Manganese and Iron Solubility Changes as a Factor in Tile Drain Clogging: II. Observations During the Growth of Cotton,
W74-07152 2G

TIME SERIES ANALYSIS
Generation Models for Synthetic Annual and Monthly Flows for Some Indiana Watersheds,
W74-07431 2A

A Note on the Use of Spectral Analysis to Detect Leads and Lags in Annual Cycles of Water Quality,
W74-07522 7C

TIN
Kaempferol (3,5,7,4'-Tetrahydroxyflavone) as a Chromogenic Reagent for Tin(IV),
W74-07579 5A

TOMATOES
Volcanic Air Pollution: Deleterious Effects on Tomatoes,
W74-07430 5C

Effects of Subsurface Asphalt Layers on Corn and Tomato Root Systems,
W74-07447 3F

TORT LIABILITY
Pollution Sanctions--New Alternatives to Civil Liability,
W74-07123 5G

TOXICITY
Biochemistry of Selective Toxicity and Biodegradability: Comparative O-Dealkylation by Aquatic Organisms,
W74-07126 5C

TRACE ELEMENTS
Mechanism of Element Distribution in the Pacific Ocean (Japanese Profile) (K poznaniyu mekhanizma raspredeleniya elementov v Tikhom okeane (Yaponskiy profil')),
W74-07503 2J

Effect of Irrigation with Thermal Water on Trace-Element Content in Some Soils of Georgia (Vliyaniye orosheniya termal'nymi vodami na soderzhaniye mikroelementov v nekotorykh pochvakh Gruzii),
W74-07508 3F

Elemental Variability Within a Sampling Unit,
W74-07598 2K

TRACERS
Strontium Isotope Composition and Sediment Transport in the Rio de la Plata Estuary,
W74-07240 2L

TRACKING TECHNIQUES
Ultra-Violet Absorption Characteristics of Natural Waters,
W74-07419 2K

TRAINING
Pollution Control Through Training, Education, and Rigorous Follow-Up,
W74-07408 5G

Selection and Operation of Small Wastewater Treatment Facilities - Training Manual.
W74-07485 5D

TRANSVERSAL SECTIONS
Contributions to the Calculation of the Rood Territory Width and the Transversal Section Under the Retention Level at the Weirs and Dams of Fishery Purposes, (In Rumanian),
W74-07448 8I

TREATMENT FACILITIES
Sanitary Services in Tennessee, 1972.
W74-07060 5D

Combined Sewer Overflow Regulator Facilities,
W74-07258 5D

Phosphorus Removal Treatability Studies at C.F.B. Bordon, Petawawa, Trenton and Uplands,
W74-07273 5D

Water and Effluent Treatment Plants - Cost Considerations and Client, Contractor, Consultant Relationships, The Consultant's View,
W74-07312 5D

Rotating Biological Disk Wastewater Treatment Process - Pilot Plant Evaluation,
W74-07373 5D

New Effluent Plant at Colthrop Board Mills.
W74-07380 5D

Some Equipment Used in Fibre Recovery and Effluent Treatment Operations.
W74-07390 5D

Effluent - Fibre Recovery - Water Savings; Case History of a Recent Plant Installation,
W74-07395 5D

Selection and Operation of Small Wastewater Treatment Facilities - Training Manual.
W74-07485 5D

TREE SEEDLINGS
Extruded Peat Cylinders: Their Physical Characteristics as Affecting Tree Seedling Growth and Greenhouse Drought Tolerance,
W74-07180 2I

TRIAZINE PESTICIDES
Residues of Atrazine, Cyanazine, and Their Phytotoxic Metabolites in a Clay Loam Soil,
W74-07585 5A

TRICHODERMA VIRIDE
Utilization of Fibrous Wastes as Sources of Nutrients,
W74-07472 5D

TRICKLE IRRIGATION
Trickle Irrigation in Australia,
W74-07450 3F

TRINITY RIVER BASIN (TEX)
Instrumentation for Engineering Management of a Multi-Purpose River Basin System (Trinity River Basin, Texas) Real-Time Engineering Management of a Multi-Purpose River Basin System,
W74-07369 4A

TRITIUM
Summary of the State of the Art in Radiochromatography,
W74-07571 5A

TROPHIC LEVEL
Byglandsfjorden. Primary Production and Other Limnological Features in an Oligotrophic Norwegian Lake,
W74-07554 5C

TROPICAL RAINS
Phenology of a Tropical Rain Forest in Malaya,
W74-07482 2I

TROPICAL REGIONS
Drainage Density and Effective Precipitation,
W74-07155 2A

TROPICAL SOILS
Structural Changes in Tropical Soils Due to Anions in Irrigation Water,
W74-07348 2G

TROUT
On the Composition of Mixed Fodder Rations for Trout in Net Cages, (In German),
W74-07599 8I

TURBIDITY CURRENTS
Basin Plains in the Eastern Mediterranean: Significance in Interpreting Ancient Marine Deposits: 1. Basin Depth and Configuration,
W74-07158 2J

Role of Turbidity Currents in Sedimentary Processes (O roli mut'yevykh potokov v protsessakh osadkonakopleniya),
W74-07502 2J

TURBULENCE
The Estimation of Vertical Eddy Diffusivities Below the Thermocline in Lakes,
W74-07416 2H

TURGOR
Stomatal Mechanics,
W74-07593 2I

TYPHOID FEVER
Effect of Effluents from Hydrolysis Plant on the Survival of Typhoid Fever and Dysentery Bacteria, (In Russian),
W74-07367 5C

ULTRASTRUCTURE
Effect of Light Intensity and Glycerol on the Growth, Pigment Composition, and Ultrastructure of Chroomonas Sp.,
W74-07548 5C

ULTRAVIOLET RADIATION
Ultra-Violet Absorption Characteristics of Natural Waters,
W74-07419 2K

ULVA CURVATA
Field and Experimental Studies on the Systematics and Ecology of Ulva curvata and Ulva rotundata,
W74-07473 5C

ULVA ROTUNDATA
Field and Experimental Studies on the Systematics and Ecology of Ulva curvata and Ulva rotundata,
W74-07473 5C

UNDERFLOW
Underflow in River Valleys of the Carpatho-Ukraine (Podruslovyy stok v rechnykh dolinakh Zakarpat'ya),
W74-07504 2F

UNGULATE
Short-Term Response in Ungulate Numbers to Rainfall in the Nossob River of the Kalahari Gemsbok National Park,
W74-07535 2I

UNITED KINGDOM (KENNET RIVER)
New Effluent Plant at Colthrop Board Mills.
W74-07380 5D

UNITED KINGDOM (NORTHERN IRELAND)
Effluent - Fibre Recovery - Water Savings; Case History of a Recent Plant Installation,
W74-07395 5D

UNITED STATES
Dissolved-Solids Discharge to the Oceans from the Conterminous United States,
W74-07162 5B

Hydroelectric Power Resources of the United States, Developed and Undeveloped, January 1, 1972.
W74-07189 8C

Long-Term Trends in Groundwater Level Fluctuations (Mnogoletniye tendentsii v kolebaniyakh urovney poszemnykh vod),
W74-07191 2F

Irrigation Survey.
W74-07451 3F

UNIVERSITIES
Annual Report/Fiscal Year 1973.
W74-07252 9D

Eighth Annual Report, Program Activities, July 1, 1971-Jun 30, 1972.
W74-07332 9D

Minutes, Iowa State Water Resources Research Institute Advisory Board and Council, Eighth Annual Meeting.
W74-07456 9A

Ninth Annual Report of the Water Resources Research Institute of the University of Wyoming (Activities During FY 1973).
W74-07457 9A

UNSATURATED FLOW
Experimental Evaluation of a Method for Determining Unsaturated Hydraulic Conductivity,
W74-07088 2G

Vertical Movements in the Nonsaturated Zone and the Specific Yield of a Water-Table Aquifer (Etude des transferts verticaux dans la zone non saturee et de l'emmagasinement d'une nappe libre, dans le cas d'un pompage, dans les conditions na turelles),
W74-07182 2F

Flux-Gradient Relationships and Soil-Water Diffusivity from Curves of Water Content Versus Time,
W74-07512 2G

Effect of Partial Penetration on Flow in Unconfined Aquifers Considering Delayed Gravity Response,
W74-07514 2F

URANIUM RADIOISOTOPES
Th-234/U-238 Activity Ratios in Pacific Ocean Bottom Waters,
W74-07322 2K

URBAN HYDROLOGY
Annual Compilation and Analysis of Hydrologic Data for Urban Studies in the San Antonio, Texas Metropolitan Area, 1971,
W74-07323 2E

The Geology of Water: The Limiting Factor in Urban Development,
W74-07402 3D

URBAN RUNOFF
Water Pollution Aspects of Street Surface Contaminants,
W74-07418 5B

Comparison of Rainfall-Runoff Models for Urban Areas,
W74-07463 2A

URBANIZATION
Wallowa Lake Basin Comprehensive Plan.
W74-07065 5D

Utilities and Facilities for New Residential Development: A Survey of Municipal Policy,
W74-07071 5D

Planning and Developing Waterfront Property,
W74-07072 6B

USSR
Long-Term Trends in Groundwater Level Fluctuations (Mnogoletniye tendentsii v kolebaniyakh urovney poszemnykh vod),
W74-07191 2F

Problems in Recreational Use of Reservoirs (Problemy rekreatsionnogo ispol' zovaniya vodokhranilishch),
W74-07193 6B

Radiation Safety Problems in the Operation of Atomic Electric Power Stations, (In Russian),
W74-07363 5B

Utilization of White Water in Board Mills (Ispol'zovanie oborotnoi vody na kartonnykh fabrikakh),
W74-07397 5D

Diseases of Pond Fishes,
W74-07481 8I

Supply of Terrigenous Material to the Baltic Sea (Pitaniye Baltiyskogo morya terrigennym materialom),
W74-07501 2J

Mechanism of Element Distribution in the Pacific Ocean (Japanese Profile) (K poznaniyu mekhanizma raspredeleniya elementov v Tikhom okeane (Yaponskiy profil')),
W74-07503 2J

Soil Moisture Dynamics and Its Variations
Soils Under Field Crops (Dinamika vlazhnost
stepen' yeye var'irovaniya v pochvakh p
polevymi kul'turami),
W74-07509 2

USSR (ARAL SEA)
Components of the Water Balance of the A
Sea and Their Effect on Its Long-Term Lev
Fluctuations (Sostavlyayushchiye vodno
balansa Aral'skogo morya i ikh vliyaniye
mmnogoletniye kolebaniya yego urovnya),
W74-07194 2

USSR (CARPATHO-UKRAINE)
Underflow in River Valleys of the Carpath
Ukraine (Podruslovyy stok v rechnyk
dolinakh Zakarpat'ya),
W74-07504 2

USSR (CASPIAN SEA)
Optimal Linear Extrapolation of Level Fluctu
tions of Closed Water Bodies (Optimal'nay
lineynaya ekstrapolyatsiya kolebaniy urovn
zamknutykh vodoyemov),
W74-07195 4

USSR (DNIESTER)
Food Supply and Character of its Utilization b
Dniester Vimba Fry in Ponds, (In Russian),
W74-07592 8

USSR (DON BASIN)
Taxonomic Composition of Aquatic Inve
tebrates of the Don Basin in Comparison wi
Fauna of the Other Rivers of the Black Se
Caspian Basin, (In Russian),
W74-07537 2

USSR (GEORGIAN SSR)
Effect of Irrigation with Thermal Water o
Trace-Element Content in Some Soils of Geo
gia (Vliyaniye orosheniya termal'nymi vodam
na soderzhaniye mikroelementov v nekotoryk
pochvakh Gruzii),
W74-07508 3

USSR (GOR'KIY OBLAST)
Suspended-Sediment Yield in Rivers of Gor'ki
Oblast as an Indication of Recent Erosio
Processes (Stok vzveshennykh nanosov v re
kakh Gor'kovskoy obl. kak pokazatel' razvitiy
sovremennykh erozionnykh protsessov),
W74-07507 2

USSR (TULUNSK)
Effect of Effluents from Hydrolysis Plant o
the Survival of Typhoid Fever and Dysentery
Bacteria, (In Russian),
W74-07367 5C

USSR (UFA RIVER)
The Age Dynamics and the Economic Selectio
Cuttings in Broad Leaved Dark Coniferou
Forests of the Water Protective Shelterbelt o
the UFA River Within the Sverdlovsk Region
(In Russian),
W74-07600 4A

USSR (UKRAINE)
Effect of Irrigation on Dynamics of Microor
ganism Quantity in Dark-Brown Soils i
Southern Ukraine, (In Ukrainian),
W74-07279 2G

USSR (UZBEK SSR)
Bromine in Groundwater of Uzbekistan (Brom
v podzemnykh vodakh Uzbekistana),
W74-07505 2K

nvestigation of the Relation of Groundwater vaporation to Lithological Structure of the one of Aeration (K izucheniyu zavisimosti pareniya gruntovykh vod ot litologicheskogo troyeniya zony aeratsii),
W74-07529 2D

SR (VARVARA RESERVOIR)
Fertility of the Fish From Varvara Reservoir, In Russian),
W74-07591 8I

ILITIES
Sanitary Services in Tennessee, 1972.
W74-07060 5D

Utilities and Facilities for New Residential Development: A Survey of Municipal Policy,
W74-07071 5D

ILITY ANALYSIS
Utility Analysis in the Valuation of Extra-Market Benefits with Particular Reference to Water-Based Recreation,
W74-07150 6B

LLEYS
Underflow in River Valleys of the Carpatho-Ukraine (Podruslovyy stok v rechnykh dolinakh Zakarpat'ya),
W74-07504 2F

ALUE
Utility Analysis in the Valuation of Extra-Market Benefits with Particular Reference to Water-Based Recreation,
W74-07150 6B

ANADIUM
Mass and Charge Transfer Kinetics and Coulometric Current Efficiencies. Part VII. Conditional Potentials, and Single-Scan Voltammetry of Pure Vanadium(V) - Vanadium(IV) Systems in Various Media at Platinum Elec trodes Pre-Treated By Five Methods,
W74-07557 2K

Mass and Charge Transfer Kinetics and Coulometric Current Efficiencies. Part VIII. Single-Scan Voltammetry of Vanadium(V) - Vanadium(IV) in the Presence of Chromium, Manganese and Iron, and the Kinetic Parameters of the Vanadium System, at Platinum Electrodes Pre-Treated by Five Methods,
W74-07558 5A

ARIABILITY
Soil Moisture Dynamics and Its Variations in Soils Under Field Crops (Dinamika vlazhnosti i stepen' yeye var'irovaniya v pochvakh pod polevymi kul'turami),
W74-07509 2G

EGETATION
The Past and Present Flora and Vegetation of the Hackensack Meadows,
W74-07476 2I

EGETATION ESTABLISHMENT
Sand Dune Reclamation in Iraq -- Present Status and Future Prospects,
W74-07104 2J

ERMONT
United States v. Ira S. Bushey and Sons, Inc. (Injunction Against Oil Spills).
W74-07291 6E

ERTICAL IMIGRATION
Vertical Migration of Spaniotoma akamusi Larvae (Diptera:Chironomidae) through the Bottom Deposits of Lake Suwa,
W74-07543 2H

VIMBA FRY
Food Supply and Character of its Utilization by Dniester Vimba Fry in Ponds, (In Russian),
W74-07592 8I

VINEYARDS
Occurrence and Distribution of the Vine Phylloxera, Phylloxera vitifoliae (Fitch), in the Olifants River Irrigation Area, Northwestern Cape Province,
W74-07356 3F

VINTON (VA
Flood Plain Information - Glade Creek, Vinton, Virginia.
W74-07076 4A

VIRGINIA
Flood Plain Information - Glade Creek, Vinton, Virginia.
W74-07076 4A

Mass Physical and Engineering Properties of Some York River Sediments,
W74-07239 2L

Biogeochemical Variables in Bottom Sediments of the Rapphannock River Estuary,
W74-07244 2L

Function of Marshes in Reducing Eutrophication of Estuaries of the Middle Atlantic Region,
W74-07336 5C

VOLCANIC AIR POLLUTION
Volcanic Air Pollution: Deleterious Effects on Tomatoes,
W74-07430 5C

VOLUME
Determination of Mean Cell Size of Tetrahymena in Growing Cultures,
W74-07586 5A

VOLUMETRIC ANALYSIS
Microdetermination of Resorcinol in Presence of Phenol,
W74-07580 5A

WABASH RIVER (IND)
Quantitative Chemical Analysis of Specific Components of the Waters of Lost Creek and the Wabash River, Vigo County, Indiana,
W74-07405 5A

WASHINGTON
Avalanche Studies (1971-1972),
W74-07319 2C

A Strategy for Modeling Primary Production in Stratified Fjords,
W74-07494 5C

State of the Art of Floating Breakwaters,
W74-07498 8A

WASTE ASSIMILATIVE CAPACITY
Predicting the Quality of Stream Water Under Conditions of Oxygen Deficiency (O prognoze kachetva vody vodotokov pri bol'shikh defitsitakh kisloroda),
W74-07388 5B

WASTE DILUTION
An Investigation of the Physical Impact of Sewage Outflow on a River-Estuarine Environment,
W74-07477 5C

WASTE DISPOSAL
Sanitary Services in Tennessee, 1972.
W74-07060 5D

An Economic Evaluation of Alternative Levels of Water Quality: The Role of Water Quality in Relation to Economic Benefits,
W74-07146 6B

Institutional Considerations,
W74-07147 6E

Geologic Aspects of Waste Solids and Marine Waste Deposits, New York Metropolitan Region,
W74-07171 5B

Residuals in Manufacture of Paper,
W74-07399 5B

WASTE DISPOSAL WELLS
Land Disposal of Wastewater--Literature Review for 1973,
W74-07327 5D

WASTE TREATMENT
Regeneration of Chromated Aluminum Deoxidizers, Phase I Report,
W74-07254 5D

Sanitary Districts for Sewage Disposal.
W74-07276 6E

WASTE WATER DISPOSAL
Water and Wastewater Systems Inventory - Region H, North Carolina,
W74-07063 5D

Natural Resources--Waste Control.
W74-07116 6E

Waste Water Treatment in Commercial Fish Processing: Reducing Stick Water Loadings,
W74-07270 5D

Land Disposal of Wastewater--Literature Review for 1973,
W74-07327 5D

Water Reuse and Recycle in Kraft Bleacheries,
W74-07394 5D

Residuals in Manufacture of Paper,
W74-07399 5B

WASTE WATER TREATMENT
Water and Wastewater Systems Inventory - Region H, North Carolina,
W74-07063 5D

Water Quality Management Element for the Kentucky River Area Development District Comprehensive Water and Sewer Program.
W74-07077 5D

Catalytic Oxidation of Phenol in Dilute Concentration in Air,
W74-07086 5D

Natural Resources--Waste Control.
W74-07116 6E

Acid Neutralization Doesn't Cost Much,
W74-07124 5D

Costs of Wastewater Renovation,
W74-07141 5D

Water Treatment Apparatus,
W74-07196 5D

Process of Separation of Emulsified or Dispersed Matter From Water,
W74-07197 5D

Plastic Moving-Surface Treatment of Sewage,
W74-07198 5D

Method of and Apparatus for the Purification of Water Containing Organic Contaminants,
W74-07199 5D

Fluorocarbon and Oxygen-Providing Compound Treatment of Waste Waters,
W74-07200 5D

Apn aratus for Separating Oil and SolidsfFrm m Water,
W74-07202 5D

System and Method for Separating Heavier and Lighter Components of Liquid Mixtures,
W74-07203 5D

Water Purification Apparatus,
W74-07209 5D

Water Purification System,
W74-07213 5D

Foam Flotation Concentration of Sewage,
W74-07214 5D

Waste Water Process Tank Control Facility,
W74-07216 5D

Treatment Apparatus,
W74-07218 5D

Waste water treatment,
W74-07219 5D

Agitating and Aerating Apparatus,
W74-07221 5D

Ozone in Water and Waste Water Treatment, a Bibliography.
W74-07251 5D

Hydrogen Peroxide Cures Filamentous Growth in Activated Sludge,
W74-07253 5D

Combined Sewer Overflow Seminar Papers.
W74-07255 5D

Stormflow Pollution Control in the U.S.,
W74-07256 5D

Combined Sewer Overflow Regulator Facilities,
W74-07258 5D

Pressure Sewers,
W74-07259 5D

Application of Microstraining to Combined Sewer Overflow,
W74-07260 5D

High-Rate Multi-Media Filtration,
W74-07261 5D

Screening/Dissolved-Air Flotation Treatment of Combined Sewer Overflows,
W74-07262 5D

High-Rate Disinfection of Combined Sewer Overflow,
W74-07263 5D

The Swirl Concentrator as a Combined Sewer Overflow Regulator,
W74-07264 5D

The Effects of Household Sanitary Systems on Effluent Phosphate Levels,
W74-07267 5D

Aerobic Digestion of Organic Sludges Containing Inorganic Phosphorus Precipitates: Phase I,
W74-07268 5D

Use and Production of Iron Salts for Phosphorus Removal,
W74-07269 5D

Waste Water Treatment in Commercial Fish Processing: Reducing Stick Water Loadings,
W74-07270 5D

Removal of Phosphates from Wastewaters with Electro-Chemically Generated Gadolinium Ions,
W74-07271 5D

Cyanide Waste Treatment Utilizing Catalytic Oxidation,
W74-07272 5D

Phosphorus Removal Treatability Studies at C.F.B. Bordon, Petawawa, Trenton and Uplands,
W74-07273 5D

Purification of Effluents and Improvement of the Technology in the Production of Chloretone, (In Russian),
W74-07285 5D

Water and Effluent Treatment Plants - Cost Considerations and Client, Contractor, Consultant Relationships, The Consultant's View,
W74-07312 5D

The Identification of the Reaction Products Formed by the Oxidation of Aqueous Ammonia with Potassium Ferrate VI,
W74-07333 5D

Planning and Operation of Urban Water Quality Management Systems,
W74-07334 5D

Modular Wastewater Treatment System Demonstration For The Textile Maintenance Industry,
W74-07343 5D

Organization of the Collection and Decontamination of Industrial and Domestic Radioactive Sewage, (In Russian),
W74-07362 5D

Microbial Indicators for the Biological Quality of Treated Wastewater Effluents,
W74-07372 5D

Rotating Biological Disk Wastewater Treatment Process - Pilot Plant Evaluation,
W74-07373 5D

Combined Sewer Overflow Treatment by the Rotating Biological Contactor Process.
W74-07374 5D

A Comparison of Effluent Characteristics from Conventional and Oxygen Bleaching Sequences: Results of a Laboratory Study,
W74-07375 5D

Oxygen Bleaching -- A Flexible Process for Pollution Abatement,
W74-07376 5D

Water Reuse and Recycle in the D(C)EDED Bleach Sequence,
W74-07377 5D

The Effluent-Free Bleached Kraft Pulp Mill. Part V. The R4 Process for Chlorine Dioxide Manufacture to Decrease Production of Sodium Sulphate,
W74-07378 5D

The Effluent-Free Bleached Kraft Pulp Mill Part IV The Salt Recovery Process,
W74-07379 5D

New Effluent Plant at Colthrop Board Mills.
W74-07380 5D

Mechanical Waste Water Clarification and Biological-Chemical Waste Water Purification Using the Attisholz and Ruthner System (Mechanische Abwasserklaerung und biologisch-chemische Abwasserreinigung nach System Attisholz und Ruthner),
W74-07381 5D

Possibilities of Effluent Clarification (Moeglichkeiten der Abwasserklaerung),
W74-07382 5D

Use of Amberlite XAD-4 for Extraction and Recovery of Chlorinated Insecticides and Polychlorinated Biphenyls from Water,
W74-07383 5D

Reduction of the Volume of Pollutants Discharged and of Fresh Water Consumption (Sokrashchenie sbrosa zagryaznenii umen'shenie raskhoda svezhei vody),
W74-07384 5D

On Some Special Problems of Sulfite Pulp Waste Water Purification (Zu einigen speziellen Problemen der Sulfitzellstoff-Abwasserreinigung),
W74-07386 5D

Microbiological Purification of Hydrogen Sulfide-Containing Kraft Mill Effluents (Mikrobiologicheskaya ochistka serovodorodnykh stochnykh vod sul'fatno-tsellyuloznogo proizvodstva),
W74-07387 5D

Study of the Adaptation of an Activated Sludge to the Purification of an Industrial Effluent (Etude de l'adaptation d'une boue activee a l'epuration d'un effluent industriel),
W74-07389 5D

Some Equipment Used in Fibre Recovery and Effluent Treatment Operations.
W74-07390 5D

How Polyacrylamides can Help Effluent Problems,
W74-07391 5D

Biodegradation of Resin Acid Sodium Salts,
W74-07393 5D

Water Reuse and Recycle in Kraft Bleacheries,
W74-07394 5D

Effluent - Fibre Recovery - Water Savings Case History of a Recent Plant Installation,
W74-07395 5D

Utilization of White Water in Board Mills (Ispol'zovanie oborotnoi vody na kartonnykh fabrikakh),
W74-07397 5D

Pilot Application of the Rotating Biological Surface Concept for Secondary Treatment of Insulating Board Mill Effluents,
W74-07398 5D

A Practical and Trouble-Free Sewer Spill Monitor,
W74-07404 5D

A Review of Colour Reduction Technology in Pulp and Paper Mill Effluents,
W74-07406 5D

Pollution Control by Recycling Effluent,
W74-07407 5D

An Overview of Water Reuse Potential in Pulp and Paper Manufacturing,
W74-07410 5D

Evaluation of Current Techniques for Nutrient Removal from Wastewaters,
W74-07441 5D

An Explanatory Work on the Oxidation of Ammonia by Potassium Ferrate (VI),
W74-07454 5D

Production Function Theory for Use in Optimal Planning Decisions,
W74-07460 5D

Utilization of Fibrous Wastes as Sources of Nutrients,
W74-07472 5D

Selection and Operation of Small Wastewater Treatment Facilities - Training Manual.
W74-07485 5D

WASTEWATER TREATMENT
Sewage Treatment System,
W74-07217 5D

WATER ANALYSIS
Determination of Pentachlorophenol in Natural and Waste Waters,
W74-07385 5A

Quantitative Chemical Analysis of Specific Components of the Waters of Lost Creek and the Wabash River, Vigo County, Indiana,
W74-07405 5A

WATER BALANCE
Vertical Movements in the Nonsaturated Zone and the Specific Yield of a Water-Table Aquifer (Etude des transferts verticaux dans la zone non saturee et de l'emmagasinement d'une nappe libre, dans le cas d'un pompage, dans les conditions na turelles),
W74-07182 2F

Components of the Water Balance of the Aral Sea and Their Effect on Its Long-Term Level Fluctuations (Sostavlyayushchiye vodnogo balansa Aral'skogo morya i ikh vliyaniye na mmnogoletniye kolebaniya yego urovnya),
W74-07194 2H

WATER CHEMISTRY
Mineral Springs in the Suez Rift Valley--Comparison with Waters in the Jordan Rift Valley and Postulation of a Marine Origin,
W74-07167 2K

Influence of Mineral-Water Reactions in Estuaries on Boron Budget in the Oceans,
W74-07227 2L

Processes Affecting Gas Distributions in Estuarine Sediments,
W74-07242 2L

Th-234/U-238 Activity Ratios in Pacific Ocean Bottom Waters,
W74-07322 2K

Strontium and Other Notable Chemical Constituents of Well-Water of Allen County, Indiana,
W74-07400 2K

A Preliminary Description of the Physico-Chemical Characteristics and Biota of Three Strip Mine Lakes, Spencer County, Indiana,
W74-07403 5B

Determination of Nitrates in Soil Extracts,
W74-07443 2G

Bromine in Groundwater of Uzbekistan (Brom v podzemnykh vodakh Uzbekistana),
W74-07505 2K

The Influence of Geological Membranes on the Geochemistry of Subsurface Waters from Miocene Sediments at Kettleman North Dome in California,
W74-07513 2K

WATER CIRCULATION
Effects of Man-Made Works on the Hydraulic, Salinity, and Shoaling Regimens of Estuaries,
W74-07249 5C

Effect of Increasing Depth on Salinity in the James River Estuary,
W74-07250 2L

Summertime Temperature and Circulation Patterns in Lake Superior,
W74-07338 2H

WATER CONSERVATION
Measures to Reduce Water Consumption in Southeastern New York.
W74-07079 6D

Model Tests with Thin Sheets to Reduce Evaporation,
W74-07103 3B

Wild, Scenic River Systems.
W74-07280 6E

Wild and Scenic Rivers.
W74-07290 6E

Reduction of the Volume of Pollutants Discharged and of Fresh Water Consumption (Sokrashchenie sbrosa zagryaznenii i umen'shenie raskhoda svezhei vody),
W74-07384 5D

WATER CONSUMPTION
The Relationship of Land Use to Water Use in San Antonio, Texas,
W74-07067 4A

An Overview of Water Reuse Potential in Pulp and Paper Manufacturing,
W74-07410 5D

WATER CONTROL
Effects of Man-Made Works on the Hydraulic, Salinity, and Shoaling Regimens of Estuaries,
W74-07249 5C

Effect of Increasing Depth on Salinity in the James River Estuary,
W74-07250 2L

WATER COSTS
Costs of Wastewater Renovation,
W74-07141 5D

WATER CURRENTS
Summertime Temperature and Circulation Patterns in Lake Superior,
W74-07338 2H

WATER DEMAND
Preliminary Water and Sewer Plan for Alcorn, Benton, Marshall, Prentiss, Tippah, Tishomingo Counties.
W74-07062 5D

The Relationship of Land Use to Water Use in San Antonio, Texas,
W74-07067 4A

Proposed Water Supply Projects for Southeastern New York.
W74-07080 6D

Water Uses and Water Development in Fall Creek--Possible Conflicts,
W74-07149 6B

The Bittersweet Waters of the Lower Colorado,
W74-07292 3F

Ipswich River Basin Model Study,
W74-07302 6D

WATER DEVELOPMENT
West Virginia Water Development Authority.
W74-07277 6E

River Regulation--Reservoirs.
W74-07278 6E

WATER DISTRIBUTION
Measures to Reduce Water Consumption in Southeastern New York.
W74-07079 6D

Proposed Water Supply Projects for Southeastern New York.
W74-07080 6D

WATER DISTRIBUTION (APPLIED)
Problems in Distribution of Water Resources in the Arid Zone of the Amudar'ya River Basin (Voprosy raspredeleniya vodnykh resursov v arisnoy zone (na primere Amudar'i)),
W74-07192 4A

WATER EQUIVALENT
Probability Distribution of Snow Course Data for Central Arizona,
W74-07094 2C

WATER LAW
The Interlake Affair,
W74-07120 5G

Stream Pollution.
W74-07275 6E

West Virginia Water Development Authority.
W74-07277 6E

Riparian Rights in Certain Counties.
W74-07283 6E

WATER LEVEL FLUCTUATIONS
Vertical Movements in the Nonsaturated Zone and the Specific Yield of a Water-Table Aquifer (Etude des transferts verticaux dans la zone non saturee et de l'emmagasinement d'une nappe libre, dans le cas d'un pompage, dans les conditions na turelles),
W74-07182 2F

Long-Term Trends in Groundwater Level Fluctuations (Mnogoletniye tendentsii v kolebaniyakh urovney poszemnykh vod),
W74-07191 2F

Components of the Water Balance of the Aral Sea and Their Effect on Its Long-Term Level Fluctuations (Sostavlyayushchiye vodnogo balansa Aral'skogo morya i ikh vliyaniye na mmnogoletniye kolebaniya yego urovnya),
W74-07194 2H

Optimal Linear Extrapolation of Level Fluctuations of Closed Water Bodies (Optimal'naya lineynaya ekstrapolyatsiya kolebaniy urovnya zamknutykh vodoyemov),
W74-07195 4A

WATER LEVELS
Records of Ground-Water Levels in Wyoming, 1940-1971,
W74-07186 4B

Hydrologic Conditions in the Lakeland Ridge Area of Polk County, Florida,
W74-07318 4B

WATER MANAGEMENT
River Regulation--Reservoirs.
W74-07278 6E

WATER MANAGEMENT (APPLIED)
Technology Transfer in the Marine Environment of Long Island,
W74-07059 6B

WATER MEASUREMENT
An Innovative Automatic Stream Gaging Method,
W74-07181 7B

WATER POLICY
A Study of Potential Institutional Arrangements for Water Quality and Water Resources (Quantity) Planning and Management,
W74-07051 6B

Measures to Reduce Water Consumption in Southeastern New York.
W74-07079 6D

Proposed Water Supply Projects for Southeastern New York.
W74-07080 6D

Institutional Arrangements and Alternative Futures.
W74-07081 6D

Wild, Scenic River Systems.
W74-07280 6E

Classification of Water and Water Standards.
W74-07281 6E

Environmental Impact Analysis: An Examination of Three Methodologies,
W74-07339 6G

WATER POLLUTION
Pollution, Production, and Compensation,
W74-07064 5G

Classification of Water and Water Standards.
W74-07281 6E

More Heat Than Light: Thermal Pollution Versus Heat Energy Utilization,
W74-07465 5B

WATER POLLUTION CONTROL
An Economic Evaluation of Alternative Levels of Water Quality: The Role of Water Quality in Relation to Economic Benefits,
W74-07146 6B

Resource Management Decisions: Externalities and Public Policy,
W74-07148 6A

Safety Device Against Leakage from Ships, Especially Tankers,
W74-07205 5G

Prevention and Control of Infiltration and Inflow,
W74-07257 5D

Classification of Water and Water Standards.
W74-07281 6E

The Effluent-Free Bleached Kraft Pulp Mill. Part IV. The Salt Recovery Process,
W74-07379 5D

Pollution Control Through Training, Education, and Rigorous Follow-Up,
W74-07408 5G

The Pulp and Paper Industry and the Environment,
W74-07411 5D

Application of Nonlinear Programming to Water Quality Control,
W74-07462 5D

Bacteria-Assimilable Organic Compounds, Phosphate, and Enhanced Growth of Bacteria-Associated Blue-Green Algae,
W74-07587 5C

WATER POLLUTION EFFECTS
The Predicted Influence of Kraft Mill Effluent on the Fishery Resources,
W74-07145 5C

Environmental Framework of Coastal Plain Estuaries.
W74-07225 2L

Marine Fungi Isolated from a Kraft Pulp Mill Outfall Area,
W74-07396 5B

WATER POLLUTION SOURCES
Pollution and Industry: Pros, Cons of Growing Fight.
W74-07112 5G

The Interlake Affair,
W74-07120 5G

United States v. Ira S. Bushey and Sons, Inc. (Injunction Against Oil Spills).
W74-07291 6E

Pollution Caused by Agriculture,
W74-07366 5B

Marine Fungi Isolated from a Kraft Pulp Mill Outfall Area,
W74-07396 5B

Residuals in Manufacture of Paper,
W74-07399 5B

Water Pollution Aspects of Street Surface Contaminants,
W74-07418 5B

More Heat Than Light: Thermal Pollution Versus Heat Energy Utilization,
W74-07465 5B

Possible Effects of Construction and Operation of a Supertanker Terminal on the Marine Environment in New York Bight,
W74-07488 5C

The Environmental Impact of Cadmium,
W74-07530 5A

Hydrogen Sulfide Production by Synechococcus lividus Y52-si,
W74-07546 5C

WATER POLLUTION TREATMENT
Application of a Large Scale Nonlinear Programming Problem to Pollution Control,
W74-07461 5D

Application of Nonlinear Programming to Water Quality Control,
W74-07462 5D

WATER PURIFICATION
Method of and Apparatus for the Purification of Water Containing Organic Contaminants,
W74-07199 5D

Water Purification Apparatus,
W74-07209 5D

Water Purification System,
W74-07213 5D

WATER QUALITY
Chemical and Biological Problems in the Grand Canyon,
W74-07093 5B

Quality of Well Waters of Jaipur District,
W74-07106 4B

Hawaii's Statewide Land Classification Proves Adaptability as Land Use and Environmental Concerns Change,
W74-07138 4A

Multi-Disciplinary Study of Water Quality Relationships: A Case Study of Yaquina Bay, Oregon,
W74-07142 6B

Variables Affecting Well Success in a Kentucky Limestone Aquifer,
W74-07176 4B

Stream Pollution.
W74-07275 6E

Classification of Water and Water Standards.
W74-07281 6E

Simulation--A Tool for Water Resource Management,
W74-07300 6A

A Systems Analysis of Water Quality Survey Design,
W74-07310 5B

Environmental Impact Analysis: An Examination of Three Methodologies,
W74-07339 6G

Economic Damages from Residential Use of Mineralized Water Supply,
W74-07417 5C

Mineral Springs in the Suez Rift Valley - Comparison With Waters in the Jordan Rift Valley and Postulation of a Marine Origin,
W74-07444 2K

A Note on the Use of Spectral Analysis to Detect Leads and Lags in Annual Cycles of Water Quality,
W74-07522 7C

Quality of Water Discharged from Two Agricultural Watersheds in Southwestern Iowa,
W74-07528 5B

Byglandsfjorden. Primary Production and Other Limnological Features in an Oligotrophic Norwegian Lake,
W74-07554 5C

The Bacterial Flora of the Atlantic Salmon (Salmo salar L.) in Relation to its Environment,
W74-07567 5A

Moina Sp. (Cladocera: Moinidae) in a Sewage Plant, Wellington, Referred to Moina tenuicornis Sars, 1896 (Note),
W74-07569 5A

WATER QUALITY CONTROL
A Study of Potential Institutional Arrangements for Water Quality and Water Resources (Quantity) Planning and Management,
W74-07051 6B

Water Quality Management Element for the Kentucky River Area Development District Comprehensive Water and Sewer Program.
W74-07077 5D

Water Purification System,
W74-07213 5D

Sanitary Districts for Sewage Disposal.
W74-07276 6E

Law Affecting the Quality of the Marine Environment,
W74-07282 5G

Interdisciplinary Modeling in the Analysis of the Salinity Problems of the Safford Valley,
W74-07297 5B

Nonlinear Programming in River Basin Modeling,
W74-07298 5B

Regional Water Quality Management by the Generalized Reduced Gradient Method,
W74-07311 5B

Planning and Operation of Urban Water Quality Management Systems,
W74-07334 5D

Application of a Large Scale Nonlinear Programming Problem to Pollution Control,
W74-07461 5D

Application of Nonlinear Programming to Water Quality Control,
W74-07462 5D

WATER QUALITY STANDARDS
Petroleum Refinery Effluent Regulations and Guidelines.
W74-07274 5G

The Environmental Impact of Cadmium,
W74-07530 5A

WATER REQUIREMENTS
The Geology of Water: The Limiting Factor in Urban Development,
W74-07402 3D

WATER RESOURCE DEVELOPMENT
A Bill to Authorize the Secretary of the Interior to Engage in Feasibility Investigations of Certain Potential Water Resource Developments.
W74-07284 6E

WATER RESOURCES
Population, Land Use and Livestock Composition in India and Its Arid Zone,
W74-07105 3F

Current Thinking in Water Resources Research and Their Applicability to Hawaii Conditions,
W74-07135 6B

Aquifers in the Sokoto Basin, Northwestern Nigeria, with a Description of the General Hydrogeology of the Region,
W74-07184 2F

Water Resources Investigations in New York, 1973.
W74-07188 7C

Water Resources of the Taunton River Basin Southeastern Massachusetts,
W74-07190 7C

Problems in Distribution of Water Resources in the Arid Zone of the Amudar'ya River Basin (Voprosy raspredeleniya vodnykh resursov v arisnoy zone (na primere Amudar'i)),
W74-07192 4A

West Virginia Water Development Authority.
W74-07277 6E

Wild, Scenic River Systems.
W74-07280 6E

Water-Resources Investigations in Texas, Fiscal Year 1974.
W74-07321 2E

The Geology of Water: The Limiting Factor in Urban Development,
W74-07402 3D

WATER RESOURCES DEVELOPMENT
Institutional Arrangements and Alternative Futures.
W74-07081 6D

North Coastal Area Action Program: A Study Of The Smith River Basin And Plain.
W74-07132 6B

Water Resources Seminar Series No. 2.
W74-07133 6B

Hydroelectric Power Resources of the United States, Developed and Undeveloped, January 1, 1972.
W74-07189 8C

Eighth Annual Report, Program Activities, July 1, 1971-Jun 30, 1972.
W74-07332 9D

WATER RESOURCES INSTITUTE
Annual Report/Fiscal Year 1973.
W74-07252 9D

Eighth Annual Report, Program Activities, July 1, 1971-Jun 30, 1972.
W74-07332 9D

Minutes, Iowa State Water Resources Research Institute Advisory Board and Council, Eighth Annual Meeting.
W74-07456 9A

Ninth Annual Report of the Water Resources Research Institute of the University of Wyoming (Activities During FY 1973).
W74-07457 9A

WATER REUSE
An Economic Analysis of Selected Agricultural Uses of Warm Water in the Pacific Northwest Resulting from Electric Power Generation,
W74-07125 3C

Costs of Wastewater Renovation,
W74-07141 5D

Regeneration of Chromated Aluminum Deoxidizers, Phase I Report,
W74-07254 5D

Land Application of Sewage Sludge,
W74-07266 5D

Water Reuse and Recycle in the D(C)EDED Bleach Sequence,
W74-07377 5D

Reduction of the Volume of Pollutants Discharged and of Fresh Water Consumption (Sokrashchenie sbrosa zagryaznenii i umen'shenie raskhoda svezhei vody),
W74-07384 5D

Water Reuse and Recycle in Kraft Bleacheries,
W74-07394 5D

Utilization of White Water in Board Mills (Ispol'zovanie oborotnoi vody na kartonnykh fabrikakh),
W74-07397 5D

Pollution Control by Recycling Effluent,
W74-07407 5D

Water Reuse in Protein Feed Process Utilizing Lumber Mill Wastes,
W74-07409 5D

An Overview of Water Reuse Potential in Pulp and Paper Manufacturing,
W74-07410 5D

WATER RIGHTS
Riparian Rights in Certain Counties.
W74-07283 6E

WATER SOURCES
Water and Wastewater Systems Inventory - Region H, North Carolina,
W74-07063 5D

WATER SPREADING
Land Disposal of Wastewater--Literature Review for 1973,
W74-07327 5D

WATER STORAGE
Application of the Spline Function to Soil Science,
W74-07344 2G

WATER STRESS
Effects of Water Stress on Growth and Nitrogen-Fixing Activity of Trifolium repens,
W74-07352 3F

WATER SUPPLY
Sanitary Services in Tennessee, 1972.
W74-07060 5D

Water and Wastewater Systems Inventory - Region H, North Carolina,
W74-07063 5D

Utilities and Facilities for New Residential Development: A Survey of Municipal Policy,
W74-07071 5D

Water Quality Management Element for the Kentucky River Area Development District Comprehensive Water and Sewer Program.
W74-07077 5D

Measures to Reduce Water Consumption in Southeastern New York.
W74-07079 6D

Proposed Water Supply Projects for Southeastern New York.
W74-07080 6D

Institutional Arrangements and Alternative Futures.
W74-07081 6D

North Coastal Area Action Program. A Study of the McKinleyville-Trinidad Area: Public Hearing Comments.
W74-07129 6B

WATER SUPPLY

North Coastal Area Action Program: A Study Of The Smith River Basin And Plain.
W74-07132 6B

Public Groundwater Supplies in Bond County,
W74-07429 4B

WATER SUPPLY DEVELOPMENT
Preliminary Water and Sewer Plan for Alcorn, Benton, Marshall, Prentiss, Tippah, Tishomingo Counties.
W74-07062 5D

Ipswich River Basin Model Study,
W74-07302 6D

Planning and Operational Studies in the Integrated Use of Desalination. Case Studies for Cyprus and Jersey,
W74-07308 3A

WATER TABLE
Infiltration and Water Table Effects of Soil Air Pressure Under Border Irrigation,
W74-07301 3F

Seepage Through a Hillside: The Steady Water Table,
W74-07517 2G

WATER TEMPERATURE
Summertime Temperature and Circulation Patterns in Lake Superior,
W74-07338 2H

Surface Temperatures of Lake Erie,
W74-07415 2H

Effects of Temperature on Activity and Mortality of the Scyphozoan Medusa, Chrysaora quinquecirrha,
W74-07561 5C

A Direct Comparison of Satellite and Aircraft Infrared (10 Micrometers-12 Micrometers) Remote Measurements of Surface Temperature,
W74-07578 7B

WATER TREATMENT
Costs of Wastewater Renovation,
W74-07141 5D

Ozone in Water and Waste Water Treatment, a Bibliography.
W74-07251 5D

Hygienic Features of Silicate Anticorrosion Coatings for Water Reservoirs, (In Russian),
W74-07364 5F

Hygienic Evaluation of Means of Enrichment with Salts and Decontamination of Demineralized Water, (In Russian),
W74-07365 5F

WATER TYPES
Mineral Springs in the Suez Rift Valley - Comparison With Waters in the Jordan Rift Valley and Postulation of a Marine Origin,
W74-07444 2K

WATER UTILIZATION
The Relationship of Land Use to Water Use in San Antonio, Texas,
W74-07067 4A

Public Investment Criteria: Application to a Project in the Souris River Basin,
W74-07070 6B

Water Uses and Water Development in Fall Creek--Possible Conflicts,
W74-07149 6B

Riparian Rights in Certain Counties.
W74-07283 6E

Plant and Irrigation Water Requirements,
W74-07452 3F

WATER WELLS
Public Groundwater Supplies in Adams County,
W74-07172 4B

Variables Affecting Well Success in a Kentucky Limestone Aquifer,
W74-07176 4B

Records of Ground-Water Levels in Wyoming, 1940-1971,
W74-07186 4B

Data for Municipal Wells in the City of Modesto, California,
W74-07320 4B

A Computer System for Storage and Retrieval of Hydrogeological Data from Well Records,
W74-07328 7C

Public Groundwater Supplies in Bond County,
W74-07429 4B

WATER YIELD
Probability Distribution of Snow Course Data for Central Arizona,
W74-07094 2C

Water Yield, Annual peaks and Exposure in Mountainous Terrain,
W74-07165 2A

Variables Affecting Well Success in a Kentucky Limestone Aquifer,
W74-07176 4B

Calibrating a Water Yield Model for Small Ungaged Watersheds,
W74-07519 2A

Effect of Grazing on Runoff from Two Small Watersheds in Southwestern Wisconsin,
W74-07525 4C

WATER YIELD IMPROVEMENT
Study on the Pasture Establishment Technique VI. Effect of Different Spacings and Weedings on Establishment and Forage Production of Cenchrus ciliaris Linn., Lasiurus sindicus Henr. and Panicum antidotale Retz under Arid Conditions,
W74-07107 3F

WATER ZONING
Wallowa Lake Basin Comprehensive Plan.
W74-07065 5D

WATERFLEAS
Moina Sp. (Cladocera: Moinidae) in a Sewage Plant, Wellington, Referred to Moina tenuicornis Sars, 1896 (Note),
W74-07569 5A

WATERFRONT DEVELOPMENT
Planning and Developing Waterfront Property,
W74-07072 6B

WATERLOGGING
The Effect of Waterlogging on the Mineral Nutrient Content of Trifolium Subterraneum,
W74-07355 3F

WATERSHED MANAGEMENT
A Framework for Economic Planning of Watershed Drainage,
W74-07069 4A

Study Design Surface Drainage Program, Madison, St Clair, Monroe and Randolph Counties, Illinois.
W74-07083 4A

Evapotranspiration on a Palouse Watershed,
W74-07087 2D

WATERSHEDS (BASINS)
Generation Models for Synthetic Annual and Monthly Flows for Some Indiana Watersheds,
W74-07431 2A

WAVES (WATER)
Apparatus for Recording Swell Frequency and Propagation Direction of Waves,
W74-07224 8B

WEEDS
Study on the Pasture Establishment Technique VI. Effect of Different Spacings and Weedings on Establishment and Forage Production of Cenchrus ciliaris Linn., Lasiurus sindicus Henr. and Panicum antidotale Retz under Arid Conditions,
W74-07107 3F

WEIRS
Contributions to the Calculation of the Rood Territory Width and the Transversal Section Under the Retention Level at the Weirs and Dams of Fishery Purposes, (In Rumanian),
W74-07448 8I

WELL DATA
Evaluation of Methods of Pumping Test Analyses for Application to Hawaiian Aquifers,
W74-07531 5C

WELLS
Hydrogeology of Carbonate and Volcanic Rocks--Similarities and Contrasts,
W74-07134 2F

Sandstone Aquifers in Eastern Sullivan County, Indiana,
W74-07401 4B

WEST BOGGS CREEK WATERSHED (IND)
Cost Sharing for Recreation: Efficiency and Equity,
W74-07307 6B

WEST VIRGINIA
Sanitary Districts for Sewage Disposal.
W74-07276 6E

West Virginia Water Development Authority.
W74-07277 6E

WETLANDS
Fisheries and Game; General Provisions.
W74-07286 6E

WHEAT
Effects of Moisture Stress at Early Heading and of Nitrogen Fertilizer on Three Spring Wheat Cultivars,
W74-07351 3F

Water Relations of Wheat as Affected by Irrigation and Nitrogen Fertilization,
W74-07596 3F

WHITE WATER
Utilization of White Water in Board Mills (Ispol'zovanie oborotnoi vody na kartonnykh fabrikakh),
W74-07397 5D

WILDLIFE CONSERVATION
Fisheries and Game; General Provisions.
W74-07286 6E

ILLAMETTE RIVER (ORE)
Nonlinear Programming in River Basin Modeling,
W74-07298 5B

IND EROSION
Sand Dune Reclamation in Iraq -- Present Status and Future Prospects,
W74-07104 2J

INDBREAKS
Sand Dune Reclamation in Iraq -- Present Status and Future Prospects,
W74-07104 2J

INDS
The Influence of Wind on the Surface Waters of Alberni Inlet,
W74-07497 2L

ISCONSIN
Screening/Dissolved-Air Flotation Treatment of Combined Sewer Overflows,
W74-07262 5D

Combined Sewer Overflow Treatment by the Rotating Biological Contactor Process.
W74-07374 5D

Methylmercury Formation in Mercury-Treated River Sediments During in Situ Equilibration,
W74-07425 5B

Effect of Grazing on Runoff from Two Small Watersheds in Southwestern Wisconsin,
W74-07525 4C

ITHDRAWAL
Hydrologic Conditions in the Lakeland Ridge Area of Polk County, Florida,
W74-07318 4B

Planar and Axisymmetric Bottom Withdrawal from a Density-Stratified Reservoir,
W74-07340 4A

OOD-ROTTING FUNGI
Annotated Checklist and Host Index for Arizona Wood-Rotting Fungi,
W74-07097 2I

OOD WASTES
Water Reuse in Protein Feed Process Utilizing Lumber Mill Wastes,
W74-07409 5D

ORMS
Taxonomic Position of Two Lumbrineris Spp.,
W74-07568 2L

YOMING
Records of Ground-Water Levels in Wyoming, 1940-1971,
W74-07186 4B

Ninth Annual Report of the Water Resources Research Institute of the University of Wyoming (Activities During FY 1973).
W74-07457 9A

Snow Accumulation and Snowmelt as Influenced by a Small Clearing in a Lodgepole Pine Forest,
W74-07526 2C

YAQUINA BAY (ORE
The Predicted Influence of Kraft Mill Effluent on the Fishery Resources,
W74-07145 5C

An Economic Evaluation of Alternative Levels of Water Quality: The Role of Water Quality in Relation to Economic Benefits,
W74-07146 6B

Institutional Considerations,
W74-07147 6E

Resource Management Decisions: Externalities and Public Policy,
W74-07148 6A

YEASTS
Microbial Indicators for the Biological Quality of Treated Wastewater Effluents,
W74-07372 5D

Psychrophilic Yeasts Isolated From Marine Fish,
W74-07563 5A

Numerical Analysis of Hansenula, Pichia and Related Yeast Genera,
W74-07583 5A

YORK RIVER (VA)
Mass Physical and Engineering Properties of Some York River Sediments,
W74-07239 2L

ZECTRAN
The Photochemistry of Carbamates. 1. The Photodecomposition of Zectran: 4-Dimethylamino-3,5-XYLYL-N-Methyl Carbamate,
W74-07552 5B

ZONE OF AERATION
Investigation of the Relation of Groundwater Evaporation to Lithological Structure of the Zone of Aeration (K izucheniyu zavisimosti ispareniya gruntovykh vod ot litologicheskogo stroyeniya zony aeratsii),
W74-07529 2D

ZONING
State Flood Control Program.
W74-07111 4A

ZOOPLANKTON
Seasonal Abundance and Vertical Distribution of Crustacean Zooplankton in a Coloured Dystrophic Lake in Northeastern Ontario,
W74-07467 5C

AUTHOR INDEX

BDURAKHMANOV, YU. A.
Fertility of the Fish From Varvara Reservoir, (In Russian),
W74-07591 8I

CKERMANN, W. C.
Current Thinking in Water Resources Research and Their Applicability to Hawaii Conditions,
W74-07135 6B

Research Activities of the Illinois State Water Survey,
W74-07136 6B

DAM, A.
Contributions to the Calculation of the Rood Territory Width and the Transversal Section Under the Retention Level at the Weirs and Dams of Fishery Purposes, (In Rumanian),
W74-07448 8I

DRIANO, D. C.
Nitrate Concentrations in the Unsaturated Zone Beneath Irrigated Fields in Southern California,
W74-07445 5G

GARDY, F. J.
Water Pollution Aspects of Street Surface Contaminants,
W74-07418 5B

GNEW, A. F.
Sandstone Aquifers in Eastern Sullivan County, Indiana,
W74-07401 4B

GNEW, R. W.
Screening/Dissolved-Air Flotation Treatment of Combined Sewer Overflows,
W74-07262 5D

HUJA, L. R.
Flux-Gradient Relationships and Soil-Water Diffusivity from Curves of Water Content Versus Time,
W74-07512 2G

ITA, N.
Studies of the Ingredients Variation of the Sake-Gawa River, A Tributary of the Mogami River (In Japanese),
W74-07360 2K

LBERTSSON, U.
Environmental Protection Techniques to be Applied in a Bleached Kraft Pulp Mill in Sweden,
W74-07392 5D

LDON, E. F.
Reactivating Soil Ripping Treatments for Runoff and Erosion Control in the Southwestern U.S.,
W74-07089 2G

LKIKU, P.
Flood Proofing Decisions with Uncertain Events,
W74-07299 6A

LVIM, DE TARSO PAULO
Effects of Drainage on the Yield of Cacao, (In Portuguese),
W74-07435 3F

MIEL, A. J.
Mineralogical Composition of Clays in Soil Profiles of Israel: I. The Soils of the Mediterranean Zone,
W74-07099 2G

AMIN, B. S.
Th-234/U-238 Activity Ratios in Pacific Ocean Bottom Waters,
W74-07322 2K

ANDERSON, H. R.
Aquifers in the Sokoto Basin, Northwestern Nigeria, with a Description of the General Hydrogeology of the Region,
W74-07184 2F

ANGHEL, CRISTEA
A New Type of Incubator Used in the Induced Spawning of Phytophagous Fishes, (In Rumanian),
W74-07434 8I

ARCHER, M. C.
Reduction in Mercury Content of Fish Protein Concentrate by Enzymatic Digestion,
W74-07576 5A

ARKHANGEL'SKAYA, I. G.
Radiation Safety Problems in the Operation of Atomic Electric Power Stations, (In Russian),
W74-07363 5B

ARVANITIDIS, N. V.
A Computer Simulation Model for Flood Plain Development. Part II: Model Description and Applications,
W74-07296 6A

ASARIN, A. YE.
Components of the Water Balance of the Aral Sea and Their Effect on Its Long-Term Level Fluctuations (Sostavlyayushchiye vodnogo balansa Aral'skogo morya i ikh vliyaniye na mmnogoletniye kolebaniya yego urovnya),
W74-07194 2H

AULL, G. H. JR.
User Charges and Industrial Cost Recovery, Denver SMSA,
W74-07370 5D

AVAKYAN, A. B.
Problems in Recreational Use of Reservoirs (Problemy rekreatsionnogo ispol' zovaniya vodokhranilishch),
W74-07193 6B

AXELRAD, D. M.
Function of Marshes in Reducing Eutrophication of Estuaries of the Middle Atlantic Region,
W74-07336 5C

AYLOR, D. E.
Stomatal Mechanics,
W74-07593 2I

BACKSTROM, A. L.
Safety Device Against Leakage from Ships, Especially Tankers,
W74-07205 5G

BAER, E. H.
Process of Separation of Emulsified or Dispersed Matter From Water,
W74-07197 5D

BAGRETSOV, V. F.
Organization of the Collection and Decontamination of Industrial and Domestic Radioactive Sewage, (In Russian),
W74-07362 5D

BAILEY, G. W.
Predicting Pesticide Runoff From Agricultural Land: A Conceptual Model,
W74-07427 5B

BAJWA, P. S.
A Contribution to the Botany of Ganganagar District, North Rajasthan,
W74-07357 3F

BAKANINA, F. M.
Suspended-Sediment Yield in Rivers of Gor'kiy Oblast as an Indication of Recent Erosion Processes (Stok vzveshennykh nanosov v rekakh Gor'kovskoy obl. kak pokazatel' razvitiya sovremennykh erozionnykh protsessov),
W74-07507 2J

BAKER, H. L.
Hawaii's Statewide Land Classification Proves Adaptability as Land Use and Environmental Concerns Change,
W74-07138 4A

BANKS, R. B.
A Mixing Cell Model for Longitudinal Dispersion in Open Channels,
W74-07527 8B

BANSE, K.
A Strategy for Modeling Primary Production in Stratified Fjords,
W74-07494 5C

BARANOV, M. A.
Radiation Safety Problems in the Operation of Atomic Electric Power Stations, (In Russian),
W74-07363 5B

BARBER, S. A.
Ammonium and Nitrate Uptake by Corn (Zea mays L.) as Influenced by Nitrogen Concentration and NH4(+)/NO3(-) Ratio,
W74-07459 3F

BARLOW, E. W. R.
Subsurface Heating and Irrigation of Soils: Its Effect on Temperature and Water Content and on Plant Growth,
W74-07054 2G

BARNES, W. B.
A Practical and Trouble-Free Sewer Spill Monitor,
W74-07404 5D

BARRA, F. J.
Apn aratus for Separating Oil and SolidsfFrm m Water,
W74-07202 5D

BATES, T. E.
Land Application of Sewage Sludge,
W74-07266 5D

BAUER, O. N.
Diseases of Pond Fishes,
W74-07481 8I

BAUER, R. C.
Reactions of Chloramines with Active Carbon,
W74-07544 5B

BAYER, D. R.
Irrigation and Sprinkler System,
W74-07212 3F

BAYER, M. B.
Nonlinear Programming in River Basin Modeling,
W74-07298 5B

BELLA, D. A.
New Concepts in Environmental Planning,
W74-07492 6B

BENDER, M. E.
Function of Marshes in Reducing Eutrophication of Estuaries of the Middle Atlantic Region,
W74-07336 5C

BENNETT, D. J.
Pilot Application of the Rotating Biological Surface Concept for Secondary Treatment of Insulating Board Mill Effluents,
W74-07398 5D

BENNETT, J. T.
Determinants of Use of Water-Based Recreational Facilities,
W74-07058 6B

BERGER, H. F.
A Comparison of Effluent Characteristics from Conventional and Oxygen Bleaching Sequences: Results of a Laboratory Study,
W74-07375 5D

BERGKVIST, S.
Environmental Protection Techniques to be Applied in a Bleached Kraft Pulp Mill in Sweden,
W74-07392 5D

BERLAMONT, J.
Solutions for Lateral Outflow in Perforated Conduits,
W74-07433 8B

BERRY, F. A. F.
The Influence of Geological Membranes on the Geochemistry of Subsurface Waters from Miocene Sediments at Kettleman North Dome in California,
W74-07513 2K

BESCHTA, R. L.
Probability Distribution of Snow Course Data for Central Arizona,
W74-07094 2C

BESKRESTNOV, N. V.
Radiation Safety Problems in the Operation of Atomic Electric Power Stations, (In Russian),
W74-07363 5B

BETHLAHMY, N.
Water Yield, Annual peaks and Exposure in Mountainous Terrain,
W74-07165 2A

BICK, H.
Population Dynamics of Protozoa Associated with the Decay of Organic Materials in Fresh Water,
W74-07541 5C

BISCAYE, P. E.
Strontium Isotope Composition and Sediment Transport in the Rio de la Plata Estuary,
W74-07240 2L

BISHOP, D. F.
Hydrogen Peroxide Cures Filamentous Growth in Activated Sludge,
W74-07253 5D

BISHOP, E.
Mass and Charge Transfer Kinetics and Coulometric Current Efficiencies. Part VII. Conditional Potentials, and Single-Scan Voltammetry of Pure Vanadium(V) - Vanadium(IV) Systems in Various Media at Platinum Elec trodes Pre-Treated By Five Methods,
W74-07557 2K

Mass and Charge Transfer Kinetics and Coulometric Current Efficiencies. Part VIII. Single-Scan Voltammetry of Vanadium(V) - Vanadium(IV) in the Presence of Chromium, Manganese and Iron, and the Kinetic Parameters of the Vanadium System, at Platinum Electrodes Pre-Treated by Five Methods,
W74-07558 5A

BJORK, C. D.
Effect of Anhydrous Ammonia on a Central Texas Pond, and a Review of Previous Research with Ammonia in Fisheries Management,
W74-07595 5C

BLANCHAR, R. W.
Distribution and Chemistry of Phosphorus in an Albaqualf Soil After 82 Years of Phosphate Fertilization,
W74-07532 5B

BLANK, D.
A Computer Atlas of Hydrologic and Geomorphologic Data for Small Watersheds in Indiana,
W74-07432 2A

BLAZHCHISHIN, A. I.
Supply of Terrigenous Material to the Baltic Sea (Pitaniye Baltiyskogo morya terrigennym materialom),
W74-07501 2J

BLEUER, N. K.
Strontium and Other Notable Chemical Constituents of Well-Water of Allen County, Indiana,
W74-07400 2K

BLUNDELL, K. D.
Effluent - Fibre Recovery - Water Savings; Case History of a Recent Plant Installation,
W74-07395 5D

BODROV, I. K.
Soil Moisture Dynamics and Its Variations in Soils Under Field Crops (Dinamika vlazhnosti i stepen' yeye var'irovaniya v pochvakh pod polevymi kul'turami),
W74-07509 2G

BOERSMA, L.
Subsurface Heating and Irrigation of Soils: Its Effect on Temperature and Water Content and on Plant Growth,
W74-07054 2G

BOGGS, S. JR.
Sand-Wave Fields in Taiwan Strait,
W74-07175 2J

BOLE, J. B.
Effects of Moisture Stress at Early Heading and of Nitrogen Fertilizer on Three Spring Wheat Cultivars,
W74-07351 3F

BOND, T. A.
Santee Submergence, Example of Cyclic Submerged and Emerged Sequences,
W74-07247 2L

BORODINA, G. A.
Effect of Effluents from Hydrolysis Plant on the Survival of Typhoid Fever and Dysentery Bacteria, (In Russian),
W74-07367 5C

BOSCHEN, W. O.
Waste Water Process Tank Control Facility,
W74-07216 5D

BOSTANDZHOGLO, A. A.
Problems in Distribution of Water Resources i
the Arid Zone of the Amudar'ya River Bas
(Voprosy raspredeleniya vodnykh resursov
aridnoy zone (na primere Amudar'i)),
W74-07192 4

BOTHMA, J. DU P.
Short-Term Response in Ungulate Numbers t
Rainfall in the Nossob River of the Kalaha
Gemsbok National Park,
W74-07535 2

BOULDIN, D. R.
Losses of Inorganic Nitrogen From Aquati
Systems,
W74-07426 5

BOURODIMOS, E. L.
Cross-Spectral Analysis of Rainfall and Runof
for Raritan and Mullica River Basins in Ne
Jersey,
W74-07183 2

BOWER, B. T.
Residuals in Manufacture of Paper,
W74-07399 5

BOYD, G. B.
Water Pollution Aspects of Street Surface Co
taminants,
W74-07418 5

BRENNER, F. J.
Ecology and Productivity of Strip-Mine Are
in Mercer County, Pennsylvania,
W74-07055 5

BRINK, E. H.
Foam Flotation Concentration of Sewage,
W74-07214 5

BROOME, S. W.
An Investigation of Propagation and t
Mineral Nutrition of Spartina alterniflora,
W74-07486 5

BROWN, C. B.
Avalanche Studies (1971-1972),
W74-07319 2

BRUCE, J.
Psychrophilic Yeasts Isolated From Mari
Fish,
W74-07563 5

BRUCKENSTEIN, S.
Rotating Ring-Disk Electrode Study of the A
sorption of Lead on Gold in 0.5M Potassiu
Chloride,
W74-07555 2

BRUCKMAN, L.
The Environmental Impact of Cadmium,
W74-07530 5

BRYAN, B. B.
Broad Spectrum Microwave Systems f
Remotely Measuring Soil Moisture Content,
W74-07052 2

BUATOIS, J.
Study of the Adaptation of an Activated Slud
to the Purification of an Industrial Efflue
(Etude de l'adaptation d'une boue activee
l'epuration d'un effluent industriel),
W74-07389 5

BUNN, C. O.
Method of and Apparatus for the Recovery
Oil from Water,
W74-07201 5

A, C.
es of Inorganic Nitrogen From Aquatic ems,
-07426 5B

ETT, C. A.
Chromatographic Studies of Mixed-Ligand plexes of Divalent Cations,
-07582 5A

HAM, J. C.
Effect of Selenite on the Physiological and phological Properties of the Blue-Green Phormidium luridum Var. Olivacea,
-07550 5C

S, A. W.
ich River Basin Model Study,
-07302 6D

ESS, R. M.
bivorous Fish for Aquatic Plant Control,
-07470 4A

ELL, R. E.
lity of Water Discharged from Two cultural Watersheds in Southwestern Iowa,
-07528 5B

Y, F. E.
nsive Infiltrometer Studies on A Plowed Sagebrush Site,
-07166 2G

H, C. D.
Irrigation Scheduling Model Which Incor- ates Rainfall Predictions,
-07440 3F

, K-U.
rodetermination of Resorcinol in Presence henol,
-07580 5A

WIN, G. W.
Identification of the Reaction Products med by the Oxidation of Aqueous Ammonia n Potassium Ferrate VI,
-07333 5D

MA, Z. ANTONIO
ects of Drainage on the Yield of Cacao, (In tuguese),
-07435 3F

NS, J. JR.
tems simulation of the effect of tertiary tment for carbon, nitrogen, and phosphorus oval upon primary productivity, standing p, and community structure of autotrophic hetertrophic communities in receiving del streams.
-07337 5C

ERON, D. G.
formance of Lucerne (Medicago sativa) es in Pure Stands Under Irrigated and Rain own Conditions in Sub-Coastal Central eensland,
-07359 3F

PBELL, I.
merical Analysis of Hansenula, Pichia and lated Yeast Genera,
-07583 5A

CICH, I. G.
essure Sewers,
-07259 5D

CARO, J. H.
Acid Ammonium Acetate Extraction and Electron Capture Gas Chromatographic Determination of Carbofuran in Soils,
W74-07574 5A

CARPENTER, W. L.
A Comparison of Effluent Characteristics from Conventional and Oxygen Bleaching Sequences: Results of a Laboratory Study,
W74-07375 5D

CARSTENS, T.
Physical Modeling of Residence Times in Tidal Basins,
W74-07496 2L

CARY, L. E.
Probability Distribution of Snow Course Data for Central Arizona,
W74-07094 2C

CASTLE, E. N.
Resource Management Decisions: Externalities and Public Policy,
W74-07148 6A

CASTLE, M. E.
A Study of the Intake of Drinking Water by Dairy Cows at Grass,
W74-07358 3F

CAZAL, A.
Vertical Movements in the Nonsaturated Zone and the Specific Yield of a Water-Table Aquifer (Etude des transferts verticaux dans la zone non saturee et de l'emmagasinement d'une nappe libre, dans le cas d'un pompage, dans les conditions na turelles),
W74-07182 2F

CERNY, K.
Abundance and Mortality of the Perch Fry (Perca Fluviatilis, Linnacus, 1758) in the Klicava Reservoir,
W74-07588 8I

CHAKRAVARTY, A. K.
Effect of Contour Furrows and Contour Bunds on Water Conservation in Grasslands of Western Rajasthan,
W74-07090 3F

Study on the Pasture Establishment Technique VI. Effect of Different Spacings and Weedings on Establishment and Forage Production of Cenchrus ciliaris Linn., Lasiurus sindicus Henr. and Panicum antidotale Retz under Arid Conditions,
W74-07107 3F

CHAMP, M. A.
Effect of Anhydrous Ammonia on a Central Texas Pond, and a Review of Previous Research with Ammonia in Fisheries Management,
W74-07595 5C

CHANDRA, H.
Effect of Gypsum in Reducing Boron Hazard of Saline Waters and Soils,
W74-07095 3C

CHAPPEL, D.
Santee Submergence, Example of Cyclic Submerged and Emerged Sequences,
W74-07247 2L

CHASE, P. E.
Utilization of ERTS-1 Data to monitor and Classify Eutrophication of Inland Lakes,
W74-07484 5C

CHAU, A. S. Y.
Determination of Pentachlorophenol in Natural and Waste Waters,
W74-07385 5A

CHEN, K. Y.
Solvent Extraction of Sulfur From Marine Sediment and Its Determination by Gas Chromatography.
W74-07565 5A

CHEONG, H. F.
Dispersion of Contaminated Sediment Bed Load,
W74-07446 5B

CHESSON, N. W.
Water and Wastewater Systems Inventory - Region H, North Carolina,
W74-07063 5D

CHESTERMAN, W. D.
Sedimentation by Non-Tidal Currents Around Northern Denmark,
W74-07160 2L

CHESTNUT, A. F.
Biological Investigations of Noxious Coelenterates and Ctenophores in Coastal North Carolina,
W74-07479 2L

CHUN, R.
Control of Grading Practices in the City and County of Honolulu,
W74-07139 4D

CHURCHLAND, L. M.
Marine Fungi Isolated from a Kraft Pulp Mill Outfall Area,
W74-07396 5B

CLARK, D. P.
Cyanide Waste Treatment Utilizing Catalytic Oxidation,
W74-07272 5D

CLAYTON, J. L.
Water Retention of Granitic Soils in the Idaho Batholith,
W74-07170 2G

CLIATH, M. M.
Volatility of DDT Residues in Soil as Affected by Flooding and Organic Matter Applications,
W74-07424 5B

CLINGAN, T. A. JR.
Law Affecting the Quality of the Marine Environment,
W74-07282 5G

CLOUGH, R. L. JR.
Agitating and Aerating Apparatus,
W74-07221 5D

COBURN, J. A.
Determination of Pentachlorophenol in Natural and Waste Waters,
W74-07385 5A

COCHRAN, R. A.
An Oil Recovery System Utilizing Polyurethane Foam--A Feasibility Study,
W74-07341 5G

COCHRAN, V. L.
Effectiveness of Two Nitrification Inhibitors for Anhydrous Ammonia Under Irrigated and Dryland Conditions,
W74-07436 5G

COE, M. W.
A Preliminary Description of the Physico-Chemical Characteristics and Biota of Three Strip Mine Lakes, Spencer County, Indiana,
W74-07403 5B

COFFEY, J. P.
Self Cleaning, Tubular Solar Still,
W74-07207 3A

COKER, R. J.
Potential of Westland's Morainic Soils for Forest Management,
W74-07594 4A

COLE, C. A.
Hydrogen Peroxide Cures Filamentous Growth in Activated Sludge,
W74-07253 5D

COLQUHOUN, D. J.
Santee Submergence, Example of Cyclic Submerged and Emerged Sequences,
W74-07247 2L

COOK, K. R.
Broad Spectrum Microwave Systems for Remotely Measuring Soil Moisture Content,
W74-07052 2G

COSSMAN, V.
Mineralogical Composition of Clays in Soil Profiles of Israel: II. The Soils of the Desert Zone,
W74-07100 2G

COUCH, R. W.
Response of Aquatic Weeds to Laser Radiation,
W74-07475 5G

CRISTEA, ELISABETA
A New Type of Incubator Used in the Induced Spawning of Phytophagous Fishes, (In Rumanian),
W74-07434 8I

CURL, H. C.
An Ecosystem Study in the Inside Passage of Southeastern Alaska,
W74-07495 5C

CUTRESS, C. E.
Investigation of the Biology and Control of Noxious Coelenterates Occurring in the Coastal Waters of Puerto Rico,
W74-07480 2L

DAILEY, R. T.
An Economic Analysis of Selected Agricultural Uses of Warm Water in the Pacific Northwest Resulting from Electric Power Generation,
W74-07125 3C

DAJANI, J. S.
Capital Cost Minimization of Drainage Networks,
W74-07309 4A

DALPKE, H. L.
Possibilities of Effluent Clarification (Moeglichkeiten der Abwasserklaerung),
W74-07382 5D

DAUGHTREY, Z. W.
Phosphorus Supply Characteristics of Acid Organic Soils as Measured by Desorption and Mineralization,
W74-07345 2G

DAVIS, D. J.
Evapotranspiration on a Palouse Watershed,
W74-07087 2D

DAVIS, R. J.
Relative Movement of Bromide and Nitrate Through Soils,
W74-07423 5B

DAVIS, S. N.
Hydrogeology of Carbonate and Volcanic Rocks--Similarities and Contrasts,
W74-07134 2F

DAWDY, D. R.
Streamflow Simulation: 3. The Broken Line Process and Operational Hydrology,
W74-07520 2A

DEANGELIS, A. L.
Method for the Elimination and Possible Recovery of the Floating Polluting Substances, Mineral Oils in Particular, From Sheets of Water and Boat Fitted to This Aim,
W74-07220 5G

DEJOUX, C.
A Study of the Communities of Invertebrates of Plants of Lake Chad: Preliminary Inquires, (In French),
W74-07538 2H

DEKLERK, C. A.
Occurrence and Distribution of the Vine Phylloxera, Phylloxera vitifoliae (Fitch), in the Olifants River Irrigation Area, Northwestern Cape Province,
W74-07356 3F

DELLEUR, J. W.
Comparison of Rainfall-Runoff Models for Urban Areas,
W74-07463 2A

A Computer Atlas of Hydrologic and Geomorphologic Data for Small Watersheds in Indiana,
W74-07432 2A

Generation Models for Synthetic Annual and Monthly Flows for Some Indiana Watersheds,
W74-07431 2A

A Rainfall-Runoff Model Based on the Watershed Stream Network,
W74-07464 2A

DEVITT, A. C.
The Effect of Waterlogging on the Mineral Nutrient Content of Trifolium Subterraneum,
W74-07355 3F

DEWITT, R. H.
Groundwater Geology of Fort Valley, Coconino County, Arizona,
W74-07092 4B

DHILLON, K. B. S.
A Contribution to the Botany of Ganganagar District, North Rajasthan,
W74-07357 3F

DICKEY, G. L.
Development of an Agricultural Drainage Guide,
W74-07438 4A

DICKSON, K. L.
Systems simulation of the effect of tertiary treatment for carbon, nitrogen, and phosphorus removal upon primary productivity, standing crop, and community structure of autotrophic and hetertrophic communities in receiving model streams.
W74-07337 5C

DIXON, R. M.
Infiltration and Water Table Effects of Soil A
Pressure Under Border Irrigation,
W74-07301 3

DJURIC, D.
On The Determination of Turbulent Diffusiv
in Shallow Waters by Aerial Photography
Floating Markers,
W74-07316 2

DONIGIAN, A. JR.
Simulation--A Tool for Water Resour
Management,
W74-07300 6

DOORNKAMP, J. C.
A Note on the Areal Distribution of Suspend
Sediment Yield in South Africa,
W74-07177 2

DOUGHERTY, C. T.
Water Relations of Wheat as Affected by I
rigation and Nitrogen Fertilization,
W74-07596 3

DOUGLAS, G.
Modular Wastewater Treatment Syste
Demonstration For The Textile Maintenan
Industry,
W74-07343 5

DOUGRAMEJI, J.
Sand Dune Reclamation in Iraq -- Prese
Status and Future Prospects,
W74-07104 3

DOVZHENKO, V. K.
Effect of Irrigation on Dynamics of Microo
ganism Quantity in Dark-Brown Soils
Southern Ukraine, (In Ukrainian),
W74-07279 2

DOWLING, J. M.
A Note on the Use of Spectral Analysis to D
tect Leads and Lags in Annual Cycles of Wat
Quality,
W74-07522 2

DREES, L. R.
Elemental Variability Within a Sampling Unit,
W74-07598 2

DUBETZ, S.
Effects of Moisture Stress at Early Headi
and of Nitrogen Fertilizer on Three Spri
Wheat Cultivars,
W74-07351 3

DUBITSKAYA, N. I.
Utilization of White Water in Board Mi
(Ispol'zovanie oborotnoi vody na kartonny
fabrikakh),
W74-07397 5

DUDAS, M. J.
Micro-Determination of Cation-Exchan
Capacity by Neutron Activation Analysis,
W74-07439 2

DUDDY, J. C.
Self Cleaning, Tubular Solar Still,
W74-07207 3

DUL'HEROV, O. M.
Effect of Irrigation on Dynamics of Microo
ganism Quantity in Dark-Brown Soils
Southern Ukraine, (In Ukrainian),
W74-07279 2

ETTE, R.
ution Control Through Training, Education, Rigorous Follow-Up,
4-07408 5G

RSKY, L. B.
Study of Potential Institutional Arrange-ts for Water Quality and Water Resources antity) Planning and Management,
4-07051 6B

RD, E.
Comparison of the Food of Salamanders and n in Marion Lake, British Columbia,
4-07349 2H

ROVA, M. S.
iation Safety Problems in the Operation of mic Electric Power Stations, (In Russian),
4-07363 5B

VAIFY, S. A.
ictural Changes in Tropical Soils Due to ons in Irrigation Water,
4-07348 2G

KHOVSKAYA, N. P.
dy of Metabolism of Nickel Entering the dy with Drinking Water, (In Russian),
4-07361 5C

OTT, R. D.
onomic Study of the Effect of Municipal ver Surcharges on Industrial Wastes and ter Usage,
4-07057 5G

HRAGTY, M. M.
nning and Operation of Urban Water Quali-Management Systems,
4-07334 5D

ELEN, G. B.
drogeology of the Sasso Lungo Group, a lomitic Reef Stock in the Alpine Dolomites North Italy,
74-07153 2F

IN, M.
fects of Water Stress on Growth and trogen-Fixing Activity of Trifolium repens,
74-07352 3F

ELY, L.
paratus for Recording Swell Frequency and opagation Direction of Waves,
74-07224 8B

, K. T.
plication of the Spline Function to Soil ience,
74-07344 2G

NS, G. N.
aporation from an Irrigated Rice Crop in a mi-Arid Region,
74-07096 2D

NS, J. S.
e Pulp and Paper Industry and the Environ-ent,
74-07411 5D

NS, R. J.
valanche Studies (1971-1972),
74-07319 2C

RETT, L. G.
hemical and Biological Problems in the Grand anyon,
74-07093 5B

FAAS, R. W.
Mass Physical and Engineering Properties of Some York River Sediments,
W74-07239 2L

FADRUS, H.
Photometric Determination of Manganese in Water by Using O-Tolidine,
W74-07315 2K

FAN, L. T.
Regional Water Quality Management by the Generalized Reduced Gradient Method,
W74-07311 5B

FARMER, D. M.
The Influence of Wind on the Surface Waters of Alberni Inlet,
W74-07497 2L

FARMER, W. J.
Volatility of DDT Residues in Soil as Affected by Flooding and Organic Matter Applications,
W74-07424 5B

FARODA, A. S.
Effect of Seeding Rates and Row Spacings on Fodder Production of Moth Bean (Phaseolus aconitifolius),
W74-07091 3F

FARRELL, D. F.
Water Resources of the Taunton River Basin Southeastern Massachusetts,
W74-07190 7C

FAUST, M. A.
Effect of Light Intensity and Glycerol on the Growth, Pigment Composition, and Ultrastructure of Chroomonas Sp.,
W74-07548 5C

FIELD, R.
Stormflow Pollution Control in the U.S.,
W74-07256 5D

FINDLEY, R.
The Bittersweet Waters of the Lower Colorado,
W74-07292 3F

FISH, D. C. E.
Inflatable Dams and Dam Units,
W74-07210 8A

FISHER, B. D.
How Polyacrylamides can Help Effluent Problems,
W74-07391 5D

FITCHETT, D. A.
A Model of Irrigated Agriculture and Regional Development in Southern Argentina: The Rio Negro Basin,
W74-07306 6A

FITZGERALD, A. D.
A Review of Colour Reduction Technology in Pulp and Paper Mill Effluents,
W74-07406 5D

FOGG, G. E.
Extracellular Products of Algae in Freshwater,
W74-07353 5C

FOLEY, C. F.
Strontium and Other Notable Chemical Constituents of Well-Water of Allen County, Indiana,
W74-07400 2K

FOLGER, D. W.
Texture and Organic Carbon Content of Bottom Sediments in some Estuaries of the United States,
W74-07243 2L

FOLWELL, R. J.
An Economic Analysis of Selected Agricultural Uses of Warm Water in the Pacific Northwest Resulting from Electric Power Generation,
W74-07125 3C

FONTANGES, R.
Study of the Adaptation of an Activated Sludge to the Purification of an Industrial Effluent (Etude de l'adaptation d'une boue activee a l'epuration d'un effluent industriel),
W74-07389 5D

FOOTE, B. A.
Habitat Distribution of the Shore Flies of Northeastern Ohio (Diptera: Ephydridae),
W74-07556 5C

FORDHAM, R.
The Micro-Meteorology of an Extended Area of Tea Before and After Rain,
W74-07354 3F

FOSTER, P.
Ultra-Violet Absorption Characteristics of Natural Waters,
W74-07419 2K

FRAHM, L. J.
Recovery of Arsenic by Dry Ashing from Animal Tissue Fortified with Organoarsenicals or Arsenic Trioxide,
W74-07573 5A

FRANCIS, C. M.
The Effect of Waterlogging on the Mineral Nutrient Content of Trifolium Subterraneum,
W74-07355 3F

FRANGULYAN, G. A.
Purification of Effluents and Improvement of the Technology in the Production of Chloretone, (In Russian),
W74-07285 5D

FRANK, R.
Residues of Atrazine, Cyanazine, and Their Phytotoxic Metabolites in a Clay Loam Soil,
W74-07585 5A

FRASER, J. P.
An Oil Recovery System Utilizing Polyurethane Foam--A Feasibility Study,
W74-07341 5G

FREEMAN, H. P.
Acid Ammonium Acetate Extraction and Electron Capture Gas Chromatographic Determination of Carbofuran in Soils,
W74-07574 5A

FREEZE, R. A.
Mathematical Simulation of Subsurface Flow Contributions to Snowmelt Runoff, Reynolds Creek Watershed, Idaho,
W74-07516 2F

FRENCH, K. A.
The Effluent-Free Bleached Kraft Pulp Mill. Part IV. The Salt Recovery Process,
W74-07379 5D

FROST, K. R.
Plant and Irrigation Water Requirements,
W74-07452 3F

FUCHS, M.
The Heat Flux Density in a Non-Homogeneous Bare Loessial Soil,
W74-07346 2G

FUKUHARA, H.
Vertical Migration of Spaniotoma akamusi Larvae (Diptera:Chironomidae) through the Bottom Deposits of Lake Suwa,
W74-07543 2H

FUKUNAGA, E. T.
Volcanic Air Pollution: Deleterious Effects on Tomatoes,
W74-07430 5C

GAL, M.
Mineralogical Composition of Clays in Soil Profiles of Israel: I. The Soils of the Mediterranean Zone,
W74-07099 2G

Mineralogical Composition of Clays in Soil Profiles of Israel: II. The Soils of the Desert Zone,
W74-07100 2G

GALENKO, A. G.
Utilization of White Water in Board Mills (Ispol'zovanie oborotnoi vody na kartonnykh fabrikakh),
W74-07397 5D

GANCZARCZYK, J.
Aerobic Digestion of Organic Sludges Containing Inorganic Phosphorus Precipitates: Phase I,
W74-07268 5D

GANDHI, A. P.
Quality of Well Waters of Jaipur District,
W74-07106 4B

GANGSTAD, E. O.
Herbivorous Fish for Aquatic Plant Control,
W74-07470 4A

GANIYEV, K. G.
Investigation of the Relation of Groundwater Evaporation to Lithological Structure of the Zone of Aeration (K izucheniyu zavisimosti ispareniya gruntovykh vod ot litologicheskogo stroyeniya zony aeratsii),
W74-07529 2D

GANTT, E.
Effect of Light Intensity and Glycerol on the Growth, Pigment Composition, and Ultrastructure of Chroomonas Sp.,
W74-07548 5C

GARCIA, J. A.
System and Method for Separating Heavier and Lighter Components of Liquid Mixtures,
W74-07203 5D

GARDINER, E. A.
Public Investment Criteria: Application to a Project in the Souris River Basin,
W74-07070 6B

GARDINER, J.
The Chemistry of Cadmium in Natural Water--II. The Adsorption of Cadmium on River Muds and Naturally Occurring Solids,
W74-07420 2K

GARG, B. S.
Kaempferol (3,5,7,4'-Tetrahydroxyflavone) as a Chromogenic Reagent for Tin(IV),
W74-07579 5A

GARTON, J. E.
Economic Size Selection for PVC Pipelines,
W74-07303 8A

GARY, H. L.
Snow Accumulation and Snowmelt as Influenced by a Small Clearing in a Lodgepole Pine Forest,
W74-07526 2C

GATZ, A. J. JR.
Effects of Temperature on Activity and Mortality of the Scyphozoan Medusa, Chrysaora quinquecirrha,
W74-07561 5C

GEHM, H. W.
An Overview of Water Reuse Potential in Pulp and Paper Manufacturing,
W74-07410 5D

GELASHVILI, F. N.
Effect of Irrigation with Thermal Water on Trace-Element Content in Some Soils of Georgia (Vliyaniye orosheniya termal'nymi vodami na soderzhaniye mikroelementov v nekotorykh pochvakh Gruzii),
W74-07508 3F

GELLMAN, I.
A Comparison of Effluent Characteristics from Conventional and Oxygen Bleaching Sequences: Results of a Laboratory Study,
W74-07375 5D

GEORGE, G. M.
Recovery of Arsenic by Dry Ashing from Animal Tissue Fortified with Organoarsenicals or Arsenic Trioxide,
W74-07573 5A

GERSON, R.
Karst Processes of the Eastern Upper Galilee, Northern Israel,
W74-07157 2F

GIBBS, R. J.
Amazon River Estuarine System,
W74-07229 2L

GIBLIN, F. J.
Pharmacodynamics of Methyl Mercury in the Rainbow Trout (Salmo Gairdneri): Tissue Uptake, Distribution and Excretion,
W74-07597 5C

GIFFORD, G. F.
Intensive Infiltrometer Studies on A Plowed Big Sagebrush Site,
W74-07166 2G

GIGER, R. D.
Some Estuarine Factors Influencing Ascent of Anadromous Cutthroat Trout in Oregon,
W74-07493 2L

GILBERTSON, R. L.
Annotated Checklist and Host Index for Arizona Wood-Rotting Fungi,
W74-07097 2I

GILES, M. S.
A Study of the Movement of Phosphorous in the Little River Estuary, N.S.W.,
W74-07483 5B

GILLIAM, J. W.
Phosphorus Supply Characteristics of Acid Organic Soils as Measured by Desorption and Mineralization,
W74-07345 2G

GINTER, J. J.
Possible Effects of Construction and Operatio of a Supertanker Terminal on the Marine En vironment in New York Bight,
W74-07488 5

GIRGOR'EVA, L. V.
Hygienic Evaluation of Means of Enrichmen with Salts and Decontamination of Demineralized Water, (In Russian),
W74-07365 5

GLORE, C. R.
Sandstone Aquifers in Eastern Sullivan County, Indiana,
W74-07401 4

GLOTFELTY, D. E.
Acid Ammonium Acetate Extraction and Electron Capture Gas Chromatographic Determination of Carbofuran in Soils,
W74-07574 5

GLOVER, G. E.
Application of Microstraining to Combined Sewer Overflow,
W74-07260 5

High-Rate Disinfection of Combined Sewer Overflow,
W74-07263 5

GLOYNA, E. F.
Instrumentation for Engineering Management of a Multi-Purpose River Basin System (Trinity River Basin, Texas) Real-Time Engineering Management of a Multi-Purpose River Basin System,
W74-07369 4

GOERLITZ, D. F.
Determination of Chlorinated Insecticides in Suspended Sediment and Bottom Material,
W74-07317 5

GOLLAN, A.
Determination of Oil Concentration and Size Distribution in Ship Ballast Waters. Method and Representative Results,
W74-07564 5

GOLLIN, S.
Water Purification Apparatus,
W74-07209 5

GOODELL, H. G.
Marine Geology and Estuarine History of Mobile Bay, Alabama: Part I. Contemporary Sediments,
W74-07248 2

GOVER, R. K.
Management of South Westland Terrace Podocarp Forest Under a Selection Logging System,
W74-07347 4

GOYAL, D.
Population, Land Use and Livestock Composition in India and Its Arid Zone,
W74-07105 3

GRAHAM, S.
Remanent Magnetization of Modern Tidal Flat Sediments from San Francisco Bay, California,
W74-07173 2

GRASS, L. B.
Manganese and Iron Solubility Changes as a Factor in Tile Drain Clogging: II. Observations During the Growth of Cotton,
W74-07152 2

RASS, L. R.
Manganese and Iron Solubility Changes as a Factor in Tile Drain Clogging: I. Observations During Flooding and Drying,
W74-07151 2G

RAVES, G. W.
Application of a Large Scale Nonlinear Programming Problem to Pollution Control,
W74-07461 5D

REAVES, H.
Biodegradation of Resin Acid Sodium Salts,
W74-07393 5D

REEN, K. M.
Taxonomic Position of Two Lumbrineris Spp.,
W74-07568 2L

REEN, N. M. D.
A Synthetic Model for Daily Streamflow,
W74-07179 2E

REENE, R. W.
Nutrient Cycling and Productivity of Dystrophic Lake-Bog Systems (Part B),
W74-07466 5C

REENFIELD, M. D.
Possible Effects of Construction and Operation of a Supertanker Terminal on the Marine Environment in New York Bight,
W74-07488 5C

REENING, E. O.
Microbial Indicators for the Biological Quality of Treated Wastewater Effluents,
W74-07372 5D

REENKORN, R. A.
An Experimental Study of Immiscible Displacement with an Unfavorable Mobility Ratio in Porous Media,
W74-07524 2F

RIESHABER, O. A.
Waste Water Process Tank Control Facility,
W74-07216 5D

ROPP, J.
On the Composition of Mixed Fodder Rations for Trout in Net Cages, (In German),
W74-07599 8I

ROPP, R. F.
Pollution Control by Recycling Effluent,
W74-07407 5D

ROSS, M. G.
Geologic Aspects of Waste Solids and Marine Waste Deposits, New York Metropolitan Region,
W74-07171 5B

UDDING, R.
Pollution Caused by Agriculture,
W74-07366 5B

UINEE, P. A. M.
Incidence of Resistance to Tetracycline, Chloramphenicol and Ampicillin Among Salmonella Species Isolated in the Netherlands in 1969, 1970 and 1971,
W74-07562 5C

GUPTA, I. C.
Effect of Gypsum in Reducing Boron Hazard of Saline Waters and Soils,
W74-07095 3C

GUPTA, M. K.
Screening/Dissolved-Air Flotation Treatment of Combined Sewer Overflows,
W74-07262 5D

GUPTA, S. P.
An Experimental Study of Immiscible Displacement with an Unfavorable Mobility Ratio in Porous Media,
W74-07524 2F

GUSEV, N. G.
Radiation Safety Problems in the Operation of Atomic Electric Power Stations, (In Russian),
W74-07363 5B

HAAN, C. T.
Calibrating a Water Yield Model for Small Ungaged Watersheds,
W74-07519 2A

HADAS, A.
The Heat Flux Density in a Non-Homogeneous Bare Loessial Soil,
W74-07346 2G

HALL, J. K.
Erosional Losses of S-Triazine Herbicides,
W74-07421 5B

HAMDAN, A. S.
Network Approach to Management of Conjunctively Operated Ground Water - Surface Water Systems,
W74-07335 4A

HAMILTON, L. S.
Water Uses and Water Development in Fall Creek--Possible Conflicts,
W74-07149 6B

HAMMOND, D. L.
Attenuation of Water Waves and Control and Utilization of Wave-Induced Water Movements,
W74-07204 8B

HAMMOND, L. C.
Effects of Subsurface Asphalt Layers on Corn and Tomato Root Systems,
W74-07447 3F

HAMODA, M. F. D.
Aerobic Digestion of Organic Sludges Containing Inorganic Phosphorus Precipitates: Phase I,
W74-07268 5D

HANSEN, E. A.
A Groundwater Profile Sampler,
W74-07523 2F

HANSEN, L. G.
Biochemistry of Selective Toxicity and Biodegradability: Comparative O-Dealkylation by Aquatic Organisms,
W74-07126 5C

HARP, J. F.
An Innovative Automatic Stream Gaging Method,
W74-07181 7B

HARRIS, A. R.
A Groundwater Profile Sampler,
W74-07523 2F

HARRISS, R. C.
Influence of Mineral-Water Reactions in Estuaries on Boron Budget in the Oceans,
W74-07227 2L

HARVEY, B. I.
A Computer System for Storage and Retrieval of Hydrogeological Data from Well Records,
W74-07328 7C

HARVEY, P.
High-Rate Multi-Media Filtration,
W74-07261 5D

HASIT, Y.
Capital Cost Minimization of Drainage Networks,
W74-07309 4A

HATHAWAY, J. C.
Regional Clay Mineral Facies in Estuaries and Continental Margin of the United States East Coast,
W74-07237 2L

HAVEN, D. S.
Biodeposition as a Factor in Sedimentation of Fine Suspended Solids in Estuaries,
W74-07231 2L

HEANEY, J. P.
The EPA Stormwater Management Model: A Current Overview,
W74-07265 5D

HEARON, W. M.
Residuals in Manufacture of Paper,
W74-07399 5B

HELLWIG, D. H. R.
Evaporation of Water from Sand: 5. The Effect of Evaporation on the Concentration of Salts Dissolved in Water Stored in Sand,
W74-07169 2D

HEMINGWAY, R. W.
Biodegradation of Resin Acid Sodium Salts,
W74-07393 5D

HEMPHILL, D. P.
An Oil Recovery System Utilizing Polyurethane Foam--A Feasibility Study,
W74-07341 5G

HERMSMEIER, L. F.
Shallow Drain Performance in a Heavy Soil,
W74-07442 4A

HERRING, W. C.
Strontium and Other Notable Chemical Constituents of Well-Water of Allen County, Indiana,
W74-07400 2K

HERRMANN, F. A. JR.
Effects of Man-Made Works on the Hydraulic, Salinity, and Shoaling Regimens of Estuaries,
W74-07249 5C

HEUKELEKIAN, H.
Rotating Biological Disk Wastewater Treatment Process - Pilot Plant Evaluation,
W74-07373 5D

HICKS, H. C.
Regeneration of Chromated Aluminum Deoxidizers, Phase I Report,
W74-07254 5D

HICKS, M. G.
Fluorocarbon and Oxygen-Providing Compound Treatment of Waste Waters,
W74-07200 5D

HIRO, M.
Distribution and Standing Crops of Chironomid-Larvae in Shiozu Bay of Lake Biwa (In Japanese),
W74-07101 5C

HISTED, J. A.
Water Reuse and Recycle in Kraft Bleacheries,
W74-07394 5D

Water Reuse and Recycle in the D(C)EDED Bleach Sequence,
W74-07377 5D

HITCHCOCK, P. H.
Mass and Charge Transfer Kinetics and Coulometric Current Efficiencies. Part VII. Conditional Potentials, and Single-Scan Voltammetry of Pure Vanadium(V) - Vanadium(IV) Systems in Various Media at Platinum Elec trodes Pre-Treated By Five Methods,
W74-07557 2K

Mass and Charge Transfer Kinetics and Coulometric Current Efficiencies. Part VIII. Single-Scan Voltammetry of Vanadium(V) - Vanadium(IV) in the Presence of Chromium, Manganese and Iron, and the Kinetic Parameters of the Vanadium System, at Platinum Electrodes Pre-Treated by Five Methods,
W74-07558 5A

HITCHON, B.
Application of Geochemistry to the Search for Crude Oil and Natural Gas,
W74-07161 4B

Source and Budget of Sulfate in Precipitation from Central Alberta, Canada,
W74-07164 5B

HITE, J. C.
Environmental Planning: An Economic Analysis. Applications for the Coastal Zone,
W74-07534 6B

HO, J. C.
Planar and Axisymmetric Bottom Withdrawal from a Density-Stratified Reservoir,
W74-07340 4A

HO, P. Y.
Evaporation from an Irrigated Rice Crop in a Semi-Arid Region,
W74-07096 2D

HOCKING, D.
Extruded Peat Cylinders: Their Physical Characteristics as Affecting Tree Seedling Growth and Greenhouse Drought Tolerance,
W74-07180 2I

HOEHN, R. C.
Effects of Thickness on Bacterial Film,
W74-07545 5C

HOLMAN, M. A.
Determinants of Use of Water-Based Recreational Facilities,
W74-07058 6B

HOMNICK, D.
In-Plant, Continuous Hot-Gas Blanching of Spinach,
W74-07368 3E

HORNER, R. A.
Studies on Organisms Found in Arctic Sea Ice,
W74-07487 5C

HORSLEY, R. W.
The Bacterial Flora of the Atlantic Salmon (Salmo salar L.) in Relation to its Environment,
W74-07567 5A

HORTON, H. F.
Multi-Disciplinary Study of Water Quality Relationships: A Case Study of Yaquina Bay, Oregon,
W74-07142 6B

The Predicted Influence of Kraft Mill Effluent on the Fishery Resources,
W74-07145 5C

HOWE, R. S.
Laundry Detergents and Environmental Quality,
W74-07122 5C

HOYT, J. H.
Erosional and Depositional Estuarine 'Terraces,' Southeastern United States,
W74-07246 2L

HUBER, W. C.
The EPA Stormwater Management Model: A Current Overview,
W74-07265 5D

HUFFMAN, L. E.
Water Purification System,
W74-07213 5D

HUGGINS, L. F.
Experimental Evaluation of a Method for Determining Unsaturated Hydraulic Conductivity,
W74-07088 2G

HWANG, C. L.
Regional Water Quality Management by the Generalized Reduced Gradient Method,
W74-07311 5B

HYLIN, J. W.
Volcanic Air Pollution: Deleterious Effects on Tomatoes,
W74-07430 5C

HYNES, M. J.
The Effect of Lack of a Carbon Source on Nitrate-Reductase Activity in Aspergillus nidulans,
W74-07581 5C

IEREMIA, JORA
A New Type of Incubator Used in the Induced Spawning of Phytophagous Fishes, (In Rumanian),
W74-07434 8I

ILICHKINA, A. G.
Hygienic Features of Silicate Anticorrosion Coatings for Water Reservoirs, (In Russian),
W74-07364 5F

IVES, N. F.
Observations on the Gas Chromatography of Kelthane (Dicofol),
W74-07575 5A

IVIE, G. W.
Nature and Toxicity of Two Oxychlordane Photoisomers,
W74-07584 5C

JACOBS, L. W.
Methylmercury Formation in Mercury-Treated River Sediments During in Situ Equilibration,
W74-07425 5B

JANSEN, K. P.
Preliminary Diagnosis of a New Species of Marine Isopod From Stewart Island,
W74-07570 2I

JARBOE, J. E.
Calibrating a Water Yield Model for Small Ungaged Watersheds,
W74-07519 2A

JARMUTH, R. A.
Regeneration of Chromated Aluminum Deoxidizers, Phase I Report,
W74-07254 5D

JASSBY, A.
The Estimation of Vertical Eddy Diffusivities Below the Thermocline in Lakes,
W74-07416 2H

JENSEN, C. E.
Water Retention of Granitic Soils in the Idaho Batholith,
W74-07170 2G

JOHNS, R. W.
An Economic Analysis of Selected Agricultural Uses of Warm Water in the Pacific Northwest Resulting from Electric Power Generation,
W74-07125 3C

JOHNSON, E. S.
Some Generalized Beta Distributions of the Second Kind Having Desirable Application Features in Hydrology and Meteorology,
W74-07412 2A

JOHNSON, J. T.
Variables Affecting Well Success in a Kentucky Limestone Aquifer,
W74-07176 4B

JOHNSON, R. L.
Losses of Inorganic Nitrogen From Aquatic Systems,
W74-07426 5B

JOHNSTON, W. R.
Development of an Agricultural Drainage Guide,
W74-07438 4A

JOLISSAINT, C. H.
A Computer Simulation Model for Flood Plain Development. Part II: Model Description and Applications,
W74-07296 6A

JONES, T. F.
User Charges and Industrial Cost Recovery, Denver SMSA,
W74-07370 5D

JORDAN, R. R.
Suspended Sediment Transport in Delaware Bay,
W74-07233 2L

JOSLIN, J. R.
Water and Effluent Treatment Plants - Cost Considerations and Client, Contractor, Consultant Relationships, The Consultant's View,
W74-07312 5D

JUDY, H.
Seasonal Abundance and Distribution of Juvenile Blue Crabs in Core Sound, N.C. 1965-1966,
W74-07350 2L

ABALIN, YE. G.
Soil Moisture Dynamics and Its Variations in Soils Under Field Crops (Dinamika vlazhnosti i stepen' yeye var'irovaniya v pochvakh pod polevymi kul'turami),
W74-07509 2G

ALABUGIN, L. A.
Bromine in Groundwater of Uzbekistan (Brom v podzemnykh vodakh Uzbekistana),
W74-07505 2K

AMPRATH, E. J.
Leaching Losses of Sulfur During Winter Months When Applied as Gypsum, Elemental S or Prilled S,
W74-07449 5B

Phosphorus Supply Characteristics of Acid Organic Soils as Measured by Desorption and Mineralization,
W74-07345 2G

AO, C. W.
Distribution and Chemistry of Phosphorus in an Albaqualf Soil After 82 Years of Phosphate Fertilization,
W74-07532 5B

Losses of Inorganic Nitrogen From Aquatic Systems,
W74-07426 5B

APLOVSKY, A. J.
Rotating Biological Disk Wastewater Treatment Process - Pilot Plant Evaluation,
W74-07373 5D

APOOR, I. P.
Biochemistry of Selective Toxicity and Biodegradability: Comparative O-Dealkylation by Aquatic Organisms,
W74-07126 5C

ATZER, J. R.
Catalytic Oxidation of Phenol in Dilute Concentration in Air,
W74-07086 5D

AUL, R. N.
Sand Dune Reclamation in Iraq -- Present Status and Future Prospects,
W74-07104 2J

AY, W. C.
Extruded Peat Cylinders: Their Physical Characteristics as Affecting Tree Seedling Growth and Greenhouse Drought Tolerance,
W74-07180 2I

EENEY, D. R.
Methylmercury Formation in Mercury-Treated River Sediments During in Situ Equilibration,
W74-07425 5B

ENNEDY, J. F.
Winter-Regime Thermal Response of Heated Streams,
W74-07511 5B

ENNEDY, V. S.
Effects of Temperature on Activity and Mortality of the Scyphozoan Medusa, Chrysaora quinquecirrha,
W74-07561 5C

ETCHUM, P. A.
In Vitro Formation of Nitrate Reductase Using Extracts of the Nitrate Reductase Mutant of Neurospora crassa, Nit-1, and Rhodospirillum rubrum,
W74-07577 5B

KHARAKA, Y. K.
The Influence of Geological Membranes on the Geochemistry of Subsurface Waters from Miocene Sediments at Kettleman North Dome in California,
W74-07513 2K

KIMMEL, B. L.
Factors Affecting Phytoplankton Production in a Eutrophic Reservoir,
W74-07121 5C

KING, P. H.
Systems simulation of the effect of tertiary treatment for carbon, nitrogen, and phosphorus removal upon primary productivity, standing crop, and community structure of autotrophic and hetertrophic communities in receiving model streams.
W74-07337 5C

KINGSBURY, A. P.
Relationship Between Logging Activities and Salmon Production,
W74-07468 4C

KINSEY, W. B.
Data for Municipal Wells in the City of Modesto, California,
W74-07320 4B

KIRBY, W.
Algebraic Boundedness of Sample Statistics,
W74-07413 2A

KIRK, W. P.
Method and Apparatus for Collecting a Floating Liquid,
W74-07215 5G

KIRKHAM, D.
Ground-Water Flow Patterns in Confined Aquifers and Pollution,
W74-07510 5B

KISISEL, I. T.
Generation Models for Synthetic Annual and Monthly Flows for Some Indiana Watersheds,
W74-07431 2A

KLAUSING, R. L.
Ground-Water Resources of McLean County, North Dakota,
W74-07313 2F

KLUSSMANN, W. G.
Effect of Anhydrous Ammonia on a Central Texas Pond, and a Review of Previous Research with Ammonia in Fisheries Management,
W74-07595 5C

KNAPP, W. E.
Possible Effects of Construction and Operation of a Supertanker Terminal on the Marine Environment in New York Bight,
W74-07488 5C

KNOX, G. A.
Taxonomic Position of Two Lumbrineris Spp.,
W74-07568 2L

KONDO, KAORU
An Epidemiological Study on Clonorchis sinensis at the Northern part of Wakayama Prefecture, Middle Japan, (In Japan),
W74-07540 5C

KOOPS, H.
On the Composition of Mixed Fodder Rations for Trout in Net Cages, (In German),
W74-07599 8I

KOVALEVSKIY, V. S.
Long-Term Trends in Groundwater Level Fluctuations (Mnogoletniye tendentsii v kolebaniyakh urovney poszemnykh vod),
W74-07191 2F

KOWALENKO, C. G.
Determination of Nitrates in Soil Extracts,
W74-07443 2G

KRATKY, B. A.
Volcanic Air Pollution: Deleterious Effects on Tomatoes,
W74-07430 5C

KRATZ, A.
Method of and Apparatus for the Purification of Water Containing Organic Contaminants,
W74-07199 5D

KRIKORIAN, A. D.
Stomatal Mechanics,
W74-07593 2I

KRINSLEY, D. H.
A Scanning Electron Microscope Study of Surface Textures of Quartz Grains from Glacial Environments,
W74-07331 2J

KRISHNASWAMI, S.
Th-234/U-238 Activity Ratios in Pacific Ocean Bottom Waters,
W74-07322 2K

KROLL, C. G.
Sediment Discharge in the Lake Tahoe Basin, California, 1972 Water Year,
W74-07326 2J

KRUPNIK, M. YA.
Predicting the Quality of Stream Water Under Conditions of Oxygen Deficiency (O prognoze kachetva vody vodotokov pri bol'shikh defitsitakh kisloroda),
W74-07388 5B

KVALVAG, J.
A New Colorimetric Procedure for the Determination of Benomyl,
W74-07559 5A

KYSELOWA, K.
The Plankton of Ponds Enriched with Wastes from Beet Sugar Factories,
W74-07478 5C

LA VALLE, P. D.
The Effects of Household Sanitary Systems on Effluent Phosphate Levels,
W74-07267 5D

LACAZEDIEU, G.
Vertical Movements in the Nonsaturated Zone and the Specific Yield of a Water-Table Aquifer (Etude des transferts verticaux dans la zone non saturee et de l'emmagasinement d'une nappe libre, dans le cas d'un pompage, dans les conditions na turelles),
W74-07182 2F

LACHAPELLE, E. R.
Avalanche Studies (1971-1972),
W74-07319 2C

LANDE, A.
Byglandsfjorden. Primary Production and Other Limnological Features in an Oligotrophic Norwegian Lake,
W74-07554 5C

LANG, A. R. G.
Evaporation from an Irrigated Rice Crop in a Semi-Arid Region,
W74-07096 2D

LANGE, W.
Bacteria-Assimilable Organic Compounds, Phosphate, and Enhanced Growth of Bacteria-Associated Blue-Green Algae,
W74-07587 5C

LAO, C.
Development of Dike Stored Water By Drilling, Waihee, Oahu,
W74-07137 2F

LAURENT, E. A.
Environmental Planning: An Economic Analysis. Applications for the Coastal Zone,
W74-07534 6B

LAVRUKHINA, A. A.
Purification of Effluents and Improvement of the Technology in the Production of Chloretone, (In Russian),
W74-07285 5D

LAW, L. M.
Determination of Chlorinated Insecticides in Suspended Sediment and Bottom Material,
W74-07317 5A

LE RAL, P.
Study of the Adaptation of an Activated Sludge to the Purification of an Industrial Effluent (Etude de l'adaptation d'une boue activee a l'epuration d'un effluent industriel),
W74-07389 5D

LEATHERWOOD, J. M.
Utilization of Fibrous Wastes as Sources of Nutrients,
W74-07472 5D

LEE, M. T.
A Computer Atlas of Hydrologic and Geomorphologic Data for Small Watersheds in Indiana,
W74-07432 2A

A Rainfall-Runoff Model Based on the Watershed Stream Network,
W74-07464 2A

LEIFESTE, D. K.
Dissolved-Solids Discharge to the Oceans from the Conterminous United States,
W74-07162 5B

LEININGER, R. K.
Strontium and Other Notable Chemical Constituents of Well-Water of Allen County, Indiana,
W74-07400 2K

LENNOX, W. C.
The Forecasting of Streamflow Using the Method of Characteristic Modes,
W74-07178 4A

LERIBAUX, H. R.
On The Determination of Turbulent Diffusivity in Shallow Waters by Aerial Photography of Floating Markers,
W74-07316 2H

LESCOT, J. C.
Oxygen Bleaching -- A Flexible Process for Pollution Abatement,
W74-07376 5D

LESNIAK, D. G.
Quantitative Chemical Analysis of Specific Components of the Waters of Lost Creek and the Wabash River, Vigo County, Indiana,
W74-07405 5A

LESSO, W. G.
Instrumentation for Engineering Management of a Multi-Purpose River Basin System (Trinity River Basin, Texas) Real-Time Engineering Management of a Multi-Purpose River Basin System,
W74-07369 4A

LEVIN, G. V.
Plastic Moving-Surface Treatment of Sewage,
W74-07198 5D

LINDEN, D. R.
Infiltration and Water Table Effects of Soil Air Pressure Under Border Irrigation,
W74-07301 3F

LINDSEY, J. P.
Annotated Checklist and Host Index for Arizona Wood-Rotting Fungi,
W74-07097 2I

LISITSYNA, N. A.
Mechanism of Element Distribution in the Pacific Ocean (Japanese Profile) (K poznaniyu mekhanizma raspredeleniya elementov v Tikhom okeane (Yaponskiy profil')),
W74-07503 2J

LOCK, J. T.
Effect of Anhydrous Ammonia on a Central Texas Pond, and a Review of Previous Research with Ammonia in Fisheries Management,
W74-07595 5C

LOF, G. O. G.
Residuals in Manufacture of Paper,
W74-07399 5B

LOMEN, D. O.
Seepage Through a Hillside: The Steady Water Table,
W74-07517 2G

LOTZ, W.
Method of and Apparatus for the Purification of Water Containing Organic Contaminants,
W74-07199 5D

LOVE, L. S.
Treatment Apparatus,
W74-07218 5D

LOWE, L. E.
Determination of Nitrates in Soil Extracts,
W74-07443 2G

LU, C-M.
Urban Impacts of Rural Resource Development Expenditures in the Interlake Area of Manitoba,
W74-07068 6B

LUCAS, J. M.
Method of Removing Oil Spills,
W74-07222 5G

LUKES, J. A.
The Effluent-Free Bleached Kraft Pulp Mill. Part IV. The Salt Recovery Process,
W74-07379 5D

LUQUE, J. A.
First Characterization of the Runoff From the Watershed of the Manso Superior River and its Basins (Argentina), (In Spanish),
W74-07536 2E

LUTZ, W.
Mechanical Waste Water Clarification and Biological-Chemical Waste Water Purification Using the Attisholz and Ruthner System (Mechanische Abwasserklaerung und biologisch-chemische Abwasserreinigung nach System Attisholz und Ruthner),
W74-07381 5D

LUZINA, L. I.
Reduction of the Volume of Pollutants Discharged and of Fresh Water Consumption (Sokrashchenie sbrosa zagryaznenii i umen'shenie raskhoda svezhei vody),
W74-07384 5D

LYASKOVSKIY, B. YU.
Underflow in River Valleys of the Carpatho-Ukraine (Podruslovyy stok v rechnykh dolinakh Zakarpat'ya),
W74-07504 2F

MAAGDENBERG, H. J.
In-Plant, Continuous Hot-Gas Blanching of Spinach,
W74-07368 3E

MACAGNO, E. O.
Winter-Regime Thermal Response of Heated Streams,
W74-07511 5B

MACKENZIE, A. J.
Manganese and Iron Solubility Changes as a Factor in Tile Drain Clogging: I. Observations During Flooding and Drying,
W74-07151 2G

Manganese and Iron Solubility Changes as a Factor in Tile Drain Clogging: II. Observations During the Growth of Cotton,
W74-07152 2G

MACMILLAN, J. A.
A Framework for Economic Planning of Watershed Drainage,
W74-07069 4A

Urban Impacts of Rural Resource Development Expenditures in the Interlake Area of Manitoba,
W74-07068 6E

MADDUMA BANDARA, C. M.
Drainage Density and Effective Precipitation,
W74-07155 2A

MAKSIMOVA, N. G.
Long-Term Trends in Groundwater Level Fluctuations (Mnogoletniye tendentsii kolebaniyakh urovney poszemnykh vod),
W74-07191 2I

MALCOLM, R. L.
Comparison of Conditional Stability Constant of North Carolina Humic and Fulvic Acids with Co(II) and Fe(III),
W74-07228 5I

MALHOTRA, S. P.
Population, Land Use and Livestock Composition in India and Its Arid Zone,
W74-07105 3

LINA, J. F. JR.
The Relationship of Land Use to Water Use in San Antonio, Texas,
W74-07067 4A

LM, R. F.
Laws and Regulations of Pollution and Navigation in Pacific Northwest Estuaries,
W74-07499 5G

LONEY, F. E.
More Heat Than Light: Thermal Pollution Versus Heat Energy Utilization,
W74-07465 5B

LY, J.
Photometric Determination of Manganese in Water by Using O-Tolidine,
W74-07315 2K

NTEN, A.
Incidence of Resistance to Tetracycline, Chloramphenicol and Ampicillin Among Salmonella Species Isolated in the Netherlands in 1969, 1970 and 1971,
W74-07562 5C

REAN, D. F.
Solar Evaporation Controlled Irrigation System,
W74-07211 2D

RK, D. M.
Line Intersection Method for Estimating Drainage Density,
W74-07174 2J

RMELSTEIN, A. D.
Aerial Spill Prevention Surveillance During Sub-Optimim Weather,
W74-07342 5A

RSDEN, J. R.
Application of Nonlinear Programming to Water Quality Control,
W74-07462 5D

Production Function Theory for Use in Optimal Planning Decisions,
W74-07460 5D

RTIN, K. J.
Annotated Checklist and Host Index for Arizona Wood-Rotting Fungi,
W74-07097 2I

RTIN, Q. W.
Instrumentation for Engineering Management of a Multi-Purpose River Basin System (Trinity River Basin, Texas) Real-Time Engineering Management of a Multi-Purpose River Basin System,
W74-07369 4A

SSARO, E. J.
Pharmacodynamics of Methyl Mercury in the Rainbow Trout (Salmo Gairdneri): Tissue Uptake, Distribution and Excretion,
W74-07597 5C

TALAS, N. C.
Just a Moment,
W74-07414 2A

THUR, C. P.
Effect of Contour Furrows and Contour Bunds on Water Conservation in Grasslands of Western Rajasthan,
W74-07090 3F

MATSUO, KIKUO
An Epidemiological Study on Clonorchis sinensis at the Northern part of Wakayama Prefecture, Middle Japan, (In Japan),
W74-07540 5C

MAUGHAN, P. M.
Aerial Spill Prevention Surveillance During Sub-Optimim Weather,
W74-07342 5A

MAWER, P. A.
Planning and Operational Studies in the Integrated Use of Desalination. Case Studies for Cyprus and Jersey,
W74-07308 3A

MAZOR, E.
Mineral Springs in the Suez Rift Valley--Comparison with Waters in the Jordan Rift Valley and Postulation of a Marine Origin,
W74-07167 2K

Mineral Springs in the Suez Rift Valley - Comparison With Waters in the Jordan Rift Valley and Postulation of a Marine Origin,
W74-07444 2K

MCCALLA, T. M.
Quality of Water Discharged from Two Agricultural Watersheds in Southwestern Iowa,
W74-07528 5B

MCCLAREN, M.
Marine Fungi Isolated from a Kraft Pulp Mill Outfall Area,
W74-07396 5B

MCCULLOUGH, J. D. JR.
Effect of Anhydrous Ammonia on a Central Texas Pond, and a Review of Previous Research with Ammonia in Fisheries Management,
W74-07595 5C

MCDONNELL, J. P.
Recovery of Arsenic by Dry Ashing from Animal Tissue Fortified with Organoarsenicals or Arsenic Trioxide,
W74-07573 5A

MCGUINNESS, W. V. JR.
Technology Transfer in the Marine Environment of Long Island,
W74-07059 6B

MCHUGH, J. L.
Possible Effects of Construction and Operation of a Supertanker Terminal on the Marine Environment in New York Bight,
W74-07488 5C

MCKEAN, W. T.
A Comparison of Effluent Characteristics from Conventional and Oxygen Bleaching Sequences: Results of a Laboratory Study,
W74-07375 5D

MCKEEVER, J. R.
Utilities and Facilities for New Residential Development: A Survey of Municipal Policy,
W74-07071 5D

MCMAHON, J. W.
Seasonal Abundance and Vertical Distribution of Crustacean Zooplankton in a Coloured Dystrophic Lake in Northeastern Ontario,
W74-07467 5C

MEDVEDEV, I. N.
Hygienic Evaluation of Means of Enrichment with Salts and Decontamination of Demineralized Water, (In Russian),
W74-07365 5F

MEDWAY, L.
Phenology of a Tropical Rain Forest in Malaya,
W74-07482 2I

MEEK, B. D.
Manganese and Iron Solubility Changes as a Factor in Tile Drain Clogging: I. Observations During Flooding and Drying,
W74-07151 2G

Manganese and Iron Solubility Changes as a Factor in Tile Drain Clogging: II. Observations During the Growth of Cotton,
W74-07152 2G

MEJIA, J. M.
Streamflow Simulation: 3. The Broken Line Process and Operational Hydrology,
W74-07520 2A

METAL'NIKOV, S. V.
Organization of the Collection and Decontamination of Industrial and Domestic Radioactive Sewage, (In Russian),
W74-07362 5D

METCALF, R. L.
Biochemistry of Selective Toxicity and Biodegradability: Comparative O-Dealkylation by Aquatic Organisms,
W74-07126 5C

MIELKE, P. W. JR.
Some Generalized Beta Distributions of the Second Kind Having Desirable Application Features in Hydrology and Meteorology,
W74-07412 2A

MIHURSKY, J. A.
Effects of Temperature on Activity and Mortality of the Scyphozoan Medusa, Chrysaora quinquecirrha,
W74-07561 5C

MILLER, W. L.
Cost Sharing for Recreation: Efficiency and Equity,
W74-07307 6B

MILNE, J.
Trickle Irrigation in Australia,
W74-07450 3F

MIRONETS, N. V.
Hygienic Evaluation of Means of Enrichment with Salts and Decontamination of Demineralized Water, (In Russian),
W74-07365 5F

MIRONOVA, L. A.
Effect of Effluents from Hydrolysis Plant on the Survival of Typhoid Fever and Dysentery Bacteria, (In Russian),
W74-07367 5C

MIRSKY, A.
The Geology of Water: The Limiting Factor in Urban Development,
W74-07402 3D

MITCHELL, D. L.
Extruded Peat Cylinders: Their Physical Characteristics as Affecting Tree Seedling Growth and Greenhouse Drought Tolerance,
W74-07180 2I

MIYAMA, T.
The Chemical Form and Bodily Distribution of Mercury in Marine Fish,
W74-07551 5A

MIYAMOTO, S.
Land Disposal of Waste Gases: III. Sorption Patterns From Buried Gas Injection Pipes,
W74-07422 5B

Salt Displacement into Drain Tiles under Ponded Leaching,
W74-07518 2G

MOLCHO, M.
Mineral Springs in the Suez Rift Valley--Comparison with Waters in the Jordan Rift Valley and Postulation of a Marine Origin,
W74-07167 2K

Mineral Springs in the Suez Rift Valley - Comparison With Waters in the Jordan Rift Valley and Postulation of a Marine Origin,
W74-07444 2K

MOLNAU, M.
Evapotranspiration on a Palouse Watershed,
W74-07087 2D

MONKE, E. J.
Experimental Evaluation of a Method for Determining Unsaturated Hydraulic Conductivity,
W74-07088 2G

MOORE, J. G.
Development of a Decision Room for Environntal Studies, (Feasibility Study),
W74-07371 6G

MOORE, K. A.
Function of Marshes in Reducing Eutrophication of Estuaries of the Middle Atlantic Region,
W74-07336 5C

MORALES-ALAMO, R.
Biodeposition as a Factor in Sedimentation of Fine Suspended Solids in Estuaries,
W74-07231 2L

MORRIS, A. W.
Ultra-Violet Absorption Characteristics of Natural Waters,
W74-07419 2K

MORRIS, E. O.
Psychrophilic Yeasts Isolated From Marine Fish,
W74-07563 5A

MORRIS, J. G.
Laundry Detergents and Environmental Quality,
W74-07122 5C

MORRISON, G. A.
Determination of Mean Cell Size of Tetrahymena in Growing Cultures,
W74-07586 5A

MORTON, R. W.
Spatial and Temporal Distribution of Suspended Sediment in Narragansett Bay and Rhode Island Sound,
W74-07232 2L

MOSS, M. L.
Procedures and Programs to Assist in the Environmental Impact Statement Process,
W74-07061 6B

MOUSSAVI, M.
Solvent Extraction of Sulfur From Marine Sediment and Its Determination by Gas Chromatography.
W74-07565 5A

MULER, A. B.
Interdisciplinary Modeling in the Analysis of the Salinity Problems of the Safford Valley,
W74-07297 5B

MULLALY, J. D.
Performance of Lucerne (Medicago sativa) Lines in Pure Stands Under Irrigated and Rain Grown Conditions in Sub-Coastal Central Queensland,
W74-07359 3F

MURPHY, C. B. JR.
Effect of Restricted Use of Phosphate-Based Detergents on Onondaga Lake,
W74-07566 5C

MURRELL, K. R.
Apn aratus for Separating Oil and SolidsfFrm m Water,
W74-07202 5D

MUSSELIUS, V. A.
Diseases of Pond Fishes,
W74-07481 8I

MUSTY, P. R.
Use of Amberlite XAD-4 for Extraction and Recovery of Chlorinated Insecticides and Polychlorinated Biphenyls from Water,
W74-07383 5D

NABEREZHNYI, A. I.
Food Supply and Character of its Utilization by Dniester Vimba Fry in Ponds, (In Russian),
W74-07592 8I

NADLER, A.
Mineral Springs in the Suez Rift Valley--Comparison with Waters in the Jordan Rift Valley and Postulation of a Marine Origin,
W74-07167 2K

Mineral Springs in the Suez Rift Valley - Comparison With Waters in the Jordan Rift Valley and Postulation of a Marine Origin,
W74-07444 2K

NAGAHANA, MISAO,
An Epidemiological Study on Clonorchis sinensis at the Northern part of Wakayama Prefecture, Middle Japan, (In Japan),
W74-07540 5C

NAKAHARA, R. H.
An Investigation of Floods in Hawaii Through September 30, 1973,
W74-07185 2E

NAKANO, R. T.
Volcanic Air Pollution: Deleterious Effects on Tomatoes,
W74-07430 5C

NECE, R. E.
State of the Art of Floating Breakwaters,
W74-07498 8A

NEEDHAM, T.
Pilot Application of the Rotating Biological Surface Concept for Secondary Treatment of Insulating Board Mill Effluents,
W74-07398 5D

NEGHABAT, F.
Optimum Design Height of Cofferdams,
W74-07304 8A

NEIHEISEL, J.
Techniques for use of Organic and Amorphous Materials in Source Investigations of Estuary Sediments,
W74-07241 2L

NELSON, B. W.
Biogeochemical Variables in Bottom Sediments of the Rapphannock River Estuary,
W74-07244 2L

NEUMAN, S. P.
Effect of Partial Penetration on Flow in Unconfined Aquifers Considering Delayed Gravity Response,
W74-07514 2F

NICHOLS, M. M.
Effect of Increasing Depth on Salinity in the James River Estuary,
W74-07250 2L

NICHOLSON, H. P.
Predictng Pesticide Runoff From Agricultural Land: A Conceptual Model,
W74-07427 5B

NICKLESS, G.
Use of Amberlite XAD-4 for Extraction and Recovery of Chlorinated Insecticides and Polychlorinated Biphenyls from Water,
W74-07383 5D

NICOLLE, F. M. A.
Water Reuse and Recycle in Kraft Bleacheries,
W74-07394 5D

Water Reuse and Recycle in the D(C)EDED Bleach Sequence,
W74-07377 5D

NISBET, R. A.
Productivity and Water Stress in Cacti,
W74-07109 2I

NOBLE, R. L.
Depositional Features of Braided-Meandering Stream,
W74-07163 2J

NOFZIGER, D. L.
Flux-Gradient Relationships and Soil-Water Diffusivity from Curves of Water Content Versus Time,
W74-07512 2G

NORDIN, C. F.
Streamflow Simulation: 3. The Broken Line Process and Operational Hydrology,
W74-07520 2A

NORTHROP, G. M.
Technology Transfer in the Marine Environment of Long Island,
W74-07059 6B

NORTON, G. A.
A Framework for Economic Planning of Watershed Drainage,
W74-07069 4A

O'BRIEN, R. M.
Water and Wastewater Systems Inventory - Region H, North Carolina,
W74-07063 5D

O'CONNOR, M. P.
Recent Estuarine Sediment History of the Roanoke Island Area, North Carolina,
W74-07245 2L

)U, C. T. I.
Acetylene Reduction by Beijerinckia Under Various Partial Pressures of Oxygen and Acetylene,
W74-07572 5C

GILBEE, W.
Aquifers in the Sokoto Basin, Northwestern Nigeria, with a Description of the General Hydrogeology of the Region,
W74-07184 2F

GUNTUASE, A. M.
Cross-Spectral Analysis of Rainfall and Runoff for Raritan and Mullica River Basins in New Jersey,
W74-07183 2A

KO, U. M.
Acid Neutralization Doesn't Cost Much,
W74-07124 5D

MEL'YANETS, N. I.
Hygienic Evaluation of Means of Enrichment with Salts and Decontamination of Demineralized Water, (In Russian),
W74-07365 5F

NSTOTT, E. I.
Removal of Phosphates from Wastewaters with Electro-Chemically Generated Gadolinium Ions,
W74-07271 5D

OSTDAM, B. L.
Suspended Sediment Transport in Delaware Bay,
W74-07233 2L

THMER, D. F.
Sewage Treatment System,
W74-07217 5D

XENHAM, J. P.
An Oil Recovery System Utilizing Polyurethane Foam--A Feasibility Study,
W74-07341 5G

AGE, R. W.
Data for Municipal Wells in the City of Modesto, California,
W74-07320 4B

AILY, P. P.
Winter-Regime Thermal Response of Heated Streams,
W74-07511 5B

ALIWAL, K. V.
Quality of Well Waters of Jaipur District,
W74-07106 4B

ALMER, W. G.
Foam Flotation Concentration of Sewage,
W74-07214 5D

APENDICK, R. I.
Effectiveness of Two Nitrification Inhibitors for Anhydrous Ammonia Under Irrigated and Dryland Conditions,
W74-07436 5G

ARLANGE, J.-Y.
Stomatal Mechanics,
W74-07593 2I

ARRISH, L. P.
Multi-Disciplinary Study of Water Quality Relationships: A Case Study of Yaquina Bay, Oregon,
W74-07142 6B

The Predicted Influence of Kraft Mill Effluent on the Fishery Resources,
W74-07145 5C

PARTHENIADES, E.
Recent Investigations in Stratified Flows Related to Estuarial Hydraulics,
W74-07226 2L

PATRICK, C. H.
Pollution, Production, and Compensation,
W74-07064 5G

PATTEN, D. T.
Productivity and Water Stress in Cacti,
W74-07109 2I

PATWA, F. C.
Population, Land Use and Livestock Composition in India and Its Arid Zone,
W74-07105 3F

PENCZAK, T.
Structure of Fish Groupings in the Rivers and Streams of the River Nida Drainage Basin,
W74-07539 2I

PENY, J.
Study of the Adaptation of an Activated Sludge to the Purification of an Industrial Effluent (Etude de l'adaptation d'une boue activee a l'epuration d'un effluent industriel),
W74-07389 5D

PETROPOULOS, D. P.
A Computer Simulation Model for Flood Plain Development. Part II: Model Description and Applications,
W74-07296 6A

PEVEAR, D. R.
Source of Recent Nearshore Marine Clays, Southeastern United States,
W74-07238 2L

PICHON, J.
Apparatus for Removing Surface Pollutants from Water and Other Liquids,
W74-07223 5G

PIEST, R. F.
Quality of Water Discharged from Two Agricultural Watersheds in Southwestern Iowa,
W74-07528 5B

PIKUL, M. F.
A Numerical Model Based on Coupled One-Dimensional Richards and Boussinesq Equations,
W74-07515 2F

PINGRY, D. E.
Application of a Large Scale Nonlinear Programming Problem to Pollution Control,
W74-07461 5D

Application of Nonlinear Programming to Water Quality Control,
W74-07462 5D

Production Function Theory for Use in Optimal Planning Decisions,
W74-07460 5D

PITCHAI, R.
Technology Transfer in the Marine Environment of Long Island,
W74-07059 6B

PITCHFORD, A. C.
Containing and Removing Oil Spills on Water,
W74-07208 5G

PIVNICKA, K.
Abundance and Mortality of the Perch Fry (Perca Fluviatilis, Linnacus, 1758) in the Klicava Reservoir,
W74-07588 8I

PLATT, C. M. R.
A Direct Comparison of Satellite and Aircraft Infrared (10 Micrometers-12 Micrometers) Remote Measurements of Surface Temperature,
W74-07578 7B

POAGE, J. L.
A Computer Simulation Model for Flood Plain Development. Part II: Model Description and Applications,
W74-07296 6A

POGOSOV, D. P.
Hygienic Evaluation of Means of Enrichment with Salts and Decontamination of Demineralized Water, (In Russian),
W74-07365 5F

POLIKOFF, A.
The Interlake Affair,
W74-07120 5G

POMERANTS, L. B.
Microbiological Purification of Hydrogen Sulfide-Containing Kraft Mill Effluents (Mikrobiologicheskaya ochistka serovodorodnykh stochnykh vod sul'fatno-tsellyuloznogo proizvodstva),
W74-07387 5D

POSTON, H. W.
Laundry Detergents and Environmental Quality,
W74-07122 5C

POWELL, T.
The Estimation of Vertical Eddy Diffusivities Below the Thermocline in Lakes,
W74-07416 2H

PRATHER, R. J.
Land Disposal of Waste Gases: III. Sorption Patterns From Buried Gas Injection Pipes,
W74-07422 5B

PRATT, P. F.
Nitrate Concentrations in the Unsaturated Zone Beneath Irrigated Fields in Southern California,
W74-07445 5G

PRIVAL'SKIY, V. YE.
Optimal Linear Extrapolation of Level Fluctuations of Closed Water Bodies (Optimal'naya lineynaya ekstrapolyatsiya kolebaniy urovnya zamknutykh vodoyemov),
W74-07195 4A

PRYDZ, S.
Summary of the State of the Art in Radiochromatography,
W74-07571 5A

PUDOVA, T. V.
Long-Term Trends in Groundwater Level Fluctuations (Mnogoletniye tendentsii v kolebaniyakh urovney poszemnykh vod),
W74-07191 2F

PYLER, R. E.
Method of Removing Oil Spills,
W74-07222 5G

QUIGLEY, J. J.
Waste Water Treatment in Commercial Fish Processing: Reducing Stick Water Loadings,
W74-07270 5D

RALLS, J. W.
In-Plant, Continuous Hot-Gas Blanching of Spinach,
W74-07368 3E

RANDALL, C. W.
Systems simulation of the effect of tertiary treatment for carbon, nitrogen, and phosphorus removal upon primary productivity, standing crop, and community structure of autotrophic and hetertrophic communities in receiving model streams.
W74-07337 5C

RAO, A. R.
Comparison of Rainfall-Runoff Models for Urban Areas,
W74-07463 2A

RAO, J. S.
Population, Land Use and Livestock Composition in India and Its Arid Zone,
W74-07105 3F

RAPSON, W. H.
The Effluent-Free Bleached Kraft Pulp Mill. Part IV. The Salt Recovery Process,
W74-07379 5D

The Effluent-Free Bleached Kraft Pulp Mill. Part V. The R4 Process for Chlorine Dioxide Manufacture to Decrease Production of Sodium Sulphate,
W74-07378 5D

RAVIKOVITCH, S.
Mineralogical Composition of Clays in Soil Profiles of Israel: I. The Soils of the Mediterranean Zone,
W74-07099 2G

Mineralogical Composition of Clays in Soil Profiles of Israel: II. The Soils of the Desert Zone,
W74-07100 2G

RAY, A. D.
Effects of Thickness on Bacterial Film,
W74-07545 5C

RAYNES, J. J.
Herbivorous Fish for Aquatic Plant Control,
W74-07470 4A

REEBURGH, W. S.
Processes Affecting Gas Distributions in Estuarine Sediments,
W74-07242 2L

REEVE, D. W.
The Effluent-Free Bleached Kraft Pulp Mill. Part IV. The Salt Recovery Process,
W74-07379 5D

REICH, B. M.
Effect of Agnes Floods on Annual Series in Pennsylvania,
W74-07455 2E

REMSON, I.
A Numerical Model Based on Coupled One-Dimensional Richards and Boussinesq Equations,
W74-07515 2F

REYNOLDS, D. W.
Method and Apparatus for Collecting a Floating Liquid,
W74-07215 5G

RHEE, G-Y.
A Continuous Culture Study of Phosphate Uptake, Growth Rate and Polyphosphate in Scenedesmus Sp.,
W74-07549 5C

RHUE, R. D.
Leaching Losses of Sulfur During Winter Months When Applied as Gypsum, Elemental S or Prilled S,
W74-07449 5B

RHYNE, C. F.
Field and Experimental Studies on the Systematics and Ecology of Ulva curvata and Ulva rotundata,
W74-07473 5C

RICHEY, E. P.
State of the Art of Floating Breakwaters,
W74-07498 8A

RICK, W. B.
Planning and Developing Waterfront Property,
W74-07072 6B

RIGGS, S. R.
Recent Estuarine Sediment History of the Roanoke Island Area, North Carolina,
W74-07245 2L

RILEY, W. B.
Special Report: Semiconductor Memories are Taking Over Data-Storage Applications,
W74-07553 7B

RINGEN, B. H.
Records of Ground-Water Levels in Wyoming, 1940-1971,
W74-07186 4B

RITCHIE, L. M.
Irrigation and Sprinkler System,
W74-07212 3F

RIVENS, J. A.
Irrigation and Sprinkler System,
W74-07212 3F

RIVETT, L. S.
Acid Neutralization Doesn't Cost Much,
W74-07124 5D

ROBERTSON, A. F.
Hydrologic Conditions in the Lakeland Ridge Area of Polk County, Florida,
W74-07318 4B

ROBERTSON, W. K.
Effects of Subsurface Asphalt Layers on Corn and Tomato Root Systems,
W74-07447 3F

ROBISON, J. H.
Hydrology of the Dunes Area North of Coos Bay, Oregon,
W74-07325 2L

ROCHESTER, E. W.
An Irrigation Scheduling Model Which Incorporates Rainfall Predictions,
W74-07440 3F

RODINA, A. G.
Nutritive Importance and Structure of Detritus,
W74-07471 5C

ROMANOVSKIY, S. I.
Role of Turbidity Currents in Sedimentary Processes (O roli mut'yevykh potokov v protsessakh osadkonakopleniya),
W74-07502 2J

ROSING, J.
A Computer Simulation Model for Flood Plain Development. Part II: Model Description and Applications,
W74-07296 6A

RUBIN, H.
Heat Dispersion Effect on Thermal Convection in a Porous Medium Layer,
W74-07156 2F

RUSH, R. J.
Phosphorus Removal Treatability Studies at C.F.B. Bordon, Petawawa, Trenton and Uplands,
W74-07273 5D

RUSHTON, K. R.
Critical Analysis of the Alternating Direction Implicit Method of Aquifer Analysis,
W74-07154 2F

RUSIN, I. N.
Problem of Calculating Depth of the Quasi-uniform Layer of the Ocean (K voprosu o raschete tolshchiny kvaziodnorodnogo sloya okeana),
W74-07506 2A

RYAN, J. E.
Water Purification Apparatus,
W74-07209 5D

RYAN, J. J.
Marine Geology and Estuarine History of Mobile Bay, Alabama: Part 1. Contemporary Sediments,
W74-07248 2L

SAINT-JEAN, L.
A Study of the Communities of Invertebrates of Plants of Lake Chad: Preliminary Inquires, (In French),
W74-07538 2H

SAND, P. H.
Pollution Sanctions--New Alternatives to Civil Liability,
W74-07123 5G

SANDNER, H.
Leech Communities (Hirudinea) in the Mazurian and Bialystok Regions and the Pomeranian Lake District,
W74-07542 5C

SARMA, P. B. S.
Comparison of Rainfall-Runoff Models for Urban Areas,
W74-07463 2A

SARTOR, J. D.
Water Pollution Aspects of Street Surface Contaminants,
W74-07418 5B

SARTZ, R. S.
Effect of Grazing on Runoff from Two Small Watersheds in Southwestern Wisconsin,
W74-07525 4C

SARWAR, M.
Microdetermination of Resorcinol in Presence of Phenol,
W74-07580 5A

SATO, M.
Distribution and Standing Crops of Chironomid-Larvae in Shiozu Bay of Lake Biwa (In Japanese),
W74-07101 5C

SAVAGE, W. E.
Waste water treatment,
W74-07219 5D

SAWYER, T.
Residues of Atrazine, Cyanazine, and Their Phytotoxic Metabolites in a Clay Loam Soil,
W74-07585 5A

SAXENA, G. K.
Effects of Subsurface Asphalt Layers on Corn and Tomato Root Systems,
W74-07447 3F

SCHADEWALD, P. T.
The Food Habits and Age and Growth of Goldeye, Hiodon alosoides (Rafinesque), in Beaver Creek, Lake Oahe, North Dakota, 1971-72,
W74-07474 8I

SCHEIRING, J. F.
Habitat Distribution of the Shore Flies of Northeastern Ohio (Diptera: Ephydridae),
W74-07556 5C

SCHERR, B. A.
Cost Sharing for Recreation: Efficiency and Equity,
W74-07307 6B

SCHMELZ, D. V.
A Preliminary Description of the Physico-Chemical Characteristics and Biota of Three Strip Mine Lakes, Spencer County, Indiana,
W74-07403 5B

SCHMIDT, H.
On Some Special Problems of Sulfite Pulp Waste Water Purification (Zu einigen speziellen Problemen der Sulfitzellstoff-Abwasserreinigung),
W74-07386 5D

SCHUBEL, J. R.
Distribution and Transportation of Suspended Sediment in Upper Cheasapeake Bay,
W74-07234 2L

SCHUMAN, G. E.
Quality of Water Discharged from Two Agricultural Watersheds in Southwestern Iowa,
W74-07528 5B

SCHWARTZ, R. J.
Biological Investigations of Noxious Coelenterates and Ctenophores in Coastal North Carolina,
W74-07479 2L

SCOTT, D. S.
Use and Production of Iron Salts for Phosphorus Removal,
W74-07269 5D

SCOTT, P. R.
An Oil Recovery System Utilizing Polyurethane Foam--A Feasibility Study,
W74-07341 5G

SEN, A. K.
Agroclimatic Regions of Rajasthan,
W74-07102 3F

SENECA, E. D.
An Investigation of Propagation and the Mineral Nutrition of Spartina alterniflora,
W74-07486 5C

SEPASKHAH, A. R.
Subsurface Heating and Irrigation of Soils: Its Effect on Temperature and Water Content and on Plant Growth,
W74-07054 2G

SEVILLA, C. L.
In Vitro Formation of Nitrate Reductase Using Extracts of the Nitrate Reductase Mutant of Neurospora crassa, Nit-1, and Rhodospirillum rubrum,
W74-07577 5B

SHANNON, E. E.
Phosphorus Removal Treatability Studies at C.F.B. Bordon, Petawawa, Trenton and Uplands,
W74-07273 5D

SHEIKH, H.
The EPA Stormwater Management Model: A Current Overview,
W74-07265 5D

SHELTON, J. W.
Depositional Features of Braided-Meandering Stream,
W74-07163 2J

SHEN, H. W.
Dispersion of Contaminated Sediment Bed Load,
W74-07446 5B

SHEPHERD, R. A.
Volatility of DDT Residues in Soil as Affected by Flooding and Organic Matter Applications,
W74-07424 5B

SHERIDAN, R. P.
Hydrogen Sulfide Production by Synechococcus lividus Y52-si,
W74-07546 5C

SHINDALA, A.
Evaluation of Current Techniques for Nutrient Removal from Wastewaters,
W74-07441 5D

SHISHKIN, A. I.
Predicting the Quality of Stream Water Under Conditions of Oxygen Deficiency (O prognoze kachetva vody vodotokov pri bol'shikh defitsitakh kisloroda),
W74-07388 5B

SHOJALASHKARI, R.
Regional Water Quality Management by the Generalized Reduced Gradient Method,
W74-07311 5B

SHUYSKIY, YU. D.
Supply of Terrigenous Material to the Baltic Sea (Pitaniye Baltiyskogo morya terrigennym materialom),
W74-07501 2J

SIEFKER, J. R.
Quantitative Chemical Analysis of Specific Components of the Waters of Lost Creek and the Wabash River, Vigo County, Indiana,
W74-07405 5A

SIELICKI, M.
The Effect of Selenite on the Physiological and Morphological Properties of the Blue-Green Alga Phormidium luridum Var. Olivacea,
W74-07550 5C

SILK, P. J.
The Photochemistry of Carbamates. 1. The Photodecomposition of Zectran: 4-Dimethylamino-3,5-XYLYL-N-Methyl Carbamate,
W74-07552 5B

SIMMONS, D. T.
Water Reuse in Protein Feed Process Utilizing Lumber Mill Wastes,
W74-07409 5D

SIMMONS, H. B.
Effects of Man-Made Works on the Hydraulic, Salinity, and Shoaling Regimens of Estuaries,
W74-07249 5C

SIMUNDICH, T. M.
Parameter Identification in Field Problems,
W74-07428 7C

SINDEN, J. A.
Utility Analysis in the Valuation of Extra-Market Benefits with Particular Reference to Water-Based Recreation,
W74-07150 6B

SINGH, R. P.
Kaempferol (3,5,7,4'-Tetrahydroxyflavone) as a Chromogenic Reagent for Tin(IV),
W74-07579 5A

SIPPLE, W. S.
The Past and Present Flora and Vegetation of the Hackensack Meadows,
W74-07476 2I

SIRA, L. I.
Effect of Irrigation on Dynamics of Microorganism Quantity in Dark-Brown Soils in Southern Ukraine, (In Ukrainian),
W74-07279 2G

SIRONS, G. J.
Residues of Atrazine, Cyanazine, and Their Phytotoxic Metabolites in a Clay Loam Soil,
W74-07585 5A

SKAGGS, R. W.
Experimental Evaluation of a Method for Determining Unsaturated Hydraulic Conductivity,
W74-07088 2G

SKLYAROVA, T. V.
Taxonomic Composition of Aquatic Invertebrates of the Don Basin in Comparison with Fauna of the Other Rivers of the Black Sea Caspian Basin, (In Russian),
W74-07537 2I

SLACK, J. R.
Just a Moment,
W74-07414 2A

SLAWSON, G. C. JR.
Chemical and Biological Problems in the Grand Canyon,
W74-07093 5B

SMALII, V. T.
Effect of Irrigation on Dynamics of Microorganism Quantity in Dark-Brown Soils in Southern Ukraine, (In Ukrainian),
W74-07279 2G

SMETHIE, W. M. JR.
Some Aspects of the Temperature, Oxygen and Nutrient Distributions in Monterey Bay, California. Annual Report, Part 1, 1973,
W74-07469 5C

SMITH, N. P.
Summertime Temperature and Circulation Patterns in Lake Superior,
W74-07338 2H

SMITH, R.
Costs of Wastewater Renovation,
W74-07141 5D

SMITH, R. P. JR.
Oil Reclaiming Device for Removing Oil from the Surface of Water,
W74-07206 5G

SMITH, S. J.
Relative Movement of Bromide and Nitrate Through Soils,
W74-07423 5B

SMITH, V. E.
Utilization of ERTS-1 Data to monitor and Classify Eutrophication of Inland Lakes,
W74-07484 5C

SMOLONOGOV, E. P.
The Age Dynamics and the Economic Selection Cuttings in Broad Leaved Dark Coniferous Forests of the Water Protective Shelterbelt of the UFA River Within the Sverdlovsk Region, (In Russian),
W74-07600 4A

SMRCHEK, J.
Systems simulation of the effect of tertiary treatment for carbon, nitrogen, and phosphorus removal upon primary productivity, standing crop, and community structure of autotrophic and hetertrophic communities in receiving model streams.
W74-07337 5C

SNIDER, D. M.
Instability of Water Cooled from Above,
W74-07458 2H

SNOEYINK, V. L.
Reactions of Chloramines with Active Carbon,
W74-07544 5B

SOKOLOSKI, A.
Institutional Considerations,
W74-07147 6E

Multi-Disciplinary Study of Water Quality Relationships: A Case Study of Yaquina Bay, Oregon,
W74-07142 6B

SOKOLOVA, I. E.
Purification of Effluents and Improvement of the Technology in the Production of Chloretone, (In Russian),
W74-07285 5D

SOMAYAJULU, B. L. K.
Th-234/U-238 Activity Ratios in Pacific Ocean Bottom Waters,
W74-07322 2K

SORENSEN, J. C.
Procedures and Programs to Assist in the Environmental Impact Statement Process,
W74-07061 6B

SOROOS, R. L.
Evaluation of Methods of Pumping Test Analyses for Application to Hawaiian Aquifers,
W74-07531 5C

SOULIS, E. D.
The Forecasting of Streamflow Using the Method of Characteristic Modes,
W74-07178 4A

SPENCER, W. F.
Manganese and Iron Solubility Changes as a Factor in Tile Drain Clogging: I. Observations During Flooding and Drying,
W74-07151 2G

Manganese and Iron Solubility Changes as a Factor in Tile Drain Clogging: II. Observations During the Growth of Cotton,
W74-07152 2G

Volatility of DDT Residues in Soil as Affected by Flooding and Organic Matter Applications,
W74-07424 5B

SPIFF, E. D.
Acetylene Reduction by Beijerinckia Under Various Partial Pressures of Oxygen and Acetylene,
W74-07572 5C

SPOMER, R. G.
Quality of Water Discharged from Two Agricultural Watersheds in Southwestern Iowa,
W74-07528 5B

SPRENT, J. I.
Effects of Water Stress on Growth and Nitrogen-Fixing Activity of Trifolium repens,
W74-07352 3F

STACHURSKI, A.
Population Density, Biomass and Maximum Natality Rate and Food Conditions in Ligidium Hypnorum L. (Isopoda),
W74-07590 8I

STAMBERG, J. B.
Hydrogen Peroxide Cures Filamentous Growth in Activated Sludge,
W74-07253 5D

STANLEY, D. J.
Basin Plains in the Eastern Mediterranean: Significance in Interpreting Ancient Marine Deposits: 1. Basin Depth and Configuration,
W74-07158 2J

STARK, N.
Distillation-Condensation of Water and Nutrient Movement in a Desert Ecosystem,
W74-07110 2I

STARK, R. M.
Optimum Design Height of Cofferdams,
W74-07304 8A

STARRETT, J. M.
Landscape Compartmentalization: An Ecological Approach to Land Use Planning,
W74-07053 6G

STATHAM, I.
The Relationship of Porosity and Angle of Repose to Mixture Proportions in Assemblages of Different Sized Materials,
W74-07330 2J

STEENBERGH, W. F.
The Saguaro Giant Cactus, A Bibliography,
W74-07098 2I

STEGER, R. D.
Annual Compilation and Analysis of Hydrologic Data for Urban Studies in the San Antonio, Texas Metropolitan Area, 1971,
W74-07323 2E

STEICHEN, J. M.
Economic Size Selection for PVC Pipelines,
W74-07303 8A

STEPHENSON, G. R.
Mathematical Simulation of Subsurface Flow Contributions to Snowmelt Runoff, Reynolds Creek Watershed, Idaho,
W74-07516 2F

STEVENS, J. B.
The Demand for Sport Fishing at Yaquina Bay,
W74-07143 6B

An Economic Evaluation of Alternative Levels of Water Quality The Role of Water Quality in Relation to Economic Benefits,
W74-07146 6B

Multi-Disciplinary Study of Water Quality Relationships: A Case Study of Yaquina Bay, Oregon,
W74-07142 6B

STILLINGS, B. R.
Reduction in Mercury Content of Fish Protein Concentrate by Enzymatic Digestion,
W74-07576 5A

STOEVENER, H. H.
The Impact of Sport Angling on the Yaquina Bay Economy,
W74-07144 6B

STOOVENER, H. H.
Multi-Disciplinary Study of Water Quality Relationships: A Case Study of Yaquina Bay, Oregon,
W74-07142 6B

STRAKHOV, N. M.
Mechanism of Element Distribution in the Pacific Ocean (Japanese Profile) (K poznaniyu mekhanizma raspredeleniya elementov v Tikhom okeane (Yaponskiy profil')),
W74-07503 2J

STREET, R. L.
A Numerical Model Based on Coupled One-Dimensional Richards and Boussinesq Equations,
W74-07515 2F

STRELKOV, Y. A.
Diseases of Pond Fishes,
W74-07481 8I

STRIDE, A. H.
Sedimentation by Non-Tidal Currents Around Northern Denmark,
W74-07160 2L

STRINGFELLOW, W. G.
User Charges and Industrial Cost Recovery, Denver SMSA,
W74-07370 5D

STRONG, A. W.
An Explanatory Work on the Oxidation of Ammonia by Potassium Ferrate (VI),
W74-07454 5D

STUIBER, D. A.
Waste Water Treatment in Commercial Fish Processing: Reducing Stick Water Loadings,
W74-07270 5D

SUGIHARA, HOROHITO
An Epidemiological Study on Clonorchis sinensis at the Northern part of Wakayama Prefecture, Middle Japan, (In Japan),
W74-07540 5C

SULLIVAN, R. H.
Combined Sewer Overflow Regulator Facilities,
W74-07258 5D

Prevention and Control of Infiltration and Inflow,
W74-07257 5D

The Swirl Concentrator as a Combined Sewer Overflow Regulator,
W74-07264 5D

UMMER, R. E.
Pilot Application of the Rotating Biological Surface Concept for Secondary Treatment of Insulating Board Mill Effluents,
W74-07398 5D

UMMERS, P. W.
Source and Budget of Sulfate in Precipitation from Central Alberta, Canada,
W74-07164 5B

UZUKI, M.
Multiple Organochlorine Pesticide Residues in Japan,
W74-07560 5A

UZUKI, T.
The Chemical Form and Bodily Distribution of Mercury in Marine Fish,
W74-07551 5A

WANK JR, R. R.
Predicting Pesticide Runoff From Agricultural Land: A Conceptual Model,
W74-07427 5B

WARTZENDRUBER, D.
Flux-Gradient Relationships and Soil-Water Diffusivity from Curves of Water Content Versus Time,
W74-07512 2G

WIFT, E.
The Marine Diatom Ethmodiscus rex: Its Morphology and Occurrence in the Plankton of the Sargasso Sea,
W74-07547 5A

YCIP, A.
Solvent Extraction of Sulfur From Marine Sediment and Its Determination by Gas Chromatography.
W74-07565 5A

TAFURI, A.
Stormflow Pollution Control in the U.S.,
W74-07256 5D

TANNENBAUM, S. R.
Reduction in Mercury Content of Fish Protein Concentrate by Enzymatic Digestion,
W74-07576 5A

TAVENNER, M. C.
Quantitative Chemical Analysis of Specific Components of the Waters of Lost Creek and the Wabash River, Vigo County, Indiana,
W74-07405 5A

TAYLOR, A. W.
Acid Ammonium Acetate Extraction and Electron Capture Gas Chromatographic Determination of Carbofuran in Soils,
W74-07574 5A

TENG, J.
Method of Removing Oil Spills,
W74-07222 5G

TERNYIK, W. B.
Pacific Northwest Coastal Zone Management as it Relates to Estuary Protection,
W74-07500 6E

THOMA, A. F.
Model Tests with Thin Sheets to Reduce Evaporation,
W74-07103 3B

THRAILKILL, J.
Variables Affecting Well Success in a Kentucky Limestone Aquifer,
W74-07176 4B

TIEWS, J.
On the Composition of Mixed Fodder Rations for Trout in Net Cages, (In German),
W74-07599 8I

TIEWS, K.
On the Composition of Mixed Fodder Rations for Trout in Net Cages, (In German),
W74-07599 8I

TIHANSKY, D. P.
Economic Damages from Residential Use of Mineralized Water Supply,
W74-07417 5C

TKACHENKO, N. I.
Microbiological Purification of Hydrogen Sulfide-Containing Kraft Mill Effluents (Mikrobiologicheskaya ochistka serovodorodnykh stochnykh vod sul'fatno-tsellyuloznogo proizvodstva),
W74-07387 5D

TODSEN, M.
Numerical Studies of Two-Dimensional Saturated-Unsaturated Drainage Models,
W74-07168 2G

TOFFLEMIRE, T. J.
Land Disposal of Wastewater--Literature Review for 1973,
W74-07327 5D

TOLSTED, D. N.
Effect of Grazing on Runoff from Two Small Watersheds in Southwestern Wisconsin,
W74-07525 4C

TOMKINS, A. L.
Determination of Mean Cell Size of Tetrahymena in Growing Cultures,
W74-07586 5A

TORPEY, W. N.
Rotating Biological Disk Wastewater Treatment Process - Pilot Plant Evaluation,
W74-07373 5D

TOYAMA, C.
The Chemical Form and Bodily Distribution of Mercury in Marine Fish,
W74-07551 5A

TROUP, A. J.
A Direct Comparison of Satellite and Aircraft Infrared (10 Micrometers-12 Micrometers) Remote Measurements of Surface Temperature,
W74-07578 7B

TSAO, A. L.
Possible Effects of Construction and Operation of a Supertanker Terminal on the Marine Environment in New York Bight,
W74-07488 5C

TSUMURA, K.
In Comparison of the Food of Salamanders and Fish in Marion Lake, British Columbia,
W74-07349 2H

TYLER, M. A.
A Review of Colour Reduction Technology in Pulp and Paper Mill Effluents,
W74-07406 5D

TYSON, P. D.
A Note on the Areal Distribution of Suspended Sediment Yield in South Africa,
W74-07177 2J

ULLAH, W.
Effect of Contour Furrows and Contour Bunds on Water Conservation in Grasslands of Western Rajasthan,
W74-07090 3F

UNGER, I.
The Photochemistry of Carbamates. 1. The Photodecomposition of Zectran: 4-Dimethylamino-3,5-XYLYL-N-Methyl Carbamate,
W74-07552 5B

URIEN, C. M.
Rio De La Plata Estuary Environments,
W74-07236 2L

VALIBOUSE, B.
Apparatus for Removing Surface Pollutants from Water and Other Liquids,
W74-07223 5G

VALKENBURG, J. J.
Incidence of Resistance to Tetracycline, Chloramphenicol and Ampicillin Among Salmonella Species Isolated in the Netherlands in 1969, 1970 and 1971,
W74-07562 5C

VAN ALSTYNE, F. E.
Land Disposal of Wastewater--Literature Review for 1973,
W74-07327 5D

VAN DER BEKEN, A.
Solutions for Lateral Outflow in Perforated Conduits,
W74-07433 8B

VAN DER PLOEG, R. R.
Ground-Water Flow Patterns in Confined Aquifers and Pollution,
W74-07510 5B

VANGANI, N. S.
Effect of Contour Furrows and Contour Bunds on Water Conservation in Grasslands of Western Rajasthan,
W74-07090 3F

VASSILIADES, G.
Nematode Fishe Parasites from Sangalkam, Senegal,
W74-07589 2H

VEENSTRA, H. J.
Size and Shape Sorting in a Dutch Tidal Inlet,
W74-07329 2L

VERMA, C. M.
Study on the Pasture Establishment Technique VI. Effect of Different Spacings and Weedings on Establishment and Forage Production of Cenchrus ciliaris Linn., Lasiurus sindicus Henr. and Panicum antidotale Retz under Arid Conditions,
W74-07107 3F

VICENTE, V. A.
Rotating Ring-Disk Electrode Study of the Adsorption of Lead on Gold in 0.5M Potassium Chloride,
W74-07555 2K

VIDAL, I. L.
Moina Sp. (Cladocera: Moinidae) in a Sewage Plant, Wellington, Referred to Moina tenuicornis Sars, 1896 (Note),
W74-07569 5A

VINOGRADOV, V. G.
Research on the Micromorphology of the Flooded Poszolic Soils of Shallow Water Reservoirs, (In Russian),
W74-07235 2G

VISKANTA, R.
Instability of Water Cooled from Above,
W74-07458 2H

VLADIMIROV, M. Z.
Food Supply and Character of its Utilization by Dniester Vimba Fry in Ponds, (In Russian),
W74-07592 8I

VOLKOV, I. I.
Mechanism of Element Distribution in the Pacific Ocean (Japanese Profile) (K poznaniyu mekhanizma raspredeleniya elementov v Tikhom okeane (Yaponskiy profil')),
W74-07503 2J

VOOGD, C. E.
Incidence of Resistance to Tetracycline, Chloramphenicol and Ampicillin Among Salmonella Species Isolated in the Netherlands in 1969, 1970 and 1971,
W74-07562 5C

WAGGY, W. H.
Simulation--A Tool for Water Resource Management,
W74-07300 6A

WAGNER, D. D.
An Investigation of the Physical Impact of Sewage Outflow on a River-Estuarine Environment,
W74-07477 5C

WAITE, W. P.
Broad Spectrum Microwave Systems for Remotely Measuring Soil Moisture Content,
W74-07052 2G

WALLIHAN, E. F.
Portable Reflectance Meter for Estimating Chlorophyll Concentrations in Leaves,
W74-07437 7B

WALLIS, J. R.
Just a Moment,
W74-07414 2A

WALSH, M. A.
Catalytic Oxidation of Phenol in Dilute Concentration in Air,
W74-07086 5D

WANG, D. I. C.
Reduction in Mercury Content of Fish Protein Concentrate by Enzymatic Digestion,
W74-07576 5A

WARNCKE, D. D.
Ammonium and Nitrate Uptake by Corn (Zea mays L.) as Influenced by Nitrogen Concentration and NH4(+)/NO3(-) Ratio,
W74-07459 3F

WARNER, M. L.
Environmental Impact Analysis: An Examination of Three Methodologies,
W74-07339 6G

WARRICK, A. W.
Land Disposal of Waste Gases: III. Sorption Patterns From Buried Gas Injection Pipes,
W74-07422 5B

Salt Displacement into Drain Tiles under Ponded Leaching,
W74-07518 2G

Seepage Through a Hillside: The Steady Water Table,
W74-07517 2G

WATANABE, T.
Multiple Organochlorine Pesticide Residues in Japan,
W74-07560 5A

WEBB, M. S.
Surface Temperatures of Lake Erie,
W74-07415 2H

WEIGT, G.
On Some Special Problems of Sulfite Pulp Waste Water Purification (Zu einigen speziellen Problemen der Sulfitzellstoff-Abwasserreinigung),
W74-07386 5D

WELCH, R. I.
Aerial Spill Prevention Surveillance During Sub-Optimim Weather,
W74-07342 5A

WERNER, F.
An Improved Core Catcher for the Kiel Box Corer ('Kastenlot'),
W74-07159 7B

WESLEY-SMITH, R. N.
Liveweight Gains of Shorthorn Steers on Native and Improved Pastures at Adelaide River Northern Territory,
W74-07453 3F

WHALLY, W. B.
A Scanning Electron Microscope Study of Surface Textures of Quartz Grains from Glacial Environments,
W74-07331 2J

WHINSTON, A.
Application of a Large Scale Nonlinear Programming Problem to Pollution Control,
W74-07461 5D

Application of Nonlinear Programming to Water Quality Control,
W74-07462 5D

Production Function Theory for Use in Optimal Planning Decisions,
W74-07460 5D

WHIPPLE, W. JR.
Environmental Quality and its Evaluation,
W74-07533 5G

WHITE, D. H.
Water Reuse in Protein Feed Process Utilizing Lumber Mill Wastes,
W74-07409 5D

WIER, C. E.
Sandstone Aquifers in Eastern Sullivan County, Indiana,
W74-07401 4B

WIKEY, A.
Water Treatment Apparatus,
W74-07196 5D

WILCOX, L. C.
A Systems Analysis of Water Quality Surve
Design,
W74-07310 5I

WILDING, L. P.
Elemental Variability Within a Sampling Unit,
W74-07598 2I

WILKIALIS, J.
Leech Communities (Hirudinea) in the Mazur
an and Bialystok Regions and the Pomerania
Lake District,
W74-07542 5C

WILLEY, R. E.
Water Resources of the Taunton River Basi
Southeastern Massachusetts,
W74-07190 7C

WILLIAMS, J. A.
Evaluation of Methods of Pumping Tes
Analyses for Application to Hawaiian Aquifers
W74-07531 5C

WILLIAMS, J. C.
Mussel Fishery Investigations, Tennessee
Ohio, and Green Rivers,
W74-07187 8

WILLIAMS, J. L.
Regional Water Quality Management by th
Generalized Reduced Gradient Method,
W74-07311 5I

WILLIAMS, J. R.
Water Resources of the Taunton River Basi
Southeastern Massachusetts,
W74-07190 7C

WILLIS, C. E.
Flood Proofing Decisions with Uncertai
Events,
W74-07299 6A

WILSON, C. R.
Steady State Flow in Rigid Networks of Frac
tures,
W74-07521 2I

WINKELMOLEN, A. M.
Size and Shape Sorting in a Dutch Tidal Inlet,
W74-07329 2I

WINSTON, D.
Recent Estuarine Sediment History of th
Roanoke Island Area, North Carolina,
W74-07245 2I

WINTER, D. F.
A Strategy for Modeling Primary Production i
Stratified Fjords,
W74-07494 5C

WIRTH, H.
Method of and Apparatus for the Purificatio
of Water Containing Organic Contaminants,
W74-07199 5I

WIRTH, M. E.
An Economic Analysis of Selected Agricultura
Uses of Warm Water in the Pacific Northwes
Resulting from Electric Power Generation,
W74-07125 3C

WISFELD, W.
Method of and Apparatus for the Purificatio
of Water Containing Organic Contaminants,
W74-07199 5I

WITHERSPOON, P. A.
Steady State Flow in Rigid Networks of Fractures,
W74-07521 2F

WITMER, F. E.
Determination of Oil Concentration and Size Distribution in Ship Ballast Waters. Method and Representative Results,
W74-07564 5B

WOLLER, D. M.
Public Groundwater Supplies in Adams County,
W74-07172 4B

Public Groundwater Supplies in Bond County,
W74-07429 4B

WOODHOUSE, W. W. JR.
An Investigation of Propagation and the Mineral Nutrition of Spartina alterniflora,
W74-07486 5C

WOODY, W. M.
Effectiveness of Two Nitrification Inhibitors for Anhydrous Ammonia Under Irrigated and Dryland Conditions,
W74-07436 5G

WOOLHISER, P. H.
Cyanide Waste Treatment Utilizing Catalytic Oxidation,
W74-07272 5D

WORSSAM, B. C.
A New Look at River Capture and At The Denudation History of the Weald,
W74-07324 2J

WUENSCHER, J. E.
Landscape Compartmentalization: An Ecological Approach to Land Use Planning,
W74-07053 6G

WYATT, T.
Planning and Operational Studies in the Integrated Use of Desalination. Case Studies for Cyprus and Jersey,
W74-07308 3A

XIROKOSTAS, D. A.
Economic Evaluation and Determination of Plant Capacity and Dam Height,
W74-07305 8A

YACOUB, N. L.
In-Plant, Continuous Hot-Gas Blanching of Spinach,
W74-07368 3E

YAKOVLEVA, V. B.
Problems in Recreational Use of Reservoirs (Problemy rekreatsionnogo ispol' zovaniya vodokhranilishch),
W74-07193 6B

YAMAGISHI, H.
Vertical Migration of Spaniotoma akamusi Larvae (Diptera:Chironomidae) through the Bottom Deposits of Lake Suwa,
W74-07543 2H

YAMATO, Y.
Multiple Organochlorine Pesticide Residues in Japan,
W74-07560 5A

YOSHIDA, YUKIO
An Epidemiological Study on Clonorchis sinensis at the Northern part of Wakayama Prefecture, Middle Japan, (In Japan),
W74-07540 5C

YOUNG, D. R.
The Relationship of Land Use to Water Use in San Antonio, Texas,
W74-07067 4A

ZAKHAROV, S. I.
Organization of the Collection and Decontamination of Industrial and Domestic Radioactive Sewage, (In Russian),
W74-07362 5D

ZEITZ, L. R.
Data for Municipal Wells in the City of Modesto, California,
W74-07320 4B

ZIMENKO, T. G.
Activity of the Microorganisms and the Mineralization of the Organic Matter Peat Soils with a Varying Level of Sub Soil Waters, (In Russian),
W74-07230 2G

ZINNECKER, M.
In-Plant, Continuous Hot-Gas Blanching of Spinach,
W74-07368 3E

ZYUZENKO, E. V.
Purification of Effluents and Improvement of the Technology in the Production of Chloretone, (In Russian),
W74-07285 5D

ORGANIZATIONAL INDEX

GENCE NATIONALE DE VALORISATION DE A RECHERCHE, COURBEVOIE (FRANCE). SSIGNEE.
Apparatus for Recording Swell Frequency and Propagation Direction of Waves,
W74-07224 8B

GRICULTURAL RESEARCH RGANIZATION, BET-DAGAN (ISRAEL). NST. OF SOILS AND WATER.
Effect of Partial Penetration on Flow in Unconfined Aquifers Considering Delayed Gravity Response,
W74-07514 2F

GRICULTURAL RESEARCH SERVICE, ELTSVILLE, MD. AGRICULTURAL NVIRONMENTAL QUALITY INST.
Acid Ammonium Acetate Extraction and Electron Capture Gas Chromatographic Determination of Carbofuran in Soils,
W74-07574 5A

GRICULTURAL RESEARCH SERVICE, OISE, IDAHO. NORTHWEST WATERSHED ESEARCH CENTER.
Mathematical Simulation of Subsurface Flow Contributions to Snowmelt Runoff, Reynolds Creek Watershed, Idaho,
W74-07516 2F

GRICULTURAL RESEARCH SERVICE, RAWLEY, CALIF. IMPERIAL VALLEY CONSERVATION RESEARCH CENTER.
Manganese and Iron Solubility Changes as a Factor in Tile Drain Clogging: I. Observations During Flooding and Drying,
W74-07151 2G

Manganese and Iron Solubility Changes as a Factor in Tile Drain Clogging: II. Observations During the Growth of Cotton,
W74-07152 2G

Shallow Drain Performance in a Heavy Soil,
W74-07442 4A

AGRICULTURAL RESEARCH SERVICE, COLLEGE STATION, TEX. VETERINARY TOXICOLOGY AND ENTOMOLOGY RESEARCH LAB.
Nature and Toxicity of Two Oxychlordane Photoisomers,
W74-07584 5C

AGRICULTURAL RESEARCH SERVICE, COUNCIL BLUFFS, IOWA. NORTH CENTRAL WATERSHED RESEARCH CENTER.
Quality of Water Discharged from Two Agricultural Watersheds in Southwestern Iowa,
W74-07528 5B

AGRICULTURAL RESEARCH SERVICE, DURANT, OKLA. WATER QUALITY MANAGEMENT LAB.
Relative Movement of Bromide and Nitrate Through Soils,
W74-07423 5B

AGRICULTURAL RESEARCH SERVICE, PULLMAN, WASH. SOIL AND WATER CONSERVATION RESEARCH DIV.
Effectiveness of Two Nitrification Inhibitors for Anhydrous Ammonia Under Irrigated and Dryland Conditions,
W74-07436 5G

AGRICULTURAL RESEARCH SERVICE, RENO, NEV. SOIL AND WATER CONSERVATION RESEARCH DIV.
Infiltration and Water Table Effects of Soil Air Pressure Under Border Irrigation,
W74-07301 3F

AGRICULTURAL RESEARCH SERVICE, RIVERSIDE, CALIF. SOIL AND WATER CONSERVATION RESEARCH DIV.
Volatility of DDT Residues in Soil as Affected by Flooding and Organic Matter Applications,
W74-07424 5B

AKADEMIYA NAUK SSSR, KALININGRAD. INSTITUT OKEANOLOGII.
Supply of Terrigenous Material to the Baltic Sea (Pitaniye Baltiyskogo morya terrigennym materialom),
W74-07501 2J

AKADEMIYA NAUK SSSR, MOSCOW. GEOLOGICHESKII INSTITUT.
Mechanism of Element Distribution in the Pacific Ocean (Japanese Profile) (K poznaniyu mekhanizma raspredeleniya elementov v Tikhom okeane (Yaponskiy profil')),
W74-07503 2J

AKADEMIYA NAUK SSSR, MOSCOW. INSTITUT VODNYKH PROBLEM.
Long-Term Trends in Groundwater Level Fluctuations (Mnogoletniye tendentsii v kolebaniyakh urovney poszemnykh vod),
W74-07191 2F

Problems in Distribution of Water Resources in the Arid Zone of the Amudar'ya River Basin (Voprosy raspredeleniya vodnykh resursov v arisnoy zone (na primere Amudar'i)),
W74-07192 4A

Problems in Recreational Use of Reservoirs (Problemy rekreatsionnogo ispol' zovaniya vodokhranilishch),
W74-07193 6B

Optimal Linear Extrapolation of Level Fluctuations of Closed Water Bodies (Optimal'naya lineynaya ekstrapolyatsiya kolebaniy urovnya zamknutykh vodoyemov),
W74-07195 4A

AKADEMIYA NAUK URSR, KIEV. INST. OF MICROBIOLOGY AND VIROLOGY.
Effect of Irrigation on Dynamics of Microorganism Quantity in Dark-Brown Soils in Southern Ukraine, (In Ukrainian),
W74-07279 2G

AKADEMIYA NAUK USSR, KIEV. INSTYTUT GEOLOGICHNYKH NAUK.
Underflow in River Valleys of the Carpatho-Ukraine (Podruslovyy stok v rechnykh dolinakh Zakarpat'ya),
W74-07504 2F

ALASKA DEPT. OF FISH AND GAME, JUNEAU.
Relationship Between Logging Activities and Salmon Production,
W74-07468 4C

ALASKA UNIV., COLLEGE. DEPT. OF OCEAN ENGINEERING.
Physical Modeling of Residence Times in Tidal Basins,
W74-07496 2L

ALASKA UNIV., COLLEGE. INST. OF MARINE SCIENCE.
Processes Affecting Gas Distributions in Estuarine Sediments,
W74-07242 2L

Studies on Organisms Found in Arctic Sea Ice,
W74-07487 5C

ALL-UNION DESIGNING, SURVEYING AND SCIENTIFIC RESEARCH INST. HYDROPROJECT, LENINGRAD (USSR).
Components of the Water Balance of the Aral Sea and Their Effect on Its Long-Term Level Fluctuations (Sostavlyayushchiye vodnogo balansa Aral'skogo morya i ikh vliyaniye na mmnogoletniye kolebaniya yego urovnya),
W74-07194 2H

ALLIED COLLOIDS LTD., BRADFORD (ENGLAND).
How Polyacrylamides can Help Effluent Problems,
W74-07391 5D

AMERICAN PUBLIC WORKS ASSOCIATION, CHICAGO, ILL.
Prevention and Control of Infiltration and Inflow,
W74-07257 5D

Combined Sewer Overflow Regulator Facilities,
W74-07258 5D

The Swirl Concentrator as a Combined Sewer Overflow Regulator,
W74-07264 5D

ANHEUSER-BUSCH, INC., ST. LOUIS, MO. ASSIGNEE.
Method of Removing Oil Spills,
W74-07222 5G

ARIZONA AGRICULTURAL EXPERIMENT STATION, PHOENIX.
Land Disposal of Waste Gases: III. Sorption Patterns From Buried Gas Injection Pipes,
W74-07422 5B

ARIZONA OUTDOOR RECREATION COORDINATING COMMISSION, PHOENIX.
Arizona State Lake Improvement Fund Plan.
W74-07108 6B

ARIZONA STATE UNIV., TEMPE.
Productivity and Water Stress in Cacti,
W74-07109 2I

ARIZONA UNIV., TUCSON.
Annotated Checklist and Host Index for Arizona Wood-Rotting Fungi,
W74-07097 2I

Water Reuse in Protein Feed Process Utilizing Lumber Mill Wastes,
W74-07409 5D

ARIZONA UNIV., TUCSON. DEPT. OF HYDROLOGY AND WATER RESOURCES.
Chemical and Biological Problems in the Grand Canyon,
W74-07093 5B

Interdisciplinary Modeling in the Analysis of the Salinity Problems of the Safford Valley,
W74-07297 5B

ARIZONA UNIV., TUCSON. DEPT. OF SOILS, WATER, AND ENGINEERING.
Seepage Through a Hillside: The Steady Water Table,
W74-07517 2G

Salt Displacement into Drain Tiles under Ponded Leaching,
W74-07518 2G

ARIZONA UNIV., TUCSON. DEPT. OF WATERSHED MANAGEMENT.
Probability Distribution of Snow Course Data for Central Arizona,
W74-07094 2C

ARIZONA WATER COMMISSION, PHOENIX.
State Flood Control Program.
W74-07111 4A

ARKANSAS UNIV., FAYETTEVILLE. DEPT. OF ELECTRICAL ENGINEERING.
Broad Spectrum Microwave Systems for Remotely Measuring Soil Moisture Content,
W74-07052 2G

ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
Calcasieu River at Coon Island, Louisiana, Ship Channel (Final Environmental Impact Statement).
W74-07118 8A

ARMY ENGINEER DISTRICT, PHILADELPHIA, PA.
Small Beach Erosion Control Project, Lewes, Delaware (Final Environmental Impact Statement).
W74-07295 4A

ARMY ENGINEER DISTRICT, WILMINGTON, N.C.
Flood Plain Information-Neuse and Trent Rivers and Jack Smith Creek, New Bern, North Carolina.
W74-07073 4A

Flood Plain Information-Neuse River and Buffalo Creek, Smithfield, North Carolina.
W74-07074 4A

Flood Plain Information: Burdens and Two Bottle Creeks at Research Triangle Area, Durham County, North Carolina.
W74-07075 4A

Flood Plain Information - Glade Creek, Vinton, Virginia.
W74-07076 4A

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, LIVERMORE, CALIF. EXPLOSIVE EXCAVATION RESEARCH LAB.
Annotated Bibliography of Explosive Excavation Related Research.
W74-07314 8H

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS. HYDRAULICS DIV.
Effects of Man-Made Works on the Hydraulic, Salinity, and Shoaling Regimens of Estuaries,
W74-07249 5C

ATHENS COLL., ALA. DEPT. OF BIOLOGY.
Response of Aquatic Weeds to Laser Radiation,
W74-07475 5G

ATMOSPHERIC ENVIRONMENT SERVICE, DOWNSVIEW (ONTARIO).
Surface Temperatures of Lake Erie,
W74-07415 2H

ATOMIC ENERGY OF CANADA LTD., CHALK RIVER (ONTARIO). ENVIRONMENTAL RESEARCH BRANCH.
Seasonal Abundance and Vertical Distribution of Crustacean Zooplankton in a Coloured Dystrophic Lake in Northeastern Ontario,
W74-07467 5C

AUBURN UNIV., ALA. DEPT. OF AGRICULTURAL ENGINEERING.
An Irrigation Scheduling Model Which Incorporates Rainfall Predictions,
W74-07440 3F

AUSTRALIAN ATOMIC ENERGY COMMISSION RESEARCH ESTABLISHMENT, LUCAS HEIGHTS.
A Study of the Movement of Phosphorous in the Little River Estuary, N.S.W.,
W74-07483 5B

AUTOTROL CORP., MILWAUKEE, WIS. BIO-SYSTEMS DIV.
Combined Sewer Overflow Treatment by the Rotating Biological Contactor Process.
W74-07374 5D

BEAK (T. W.) CONSULTANTS LTD., MONTREAL (QUEBEC).
A Review of Colour Reduction Technology in Pulp and Paper Mill Effluents,
W74-07406 5D

BENDIX AEROSPACE SYSTEMS DIV., ANN ARBOR, MICH.
Utilization of ERTS-1 Data to monitor and Classify Eutrophication of Inland Lakes,
W74-07484 5C

BIOSPHERICS, INC., ROCKVILLE, MD. (ASSIGNEE).
Plastic Moving-Surface Treatment of Sewage,
W74-07198 5D

BIRMINGHAM UNIV. (ENGLAND). DEPT. OF CIVIL ENGINEERING.
Critical Analysis of the Alternating Direction Implicit Method of Aquifer Analysis,
W74-07154 2F

A Synthetic Model for Daily Streamflow,
W74-07179 2E

BLACK, SIVALLS AND BRYSON, INC., OKLAHOMA CITY, OKLA. (ASSIGNEE)
Apn aratus for Separating Oil and SolidsfFrm m Water,
W74-07202 5D

BOEING COMMERCIAL AIRPLANE CO., SEATTLE, WASH.
Regeneration of Chromated Aluminum Deoxidizers, Phase I Report,
W74-07254 5D

BOISE CASCADE CORP., PORTLAND, OREG.
Pilot Application of the Rotating Biological Surface Concept for Secondary Treatment of Insulating Board Mill Effluents,
W74-07398 5D

BONN UNIV. (WEST GERMANY). INSTITUT FUER LANDWIRTSCHAFTLICHE ZOOLOGIE UND BIENENKUNDE.
Population Dynamics of Protozoa Associated with the Decay of Organic Materials in Fresh Water,
W74-07541 5C

BORDEAUX UNIV. (FRANCE).
Vertical Movements in the Nonsaturated Zone and the Specific Yield of a Water-Table Aquifer (Etude des transferts verticaux dans la zone non saturee et de l'emmagasinement d'une nappe libre, dans le cas d'un pompage, dans les conditions na turelles),
W74-07182 2F

BRISTOL UNIV. (ENGLAND). DEPT. OF GEOGRAPHY.
The Relationship of Porosity and Angle of Repose to Mixture Proportions in Assemblages of Different Sized Materials,
W74-07330 2J

BRISTOL UNIV. (ENGLAND). DEPT. OF INORGANIC CHEMISTRY.
Use of Amberlite XAD-4 for Extraction and Recovery of Chlorinated Insecticides and Polychlorinated Biphenyls from Water,
W74-07383 5D

BRITISH COLUMBIA UNIV., VANCOUVER. DEPT. OF GEOGRAPHY.
Line Intersection Method for Estimating Drainage Density,
W74-07174 2J

BRITISH COLUMBIA UNIV., VANCOUVER. DEPT. OF PHYSICS.
The Influence of Wind on the Surface Waters of Alberni Inlet,
W74-07497 2L

BRITISH COLUMBIA UNIV., VANCOUVER. DEPT. OF SOIL SCIENCE.
Determination of Nitrates in Soil Extracts,
W74-07443 2G

BRITISH COLUMBIA UNIV., VANCOUVER. INST. OF ANIMAL RESOURCE ECOLOGY.
In Comparison of the Food of Salamanders and Fish in Marion Lake, British Columbia,
W74-07349 2H

BRITISH PAPER AND BOARD MAKERS' ASSOCIATION, LONDON (ENGLAND).
The Pulp and Paper Industry and the Environment,
W74-07411 5D

BUSINESSMEN FOR THE PUBLIC INTEREST, WASHINGTON, D.C.
The Interlake Affair,
W74-07120 5G

CALGARY UNIV. (ALBERTA). FACULTY OF BUSINESS.
Nonlinear Programming in River Basin Modeling,
W74-07298 5B

CALIFORNIA INSTITUTE OF TECH., PASADENA. W. M. KECK LAB. OF ENVIRONMENTAL HEALTH ENGINEERING.
Kelp Habitat Improvement Project, Annual Report July 1, 1970 - June 30, 1971.
W74-07489 5C

Kelp Habitat Improvement Project, Annual Report July 1, 1971 - June 30, 1972.
W74-07490 5C

CALIFORNIA STATE DEPT. OF WATER RESOURCES, SACRAMENTO.
Bethany Reservoir Recreation Development Plan.
W74-07127 6B

Lake Perris Recreation Development Plan.
W74-07128 6B

North Coastal Area Action Program. A Study of the McKinleyville-Trinidad Area: Public Hearing Comments.
W74-07129 6B

Silverwood Lake Recreation Development Plan.
W74-07130 6B

Land Use In California.
W74-07131 6B

North Coastal Area Action Program: A Study Of The Smith River Basin And Plain.
W74-07132 6B

CALIFORNIA UNIV., BERKELEY. DEPT. OF GEOLOGY AND GEOPHYSICS.
The Influence of Geological Membranes on the Geochemistry of Subsurface Waters from Miocene Sediments at Kettleman North Dome in California,
W74-07513 2K

CALIFORNIA UNIV., BERKELEY. INST. OF URBAN AND REGIONAL DEVELOPMENT.
Procedures and Programs to Assist in the Environmental Impact Statement Process,
W74-07061 6B

CALIFORNIA UNIV., DAVIS.
Application of the Spline Function to Soil Science,
W74-07344 2G

CALIFORNIA UNIV., DAVIS. DEPT. OF PHYSICS.
The Estimation of Vertical Eddy Diffusivities Below the Thermocline in Lakes,
W74-07416 2H

CALIFORNIA UNIV., LOS ANGELES.
Application of a Large Scale Nonlinear Programming Problem to Pollution Control,
W74-07461 5D

CALIFORNIA UNIV., RIVERSIDE. DEPT. OF SOIL SCIENCE AND AGRICULTURAL ENGINEERING.
Portable Reflectance Meter for Estimating Chlorophyll Concentrations in Leaves,
W74-07437 7B

Nitrate Concentrations in the Unsaturated Zone Beneath Irrigated Fields in Southern California,
W74-07445 5G

CALIFORNIA UNIV., SANTA BARBARA. DEPT. OF MECHANICAL ENGINEERING.
Parameter Identification in Field Problems,
W74-07428 7C

CAMBRIDGE UNIV. (ENGLAND). DEPT. OF GEOGRAPHY.
A Scanning Electron Microscope Study of Surface Textures of Quartz Grains from Glacial Environments,
W74-07331 2J

CANADA CENTRE FOR INLAND WATERS, BURLINGTON (ONTARIO).
Determination of Pentachlorophenol in Natural and Waste Waters,
W74-07385 5A

CANTERBURY UNIV., CHRISTCHURCH (NEW ZEALAND). DEPT. OF ZOOLOGY.
Taxonomic Position of Two Lumbrineris Spp.,
W74-07568 2L

CARTER (RALPH B.) CO., HACKENSACK, N. J. ASSIGNEE.
Waste Water Process Tank Control Facility,
W74-07216 5D

CENTER FOR THE ENVIRONMENT AND MAN, INC., HARTFORD, CONN.
Technology Transfer in the Marine Environment of Long Island,
W74-07059 6B

CENTRAL ARID ZONE RESEARCH INST., JODHPUR (INDIA).
Effect of Contour Furrows and Contour Bunds on Water Conservation in Grasslands of Western Rajasthan,
W74-07090 3F

Agroclimatic Regions of Rajasthan,
W74-07102 3F

Population, Land Use and Livestock Composition in India and Its Arid Zone,
W74-07105 3F

Study on the Pasture Establishment Technique VI. Effect of Different Spacings and Weedings on Establishment and Forage Production of Cenchrus ciliaris Linn., Lasiurus sindicus Henr. and Panicum antidotale Retz under Arid Conditions,
W74-07107 3F

CENTRAL SHEEP AND WOOL RESEARCH INST., JAIPUR (INDIA).
Effect of Seeding Rates and Row Spacings on Fodder Production of Moth Bean (Phaseolus aconitifolius),
W74-07091 3F

CENTRAL SOIL SALINITY RESEARCH INST., KARNAL (INDIA).
Effect of Gypsum in Reducing Boron Hazard of Saline Waters and Soils,
W74-07095 3C

CENTRE DE RECHERCHES DU SERVICE DE SANTE DES ARMEES, LYON (FRANCE). DIVISION DE MICROBIOLOGIE.
Study of the Adaptation of an Activated Sludge to the Purification of an Industrial Effluent (Etude de l'adaptation d'une boue activee a l'epuration d'un effluent industriel),
W74-07389 5D

CENTRO DE PESQUISAS DO CACAU, SALVADOR (BRAZIL).
Effects of Drainage on the Yield of Cacao, (In Portuguese),
W74-07435 3F

CINCINNATI UNIV., OHIO. TANNERS' COUNCIL LAB.
Bacteria-Assimilable Organic Compounds, Phosphate, and Enhanced Growth of Bacteria-Associated Blue-Green Algae,
W74-07587 5C

CIP RESEARCH LTD., HAWKESBURY (ONTARIO).
Water Reuse and Recycle in the D(C)EDED Bleach Sequence,
W74-07377 5D

Water Reuse and Recycle in Kraft Bleacheries,
W74-07394 5D

CLEMAR MFG. CORP., AZUSA, CALIF. ASSIGNEE.
Irrigation and Sprinkler System,
W74-07212 3F

CLEMSON UNIV., S.C. COLL. OF ENGINEERING.
A Systems Analysis of Water Quality Survey Design,
W74-07310 5B

CLEMSON UNIV., S.C. DEPT. OF ECONOMICS.
Economic Study of the Effect of Municipal Sewer Surcharges on Industrial Wastes and Water Usage,
W74-07057 5G

CLEMSON UNIV., SOUTH CAROLINA. DEPT. OF AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY.
Environmental Planning: An Economic Analysis. Applications for the Coastal Zone,
W74-07534 6B

COAST GUARD, PORTLAND, OREG.
Laws and Regulations of Pollution and Navigation in Pacific Northwest Estuaries,
W74-07499 5G

COL-MONT CORP., BUTTE, MONT. (ASSIGNEE).
Method of and Apparatus for the Recovery of Oil from Water,
W74-07201 5G

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF CIVIL ENGINEERING.
Dispersion of Contaminated Sediment Bed Load,
W74-07446 5B

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF STATISTICS.
Some Generalized Beta Distributions of the Second Kind Having Desirable Application Features in Hydrology and Meteorology,
W74-07412 2A

COLORADO UNIV., BOULDER. DEPT. OF ECONOMICS.
A Note on the Use of Spectral Analysis to Detect Leads and Lags in Annual Cycles of Water Quality,
W74-07522 7C

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, ASPENDALE (AUSTRALIA). DIV. OF ATMOSPHERIC PHYSICS.
A Direct Comparison of Satellite and Aircraft Infrared (10 Micrometers-12 Micrometers) Remote Measurements of Surface Temperature,
W74-07578 7B

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, GRIFFITH (AUSTRALIA). DIV. OF IRRIGATION RESEARCH.
Evaporation from an Irrigated Rice Crop in a Semi-Arid Region,
W74-07096 2D

CONNECTICUT AGRICULTURAL EXPERIMENT STATION, NEW HAVEN. DEPT. OF ECOLOGY AND CLIMATOLOGY.
Stomatal Mechanics,
W74-07593 2I

CONNECTICUT UNIV., STORRS.
The Environmental Impact of Cadmium,
W74-07530 5A

CORNELL UNIV., ITHACA, N.Y.
Planning and Operation of Urban Water Quality Management Systems,
W74-07334 5D

CORNELL UNIV., ITHACA, N.Y. DEPT. OF CONSERVATION.
Water Uses and Water Development in Fall Creek--Possible Conflicts,
W74-07149 6B

CORNELL UNIV., ITHACA, N.Y. WATER RESOURCES AND MARINE SCIENCES CENTER.
A Study of Potential Institutional Arrangements for Water Quality and Water Resources (Quantity) Planning and Management,
W74-07051 6B

CORPS OF ENGINEERS, HONOLULU, HAWAII. PACIFIC OCEAN DIV.
Agana Small Boat Harbor, Agana, Guam (Final Environmental Impact Statement).
W74-07294 4A

CRAFTMASTER, INC., WILLIAMSPORT, PA. (ASSIGNEE).
Oil Reclaiming Device for Removing Oil from the Surface of Water,
W74-07206 5G

CRANE CO., KING OF PRUSSIA, PA. COCHRANE DIV.
Application of Microstraining to Combined Sewer Overflow,
W74-07260 5D

High-Rate Disinfection of Combined Sewer Overflow,
W74-07263 5D

DATAMETRIC C'OR H, MCLEAN, VA.
Development of a Decision Room for Environntal Studies, (Feasibility Study),
W74-07371 6G

DELAWARE UNIV., NEWARK. DEPT. OF CHEMICAL ENGINEERING.
Catalytic Oxidation of Phenol in Dilute Concentration in Air,
W74-07086 5D

DELAWARE UNIV., NEWARK. WATER RESOURCES CENTER.
Annual Report/Fiscal Year 1973.
W74-07252 9D

DELHI UNIV. (INDIA). DEPT. OF CHEMISTRY.
Kaempferol (3,5,7,4'-Tetrahydroxyflavone) as a Chromogenic Reagent for Tin(IV),
W74-07579 5A

DELRO, INC., NEW CASTLE, DEL. ASSIGNEE.
Water Purification System,
W74-07213 5D

DENVER REGIONAL COUNCIL OF GOVERNMENTS, COLO.
Regional Environmental Reference.
W74-07085 6G

DEPARTMENT OF AGRICULTURE, LETHBRIDGE (ALBERTA). RESEARCH STATION.
Effects of Moisture Stress at Early Heading and of Nitrogen Fertilizer on Three Spring Wheat Cultivars,
W74-07351 3F

DEPARTMENT OF AGRICULTURE, SOUTH PERTH (AUSTRALIA).
The Effect of Waterlogging on the Mineral Nutrient Content of Trifolium Subterraneum,
W74-07355 3F

DEPARTMENT OF PRIMARY INDUSTRIES, BRISBANE (AUSTRALIA).
Performance of Lucerne (Medicago sativa) Lines in Pure Stands Under Irrigated and Rain Grown Conditions in Sub-Coastal Central Queensland,
W74-07359 3F

DEPT. OF CIVIL ENGINEERING. ILLINOIS UNIV., URBANA.
Microbial Indicators for the Biological Quality of Treated Wastewater Effluents,
W74-07372 5D

DISTRICT OF COLUMBIA DEPT. OF ENVIRONMENTAL SERVICES, WASHINGTON.
Hydrogen Peroxide Cures Filamentous Growth in Activated Sludge,
W74-07253 5D

DUKE UNIV., DURHAM, N.C. DEPT. OF CIVIL ENGINEERING.
Capital Cost Minimization of Drainage Networks,
W74-07309 4A

DUKE UNIV., DURHAM, N.C. SCHOOL OF FORESTRY.
Landscape Compartmentalization: An Ecological Approach to Land Use Planning,
W74-07053 6G

DUNDEE UNIV. (SCOTLAND). DEPT. OF BIOLOGICAL SCIENCES.
Effects of Water Stress on Growth and Nitrogen-Fixing Activity of Trifolium repens,
W74-07352 3F

EARTH SATELLITE CORP., WASHINGTON, D.C.
Aerial Spill Prevention Surveillance During Sub-Optimim Weather,
W74-07342 5A

EAST CAROLINA UNIV., GREENVILLE. DEPT. OF GEOLOGY.
Recent Estuarine Sediment History of the Roanoke Island Area, North Carolina,
W74-07245 2L

ECOLE POLYTECHNIQUE, MONTREAL (QUEBEC). HYDRAULIC DIV.
Streamflow Simulation: 3. The Broken Line Process and Operational Hydrology,
W74-07520 2A

EDISON WATER QUALITY RESEARCH LAB., N.J.
Combined Sewer Overflow Seminar Papers.
W74-07255 5D

Stormflow Pollution Control in the U.S.,
W74-07256 5D

ENVIREX, INC., MILWAUKEE, WIS. ENVIRONMENTAL SCIENCES DIV.
Screening/Dissolved-Air Flotation Treatment of Combined Sewer Overflows,
W74-07262 5D

ENVIRONMENTAL PROTECTION AGENCY, ATHENS, GA. AGRO-ENVIRONMENTAL SYSTEMS BRANCH.
Predicting Pesticide Runoff From Agricultural Land: A Conceptual Model,
W74-07427 5B

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W74-07379 5

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W74-07557 2

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W74-07317 5A

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W74-07320 4B

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W74-07326 2J

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W74-07413 2A

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W74-07162 5B

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W74-07184 2F

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W74-07237 2L

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W74-07246 2L

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W74-07329 2L

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W74-07376 5D

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W74-07055 5B

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W74-07358 3F

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W74-07430 5C

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W74-07138 4A

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W74-07348 2G

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W74-07099 2G

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W74-07100 2G

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W74-07583 5A

HEWLETT-PACKARD CO., AVONDALE, PA. AVONDALE DIV.
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W74-07582 5A

HONOLULU CITY AND COUNTY BOARD OF WATER SUPPLY, HAWAII.
Development of Dike Stored Water By Drilling, Waihee, Oahu,
W74-07137 2F

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W74-07139 4D

HYDROCOMP, INC., PALO ALTO, CALIF.
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W74-07300 6A

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W74-07564 5B

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W74-07572 5C

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Just a Moment,
W74-07414 2A

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W74-07087 2D

ILLINOIS STATE WATER SURVEY, URBANA.
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W74-07135 6B

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W74-07136 6B

ILLINOIS STATE WATER SURVEY, URBANA. HYDROLOGY SECTION.
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W74-07172 4B

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W74-07429 4B

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W74-07335 4A

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W74-07126 5C

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W74-07304 8A

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W74-07463 2A

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W74-07402 3D

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W74-07405 5

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W74-07401 4

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W74-07160 2

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W74-07448 8

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W74-07296 6

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W74-07510 5

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W74-07511 5B

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W74-07444 2K

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W74-07346 2G

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W74-07187 8I

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W74-07462 5D

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A New Look at River Capture and At The Denudation History of the Weald,
W74-07324 2J

A Computer System for Storage and Retrieval of Hydrogeological Data from Well Records,
W74-07328 7C

NAVAL ACADEMY, ANNAPOLIS, MD.
An Investigation of the Physical Impact of Sewage Outflow on a River-Estuarine Environment,
W74-07477 5C

NAVAL ACADEMY, ANNAPOLIS, MD. DIV. OF MATHEMATICS AND SCIENCE.
Factors Affecting Phytoplankton Production in a Eutrophic Reservoir,
W74-07121 5C

NAVAL UNDERWATER SYSTEMS CENTER, NEWPORT, R.I.
Spatial and Temporal Distribution of Suspended Sediment in Narragansett Bay and Rhode Island Sound,
W74-07232 2L

NEVADA UNIV., RENO. DESERT RESEARCH INST.
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W74-07110 2I

NEW BRUNSWICK UNIV., FREDERICTON. DEPT. OF CHEMISTRY.
The Photochemistry of Carbamates. 1. The Photodecomposition of Zectran: 4-Dimethylamino-3,5-XYLYL-N-Methyl Carbamate,
W74-07552 5B

NEW YORK STATE COLL. OF AGRICULTURE AND LIFE SCIENCES, ITHACA. DEPT. OF AGRONOMY.
Losses of Inorganic Nitrogen From Aquatic Systems,
W74-07426 5B

NEW YORK STATE DEPT. OF ENVIRONMENTAL CONSERVATION, ALABANY. ENVIRONMENTAL QUALITY RESEARCH AND DEVELOPMENT UNIT.
Pressure Sewers,
W74-07259 5D

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Land Disposal of Wastewater--Literature Review for 1973,
W74-07327 5D

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A Continuous Culture Study of Phosphate Uptake, Growth Rate and Polyphosphate in Scenedesmus Sp.,
W74-07549 5C

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Measures to Reduce Water Consumption in Southeastern New York.
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Proposed Water Supply Projects for Southeastern New York.
W74-07080 6D

Institutional Arrangements and Alternative Futures.
W74-07081 6D

NEW ZEALAND FOREST SERVICE, HARIHARI.
Management of South Westland Terrace Podocarp Forest Under a Selection Logging System,
W74-07347 4A

NEW ZEALAND FOREST SERVICE, HOKITIKA.
Potential of Westland's Morainic Soils for Forest Management,
W74-07594 4A

NORGES LANDBRUKSHOEGSKOLE, VOLLEBEKK. CHEMICAL RESEARCH LAB.
A New Colorimetric Procedure for the Determination of Benomyl,
W74-07559 5A

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Pollution Caused by Agriculture,
W74-07366 5B

NORTH CAROLINA AGRICULTURAL EXPERIMENT STATION, RALEIGH.
Leaching Losses of Sulfur During Winter Months When Applied as Gypsum, Elemental S or Prilled S,
W74-07449 5B

NORTH CAROLINA STATE UNIV., RALEIGH.
Phosphorus Supply Characteristics of Acid Organic Soils as Measured by Desorption and Mineralization,
W74-07345 2G

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Utilization of Fibrous Wastes as Sources of Nutrients,
W74-07472 5D

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Experimental Evaluation of a Method for Determining Unsaturated Hydraulic Conductivity,
W74-07088 2G

NORTH CAROLINA STATE UNIV., RALEIGH. DEPT. OF SOIL SCIENCE.
An Investigation of Propagation and the Mineral Nutrition of Spartina alterniflora,
W74-07486 5C

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W74-07473 5C

NORTH CAROLINA UNIV., MOREHEAD CITY. INST. OF MARINE SCIENCES.
Biological Investigations of Noxious Coelenterates and Ctenophores in Coastal North Carolina,
W74-07479 2L

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The Food Habits and Age and Growth of Goldeye, Hiodon alosoides (Rafinesque), in Beaver Creek, Lake Oahe, North Dakota, 1971-72,
W74-07474 8I

NORTHEAST MISSISSIPPI PLANNING AND DEVELOPMENT DISTRICT, BOONEVILLE.
Preliminary Water and Sewer Plan for Alcorn, Benton, Marshall, Prentiss, Tippah, Tishomingo Counties.
W74-07062 5D

NORTHERN TERRITORY ADMINISTRATION, DARWIN (AUSTRALIA). ANIMAL INDUSTRY AND AGRICULTURE BRANCH.
Liveweight Gains of Shorthorn Steers on Native and Improved Pastures at Adelaide River Northern Territory,
W74-07453 3F

NORTHWESTERN UNIV., EVANSTON, ILL. DEPT. OF GEOLOGY.
Amazon River Estuarine System,
W74-07229 2L

NOTRE DAME UNIV., IND. DEPT. OF BIOLOGY.
Nutrient Cycling and Productivity of Dystrophic Lake-Bog Systems (Part B),
W74-07466 5C

NOTTINGHAM UNIV. (ENGLAND).
A Note on the Areal Distribution of Suspended Sediment Yield in South Africa,
W74-07177 2J

O'BRIEN AND GERE ENGINEERS INC., SYRACUSE, N. Y.
Effect of Restricted Use of Phosphate-Based Detergents on Onondaga Lake,
W74-07566 5C

OAK RIDGE NATIONAL LAB., TENN.
Pollution, Production, and Compensation,
W74-07064 5G

OAKLAND UNIV., ROCHESTER, MICH. DEPT. OF BIOLOGICAL SCIENCES.
In Vitro Formation of Nitrate Reductase Using Extracts of the Nitrate Reductase Mutant of Neurospora crassa, Nit-1, and Rhodospirillum rubrum,
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Preliminary Diagnosis of a New Species of Marine Isopod From Stewart Island,
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A Study of the Communities of Invertebrates of Plants of Lake Chad: Preliminary Inquires, (In French),
W74-07538 2H

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W74-07251 5D

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Elemental Variability Within a Sampling Unit,
W74-07598 2K

OHIO STATE UNIV., COLUMBUS. DEPT. OF CHEMICAL ENGINEERING.
The Identification of the Reaction Products Formed by the Oxidation of Aqueous Ammonia with Potassium Ferrate VI,
W74-07333 5D

An Explanatory Work on the Oxidation of Ammonia by Potassium Ferrate (VI),
W74-07454 5D

OKLAHOMA STATE UNIV., STILLWATER. DEPT. OF AGRICULTURAL ENGINEERING.
Economic Size Selection for PVC Pipelines,
W74-07303 8A

OKLAHOMA STATE UNIV., STILLWATER. DEPT. OF GEOLOGY.
Depositional Features of Braided-Meandering Stream,
W74-07163 2J

OKLAHOMA UNIV., NORMAN. SCHOOL OF ENGINEERING AND ENVIRONMENTAL SCIENCE.
An Innovative Automatic Stream Gaging Method,
W74-07181 7B

ONTARIO MINISTRY OF AGRICULTURE AND FOOD, GUELPH. PESTICIDES RESIDUE LAB.
Residues of Atrazine, Cyanazine, and Their Phytotoxic Metabolites in a Clay Loam Soil,
W74-07585 5A

OREGON AGRICULTURAL EXPERIMENT STATION, CORVALLIS.
Micro-Determination of Cation-Exchange Capacity by Neutron Activation Analysis,
W74-07439 2G

OREGON COASTAL CONSERVATION AND DEVELOPMENT COMMISSION, PORT SIUSLAW.
Pacific Northwest Coastal Zone Management as it Relates to Estuary Protection,
W74-07500 6E

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Some Estuarine Factors Influencing Ascent of Anadromous Cutthroat Trout in Oregon,
W74-07493 2L

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An Economic Evaluation of Alternative Levels of Water Quality: The Role of Water Quality in Relation to Economic Benefits,
W74-07146 6B

Institutional Considerations,
W74-07147 6E

Resource Management Decisions: Externalities and Public Policy,
W74-07148 6A

OREGON STATE UNIV., CORVALLIS. DEPT. OF CIVIL ENGINEERING.
New Concepts in Environmental Planning,
W74-07492 6B

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The Demand for Sport Fishing at Yaquina Bay,
W74-07143 6B

The Impact of Sport Angling on the Yaquina Bay Economy,
W74-07144 6B

OREGON STATE UNIV., CORVALLIS. DEPT. OF OCEANOGRAPHY.
An Ecosystem Study in the Inside Passage of Southeastern Alaska,
W74-07495 5C

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Subsurface Heating and Irrigation of Soils: Its Effect on Temperature and Water Content and on Plant Growth,
W74-07054 2G

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The Predicted Influence of Kraft Mill Effluent on the Fishery Resources,
W74-07145 5C

OREGON STATE UNIV., CORVALLIS WATER RESOURCES INST.

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Utility Analysis in the Valuation of Extra-Market Benefits with Particular Reference to Water-Based Recreation,
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Sand-Wave Fields in Taiwan Strait,
W74-07175 2J

OSLO UNIV. (NORWAY). DEPT. OF LIMNOLOGY.
Byglandsfjorden. Primary Production and Other Limnological Features in an Oligotrophic Norwegian Lake,
W74-07554 5C

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Numerical Studies of Two-Dimensional Saturated-Unsaturated Drainage Models,
W74-07168 2G

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W74-07571 5A

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Microdetermination of Resorcinol in Presence of Phenol,
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Effluent - Fibre Recovery - Water Savings; Case History of a Recent Plant Installation,
W74-07395 5D

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Water and Wastewater Systems Inventory - Region H, North Carolina,
W74-07063 5D

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. DEPT. OF CIVIL ENGINEERING.
Effect of Agnes Floods on Annual Series in Pennsylvania,
W74-07455 2E

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. DEPT. OF SOIL CHEMISTRY.
Erosional Losses of S-Triazine Herbicides,
W74-07421 5B

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W74-07208 5G

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Occurrence and Distribution of the Vine Phylloxera, Phylloxera vitifoliae (Fitch), in the Olifants River Irrigation Area, Northwestern Cape Province,
W74-07356 3F

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The Plankton of Ponds Enriched with Wastes from Beet Sugar Factories,
W74-07478 5C

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Leech Communities (Hirudinea) in the Mazurian and Bialystok Regions and the Pomeranian Lake District,
W74-07542 5C

Population Density, Biomass and Maximum Natality Rate and Food Conditions in Ligidium Hypnorum L. (Isopoda),
W74-07590 8I

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Economic Evaluation and Determination of Plant Capacity and Dam Height,
W74-07305 8A

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Investigation of the Biology and Control of Noxious Coelenterates Occurring in the Coastal Waters of Puerto Rico,
W74-07480 2L

PURDUE UNIV., LAFAYETTE, IND. DEPT. OF AGRICULTURAL ECONOMICS.
Cost Sharing for Recreation: Efficiency and Equity,
W74-07307 6B

PURDUE UNIV., LAFAYETTE, IND. DEPT. OF AGRONOMY.
Flux-Gradient Relationships and Soil-Water Diffusivity from Curves of Water Content Versus Time,
W74-07512 2G

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An Experimental Study of Immiscible Displacement with an Unfavorable Mobility Ratio in Porous Media,
W74-07524 2F

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Generation Models for Synthetic Annual and Monthly Flows for Some Indiana Watersheds,
W74-07431 2A

A Computer Atlas of Hydrologic and Geomorphologic Data for Small Watersheds in Indiana,
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A Rainfall-Runoff Model Based on the Watershed Stream Network,
W74-07464 2A

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Instability of Water Cooled from Above,
W74-07458 2H

RESEARCH COUNCIL OF ALBERTA, EDMONTON.
Application of Geochemistry to the Search for Crude Oil and Natural Gas,
W74-07161 4B

Source and Budget of Sulfate in Precipitation from Central Alberta, Canada,
W74-07164 5J

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W74-07180 2

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W74-07103 3F

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A Model of Irrigated Agriculture and Regional Development in Southern Argentina: The Rio Negro Basin,
W74-07306 6A

Residuals in Manufacture of Paper,
W74-07399 5E

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The Marine Diatom Ethmodiscus rex: Its Morphology and Occurrence in the Plankton of the Sargasso Sea,
W74-07547 5A

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Planning and Developing Waterfront Property,
W74-07072 6E

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Incidence of Resistance to Tetracycline Chloramphenicol and Ampicillin Among Salmonella Species Isolated in the Netherlands in 1969, 1970 and 1971,
W74-07562 5C

ROLLAND PAPER CO. LTD., ST. JEROME (QUEBEC).
Pollution Control Through Training, Education and Rigorous Follow-Up,
W74-07408 5G

RUTGERS - THE STATE UNIV., NEW BRUNSWICK, N.J. DEPT. OF CIVIL AND ENVIRONMENTAL ENGINEERING.
Cross-Spectral Analysis of Rainfall and Runoff for Raritan and Mullica River Basins in New Jersey,
W74-07183 2A

RUTGERS - THE STATE UNIV., NEW BRUNSWICK, N.J. DEPT. OF ENVIRONMENTAL SCIENCE.
Rotating Biological Disk Wastewater Treatment Process - Pilot Plant Evaluation,
W74-07373 5D

RUTGERS-THE STATE UNIV., NEW BRUNSWICK, N.J. WATER RESOURCES RESEARCH INST.
Environmental Quality and its Evaluation,
W74-07533 5G

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A Preliminary Description of the Physico-Chemical Characteristics and Biota of Three Strip Mine Lakes, Spencer County, Indiana,
W74-07403 5B

SALSBURY LABS., CHARLES CITY, IOWA, PHARMACEUTICAL DEVELOPMENT AND ANALYSIS DEPT.
Recovery of Arsenic by Dry Ashing from Animal Tissue Fortified with Organoarsenicals or Arsenic Trioxide,
W74-07573 5A

SANITARNO-GIGIENICHESKII MEDITSINSKII INSTITUT, LENINGRAD (USSR).
Hygienic Features of Silicate Anticorrosion Coatings for Water Reservoirs, (In Russian),
W74-07364 5F

SETH G. N. KHALSA COLL., SRI GANGANAGAR (INDIA).
A Contribution to the Botany of Ganganagar District, North Rajasthan,
W74-07357 3F

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An Oil Recovery System Utilizing Polyurethane Foam--A Feasibility Study,
W74-07341 5G

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Waste water treatment,
W74-07219 5D

SIMON FRASER UNIV., BURNABY (BRITISH COLUMBIA). DEPT. OF BIOLOGICAL SCIENCES.
Marine Fungi Isolated from a Kraft Pulp Mill Outfall Area,
W74-07396 5B

SMITHSONIAN INSTITUTION, ROCKVILLE, MD. RADIATION BIOLOGY LAB.
Effect of Light Intensity and Glycerol on the Growth, Pigment Composition, and Ultrastructure of Chroomonas Sp.,
W74-07548 5C

SMITHSONIAN INSTITUTION, WASHINGTON, D.C. DIV. OF SEDIMENTOLOGY.
Basin Plains in the Eastern Mediterranean: Significance in Interpreting Ancient Marine Deposits: 1. Basin Depth and Configuration,
W74-07158 2J

SNESSARD L. HOLLAND LAW CENTER, GAINESVILLE, FLA.
More Heat Than Light: Thermal Pollution Versus Heat Energy Utilization,
W74-07465 5B

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Apparatus for Removing Surface Pollutants from Water and Other Liquids,
W74-07223 5G

SOIL CONSERVATION SERVICE, BERKELEY, CALIF.
Development of an Agricultural Drainage Guide,
W74-07438 4A

SOUTH CAROLINA UNIV., COLUMBIA. COLL. OF ARTS AND SCIENCES.
Biogeochemical Variables in Bottom Sediments of the Rapphannock River Estuary,
W74-07244 2L

SOUTH CAROLINA UNIV., COLUMBIA. DEPT. OF GEOLOGY.
Santee Submergence, Example of Cyclic Submerged and Emerged Sequences,
W74-07247 2L

SOUTHWESTERN ILLINOIS METROPOLITAN AREA PLANNING COMMISSION, COLLINSVILLE.
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W74-07066 4A

Study Design. Surface Drainage Program, Madison, St. Clair, Monroe and Randolph Counties, Illinois.
W74-07083 4A

STANFORD UNIV., CALIF. DEPT. OF GEOLOGY.
Remanent Magnetization of Modern Tidal Flat Sediments from San Francisco Bay, California,
W74-07173 2L

A Numerical Model Based on Coupled One-Dimensional Richards and Boussinesq Equations,
W74-07515 2F

STATE UNIV. OF NEW YORK, BUFFALO. DEPT. OF BIOCHEMISTRY.
Pharmacodynamics of Methyl Mercury in the Rainbow Trout (Salmo Gairdneri): Tissue Uptake, Distribution and Excretion,
W74-07597 5C

STATE UNIV. OF NEW YORK, BUFFALO. DEPT. OF CHEMISTRY.
Rotating Ring-Disk Electrode Study of the Adsorption of Lead on Gold in 0.5M Potassium Chloride,
W74-07555 2K

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Geologic Aspects of Waste Solids and Marine Waste Deposits, New York Metropolitan Region,
W74-07171 5B

Possible Effects of Construction and Operation of a Supertanker Terminal on the Marine Environment in New York Bight,
W74-07488 5C

STATIUNEA DE CERCETARI PISCICOLE, BRAILA (RUMANIA).
A New Type of Incubator Used in the Induced Spawning of Phytophagous Fishes, (In Rumanian),
W74-07434 8I

STEVENAGE (ENGLAND). WATER POLLUTION RESEARCH LAB.
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W74-07420 2K

STEVENS, THOMPSON AND RUNYAN, INC., PORTLAND, OREG.
Wallowa Lake Basin Comprehensive Plan.
W74-07065 5D

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Safety Device Against Leakage from Ships, Especially Tankers,
W74-07205 5G

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Th-234/U-238 Activity Ratios in Pacific Ocean Bottom Waters,
W74-07322 2K

TECHNION-ISRAEL INST. OF TECH., HAIFA. DEPT. OF CIVIL ENGINEERING.
Heat Dispersion Effect on Thermal Convection in a Porous Medium Layer,
W74-07156 2F

TECHNISCHE UNIVERSITAET, DARMSTADT (WEST GERMANY). WASSER- UND ABWASSERFORSCHUNGSSTELLE.
Possibilities of Effluent Clarification (Moeglichkeiten der Abwasserklaerung),
W74-07382 5D

TEIKYO UNIV., HACHIOJI (JAPAN). DEPT. OF ZOOLOGY.
Vertical Migration of Spaniotoma akamusi Larvae (Diptera:Chironomidae) through the Bottom Deposits of Lake Suwa,
W74-07543 2H

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W74-07060 5D

TEXAS A AND M UNIV., COLLEGE STATION. DEPT. OF BIOLOGY.
Effect of Anhydrous Ammonia on a Central Texas Pond, and a Review of Previous Research with Ammonia in Fisheries Management,
W74-07595 5C

TEXAS A AND M UNIV., COLLEGE STATION. DEPT. OF METEOROLOGY.
On The Determination of Turbulent Diffusivity in Shallow Waters by Aerial Photography of Floating Markers,
W74-07316 2H

TEXAS UNIV., AUSTIN. CENTER FOR RESEARCH IN WATER RESOURCES.
The Relationship of Land Use to Water Use in San Antonio, Texas,
W74-07067 4A

Instrumentation for Engineering Management of a Multi-Purpose River Basin System (Trinity River Basin, Texas) Real-Time Engineering Management of a Multi-Purpose River Basin System,
W74-07369 4A

THIOKOL CHEMICAL CORP., BRIGHAM CITY, UTAH.
Cyanide Waste Treatment Utilizing Catalytic Oxidation,
W74-07272 5D

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The Chemical Form and Bodily Distribution of Mercury in Marine Fish,
W74-07551 5A

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The Effluent-Free Bleached Kraft Pulp Mill. Part V. The R4 Process for Chlorine Dioxide Manufacture to Decrease Production of Sodium Sulphate,
W74-07378 5D

TORONTO UNIV. (ONTARIO). DEPT. OF CIVIL ENGINEERING.
Aerobic Digestion of Organic Sludges Containing Inorganic Phosphorus Precipitates: Phase I,
W74-07268 5D

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W74-07567 5A

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W74-07106 4B

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Utilization of White Water in Board Mills (Ispol'zovanie oborotnoi vody na kartonnykh fabrikakh),
W74-07397 5D

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A Mixing Cell Model for Longitudinal Dispersion in Open Channels,
W74-07527 8B

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First Characterization of the Runoff From the Watershed of the Manso Superior River and its Basins (Argentina), (In Spanish),
W74-07536 2E

UNIVERSITY COLL. OF NORTH WALES, MENAI BRIDGE. MARINE SCIENCE LABS.
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W74-07353 5C

Ultra-Violet Absorption Characteristics of Natural Waters,
W74-07419 2K

UNIVERSITY COLL. OF WALES, ABERYSTWYTH.
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W74-07586 5A

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W74-07565 5A

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W74-07563 5A

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The Micro-Meteorology of an Extended Area of Tea Before and After Rain.
W74-07354 3F

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W74-07418 5B

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Intensive Infiltrometer Studies on A Plowed Big Sagebrush Site,
W74-07166 2G

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Biodeposition as a Factor in Sedimentation of Fine Suspended Solids in Estuaries,
W74-07231 2L

Effect of Increasing Depth on Salinity in the James River Estuary,
W74-07250 2L

Function of Marshes in Reducing Eutrophication of Estuaries of the Middle Atlantic Region,
W74-07336 5C

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Systems simulation of the effect of tertiary treatment for carbon, nitrogen, and phosphorus removal upon primary productivity, standing crop, and community structure of autotrophic and hetertrophic communities in receiving model streams.
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Effects of Thickness on Bacterial Film,
W74-07545 5C

VRIJE UNIVERSITEIT, AMSTERDAM (NETHERLANDS). INST. OF EARTH SCIENCES.
Hydrogeology of the Sasso Lungo Group, a Dolomitic Reef Stock in the Alpine Dolomites of North Italy,
W74-07153 2F

VSESOYUZNYI GEOLOGICHESKII INSTITUT, LENINGRAD (USSR).
Role of Turbidity Currents in Sedimentary Processes (O roli mut'yevykh potokov v protsessakh osadkonakopleniya),
W74-07502 2J

VSESOYUZNYI NAUCHNO-ISSLEDOVATELSKII KHIMIKO-FARMATSEVTICHESKII INSTITUT, MOSCOW (USSR).
Purification of Effluents and Improvement of the Technology in the Production of Chloretone, (In Russian),
W74-07285 5D

VSESOYUZNYI-NAUCHNYI PLANOVII OTDEL BUMAZHNOI PROMYSHLENNOST (USSR).
Reduction of the Volume of Pollutants Discharged and of Fresh Water Consumption (Sokrashchenie sbrosa zagryaznenii i umen'shenie raskhoda svezhei vody),
W74-07384 5D

WALTER DORWIN TEAGUE ASSOCIATES, NEW YORK. (ASSIGNEE).
Water Purification Apparatus,
W74-07209 5D

WAPORA, INC., WASHINGTON, D.C.
An Overview of Water Reuse Potential in Pulp and Paper Manufacturing,
W74-07410 5D

WASHINGTON STATE UNIV., PULLMAN. DEPT. OF AGRICULTURAL ECONOMICS.
An Economic Analysis of Selected Agricultural Uses of Warm Water in the Pacific Northwest Resulting from Electric Power Generation,
W74-07125 3C

WASHINGTON UNIV., SEATTLE. DEPT. OF CIVIL ENGINEERING.
State of the Art of Floating Breakwaters,
W74-07498 8A

WASHINGTON UNIV., SEATTLE. DEPT. OF OCEANOGRAPHY.
A Strategy for Modeling Primary Production in Stratified Fjords,
W74-07494 5C

WASHINGTON UNIV., SEATTLE. GEOPHYSICS PROGRAM; AND WASHINGTON UNIV., SEATTLE. DEPT. OF CIVIL ENGINEERING.
Avalanche Studies (1971-1972),
W74-07319 2C

WATER MANAGEMENT BOARD, BRNO (CZECHOSLOVAKIA).
Photometric Determination of Manganese in Water by Using O-Tolidine,
W74-07315 2K

WATER RESEARCH ASSOCIATION, MARLOW (ENGLAND).
Planning and Operational Studies in the Integrated Use of Desalination. Case Studies for Cyprus and Jersey,
W74-07308 3A

WATERLOO UNIV. (ONTARIO). DEPT. OF CHEMICAL ENGINEERING.
Use and Production of Iron Salts for Phosphorus Removal,
W74-07269 5D

WATERLOO UNIV. (ONTARIO). DEPT. OF CIVIL ENGINEERING.
The Forecasting of Streamflow Using the Method of Characteristic Modes,
W74-07178 4A

WATERWAYS EXPERIMENT STATION., VICKSBURG, MISS.
Herbivorous Fish for Aquatic Plant Control,
W74-07470 4A

WELLINGTON CITY CORP. (NEW ZEALAND). WORKS DEPT.
Moina Sp. (Cladocera: Moinidae) in a Sewage Plant, Wellington, Referred to Moina tenuicornis Sars, 1896 (Note),
W74-07569 5A

WESTERN WASHINGTON STATE COLL., BELLINGHAM. DEPT. OF GEOLOGY.
Source of Recent Nearshore Marine Clays, Southeastern United States,
W74-07238 2L

WESTINGHOUSE OCEANIC DIV., ANNAPOLIS, MD.
Program Development Plan for the Mesa-New York Bight Regional Project.
W74-07078 6B

WILBUR SMITH AND ASSOCIATES, DENVER, COLO.
User Charges and Industrial Cost Recovery, Denver SMSA,
W74-07370 5D

WINDSOR UNIV. (ONTARIO). INDUSTRIAL RESEARCH INST.
The Effects of Household Sanitary Systems on Effluent Phosphate Levels,
W74-07267 5D

WISCONSIN UNIV., MADISON.
Waste Water Treatment in Commercial Fish Processing: Reducing Stick Water Loadings,
W74-07270 5D

WISCONSIN UNIV., MADISON. DEPT. OF AGRICULTURAL ECONOMICS.
Environmental Impact Analysis: An Examination of Three Methodologies,
W74-07339 6G

WISCONSIN UNIV., MADISON. DEPT. OF CIVIL AND ENVIRONMENTAL ENGINEERING.
Planar and Axisymmetric Bottom Withdrawal from a Density-Stratified Reservoir,
W74-07340 4A

WISCONSIN UNIV., MADISON. DEPT. OF METEOROLOGY.
Summertime Temperature and Circulation Patterns in Lake Superior,
W74-07338 2H

WISCONSIN UNIV., MADISON. DEPT. OF SOIL SCIENCE.
Methylmercury Formation in Mercury-Treated River Sediments During in Situ Equilibration,
W74-07425 5B

WYOMING UNIV., LARAMIE. WATER RESOURCES RESEARCH INST.
Coal-Energy Development in the Northern Great Plains.
W74-07056 6D

Ninth Annual Report of the Water Resources Research Institute of the University of Wyoming (Activities During FY 1973).
W74-07457 9A

XODAR CORP., WARWICK, R. I. ASSIGNEE.
Agitating and Aerating Apparatus,
W74-07221 5D

YAMAGATA PREFECTURAL SCHOOL FOR THE BLIND, KAMINOYAMA (JAPAN).
Studies of the Ingredients Variation of the Sake-Gawa River, A Tributary of the Mogami River (In Japanese),
W74-07360 2K

ACCESSION NUMBER INDEX

W74-07051 6B
W74-07052 2G
W74-07053 6G
W74-07054 2G
W74-07055 5B
W74-07056 6D
W74-07057 5G
W74-07058 6B
W74-07059 6B
W74-07060 5D
W74-07061 6B
W74-07062 5D
W74-07063 5D
W74-07064 5G
W74-07065 5D
W74-07066 4A
W74-07067 4A
W74-07068 6B
W74-07069 4A
W74-07070 6B
W74-07071 5D
W74-07072 6B
W74-07073 4A
W74-07074 4A
W74-07075 4A
W74-07076 4A
W74-07077 5D
W74-07078 6B
W74-07079 6D
W74-07080 6D
W74-07081 6D
W74-07082 5D
W74-07083 4A
W74-07085 6G
W74-07086 5D
W74-07087 2D
W74-07088 2G
W74-07089 2G
W74-07090 3F
W74-07091 3F
W74-07092 4B
W74-07093 5B
W74-07094 2C
W74-07095 3C
W74-07096 2D
W74-07097 2I
W74-07098 2I
W74-07099 2G
W74-07100 2G
W74-07101 5C
W74-07102 3F
W74-07103 3B
W74-07104 2J
W74-07105 3F
W74-07106 4B
W74-07107 3F
W74-07108 6B
W74-07109 2I
W74-07110 2I
W74-07111 4A
W74-07112 5G
W74-07113 6E
W74-07114 6E
W74-07115 6E
W74-07116 6E
W74-07117 6E
W74-07118 8A
W74-07119 6E
W74-07120 5G
W74-07121 5C
W74-07122 5C
W74-07123 5G
W74-07124 5D
W74-07125 3C
W74-07126 5C
W74-07127 6B
W74-07128 6B
W74-07129 6B
W74-07130 6B
W74-07131 6B
W74-07132 6B
W74-07133 6B
W74-07134 2F
W74-07135 6B
W74-07136 6B
W74-07137 2F
W74-07138 4A
W74-07139 4D
W74-07140 5G
W74-07141 5D
W74-07142 6B
W74-07143 6B
W74-07144 6B
W74-07145 5C
W74-07146 6B
W74-07147 6E
W74-07148 6A
W74-07149 6B
W74-07150 6B
W74-07151 2G
W74-07152 2G
W74-07153 2F
W74-07154 2F
W74-07155 2A
W74-07156 2F
W74-07157 2F
W74-07158 2J
W74-07159 7B
W74-07160 2L
W74-07161 4B
W74-07162 5B
W74-07163 2J
W74-07164 5B
W74-07165 2A
W74-07166 2G
W74-07167 2K
W74-07168 2G
W74-07169 2D
W74-07170 2G
W74-07171 5B
W74-07172 4B
W74-07173 2L
W74-07174 2J
W74-07175 2J
W74-07176 4B
W74-07177 2J
W74-07178 4A
W74-07179 2E
W74-07180 2I
W74-07181 7B
W74-07182 2F
W74-07183 2A
W74-07184 2F
W74-07185 2E
W74-07186 4B
W74-07187 8I
W74-07188 7C
W74-07189 8C
W74-07190 7C
W74-07191 2F
W74-07192 4A
W74-07193 6B
W74-07194 2H
W74-07195 4A
W74-07196 5D
W74-07197 5D
W74-07198 5D
W74-07199 5D
W74-07200 5D
W74-07201 5G
W74-07202 5D
W74-07203 5D
W74-07204 8B
W74-07205 5G
W74-07206 5G
W74-07207 3A
W74-07208 5G
W74-07209 5D
W74-07210 8A
W74-07211 2D
W74-07212 3F
W74-07213 5D
W74-07214 5D
W74-07215 5G
W74-07216 5D
W74-07217 5D
W74-07218 5D
W74-07219 5D
W74-07220 5G
W74-07221 5D
W74-07222 5G
W74-07223 5G
W74-07224 8B
W74-07225 2L
W74-07226 2L
W74-07227 2L
W74-07228 5B
W74-07229 2L
W74-07230 2G
W74-07231 2L
W74-07232 2L
W74-07233 2L
W74-07234 2L
W74-07235 2G
W74-07236 2L
W74-07237 2L
W74-07238 2L
W74-07239 2L
W74-07240 2L
W74-07241 2L
W74-07242 2L
W74-07243 2L
W74-07244 2L
W74-07245 2L
W74-07246 2L
W74-07247 2L
W74-07248 2L
W74-07249 5C
W74-07250 2L
W74-07251 5D
W74-07252 9D
W74-07253 5D
W74-07254 5D
W74-07255 5D
W74-07256 5D
W74-07257 5D
W74-07258 5D
W74-07259 5D
W74-07260 5D
W74-07261 5D
W74-07262 5D
W74-07263 5D
W74-07264 5D
W74-07265 5D
W74-07266 5D
W74-07267 5D
W74-07268 5D
W74-07269 5D
W74-07270 5D
W74-07271 5D
W74-07272 5D
W74-07273 5D
W74-07274 5G
W74-07275 6E
W74-07276 6E
W74-07277 6E
W74-07278 6E
W74-07279 2G
W74-07280 6E
W74-07281 6E
W74-07282 5G
W74-07283 6E
W74-07284 6E
W74-07285 5D
W74-07286 6E
W74-07287 6E
W74-07288 6E
W74-07289 6E
W74-07290 6E
W74-07291 6E
W74-07292 3F
W74-07293 6E
W74-07294 4A
W74-07295 4A
W74-07296 6A
W74-07297 5B
W74-07298 5B
W74-07299 6A
W74-07300 6A
W74-07301 3F
W74-07302 6D
W74-07303 8A
W74-07304 8A
W74-07305 8A
W74-07306 6A
W74-07307 6B
W74-07308 3A
W74-07309 4A
W74-07310 5B
W74-07311 5B
W74-07312 5D
W74-07313 2F
W74-07314 8H
W74-07315 2K
W74-07316 2H
W74-07317 5A
W74-07318 4B
W74-07319 2C
W74-07320 4B
W74-07321 2E
W74-07322 2K
W74-07323 2E
W74-07324 2J
W74-07325 2L
W74-07326 2J
W74-07327 5D
W74-07328 7C
W74-07329 2L
W74-07330 2J
W74-07331 2J
W74-07332 9D
W74-07333 5D
W74-07334 5D
W74-07335 4A
W74-07336 5C
W74-07337 5C
W74-07338 2H
W74-07339 6G
W74-07340 4A
W74-07341 5G
W74-07342 5A
W74-07343 5D
W74-07344 2G
W74-07345 2G
W74-07346 2G
W74-07347 4A
W74-07348 2G
W74-07349 2H
W74-07350 2L
W74-07351 3F
W74-07352 3F
W74-07353 5C
W74-07354 3F
W74-07355 3F
W74-07356 3F
W74-07357 3F
W74-07358 3F
W74-07359 3F
W74-07360 2K
W74-07361 5C
W74-07362 5D
W74-07363 5B

W74-07364 5F
W74-07365 5F
W74-07366 5B
W74-07367 5C
W74-07368 3E
W74-07369 4A
W74-07370 5D
W74-07371 6G
W74-07372 5D
W74-07373 5D
W74-07374 5D
W74-07375 5D
W74-07376 5D
W74-07377 5D
W74-07378 5D
W74-07379 5D
W74-07380 5D
W74-07381 5D
W74-07382 5D
W74-07383 5D
W74-07384 5D
W74-07385 5A
W74-07386 5D
W74-07387 5D
W74-07388 5B
W74-07389 5D
W74-07390 5D
W74-07391 5D
W74-07392 5D
W74-07393 5D
W74-07394 5D
W74-07395 5D
W74-07396 5B
W74-07397 5D
W74-07398 5D
W74-07399 5B
W74-07400 2K
W74-07401 4B
W74-07402 3D
W74-07403 5B
W74-07404 5D
W74-07405 5A
W74-07406 5D
W74-07407 5D
W74-07408 5G
W74-07409 5D
W74-07410 5D
W74-07411 5D
W74-07412 2A
W74-07413 2A
W74-07414 2A
W74-07415 2H
W74-07416 2H
W74-07417 5C
W74-07418 5B
W74-07419 2K
W74-07420 2K
W74-07421 5B
W74-07422 5B
W74-07423 5B
W74-07424 5B
W74-07425 5B
W74-07426 5B
W74-07427 5B
W74-07428 7C
W74-07429 4B
W74-07430 5C
W74-07431 2A
W74-07432 2A
W74-07433 8B
W74-07434 8I
W74-07435 3F
W74-07436 5G
W74-07437 7B
W74-07438 4A
W74-07439 2G
W74-07440 3F
W74-07441 5D
W74-07442 4A
W74-07443 2G
W74-07444 2K
W74-07445 5G
W74-07446 5B
W74-07447 3F
W74-07448 8I
W74-07449 5B
W74-07450 3F
W74-07451 3F
W74-07452 3F
W74-07453 3F
W74-07454 5D
W74-07455 2E
W74-07456 9A
W74-07457 9A
W74-07458 2H
W74-07459 3F
W74-07460 5D
W74-07461 5D
W74-07462 5D
W74-07463 2A
W74-07464 2A
W74-07465 5B
W74-07466 5C
W74-07467 5C
W74-07468 4C
W74-07469 5C
W74-07470 4A
W74-07471 5C
W74-07472 5D
W74-07473 5C
W74-07474 8I
W74-07475 5G
W74-07476 2I
W74-07477 5C
W74-07478 5C
W74-07479 2L
W74-07480 2L
W74-07481 8I
W74-07482 2I
W74-07483 5B
W74-07484 5C
W74-07485 5D
W74-07486 5C
W74-07487 5C
W74-07488 5C
W74-07489 5C
W74-07490 5C
W74-07491 2L
W74-07492 6B
W74-07493 2L
W74-07494 5C
W74-07495 5C
W74-07496 2L
W74-07497 2L
W74-07498 8A
W74-07499 5G
W74-07500 6E
W74-07501 2J
W74-07502 2J
W74-07503 2J
W74-07504 2F
W74-07505 2K
W74-07506 2A
W74-07507 2J
W74-07508 3F
W74-07509 2G
W74-07510 5B
W74-07511 5B
W74-07512 2G
W74-07513 2K
W74-07514 2F
W74-07515 2F
W74-07516 2F
W74-07517 2G
W74-07518 2G
W74-07519 2A
W74-07520 2A
W74-07521 2F
W74-07522 7C
W74-07523 2F
W74-07524 2F
W74-07525 4C
W74-07526 2C
W74-07527 8B
W74-07528 5B
W74-07529 2D
W74-07530 5A
W74-07531 5C
W74-07532 5B
W74-07533 5G
W74-07534 6B
W74-07535 2I
W74-07536 2E
W74-07537 2I
W74-07538 2H
W74-07539 2I
W74-07540 5C
W74-07541 5C
W74-07542 5C
W74-07543 2H
W74-07544 5B
W74-07545 5C
W74-07546 5C
W74-07547 5A
W74-07548 5C
W74-07549 5C
W74-07550 5C
W74-07551 5A
W74-07552 5B
W74-07553 7B
W74-07554 5C
W74-07555 2K
W74-07556 5C
W74-07557 2K
W74-07558 5A
W74-07559 5A
W74-07560 5A
W74-07561 5C
W74-07562 5C
W74-07563 5A
W74-07564 5B
W74-07565 5A
W74-07566 5C
W74-07567 5A
W74-07568 2L
W74-07569 5A
W74-07570 2I
W74-07571 5A
W74-07572 5C
W74-07573 5A
W74-07574 5A
W74-07575 5A
W74-07576 5A
W74-07577 5B
W74-07578 7B
W74-07579 5A
W74-07580 5A
W74-07581 5C
W74-07582 5A
W74-07583 5A
W74-07584 5C
W74-07585 5A
W74-07586 5A
W74-07587 5C
W74-07588 8I
W74-07589 2H
W74-07590 8I
W74-07591 8I
W74-07592 8I
W74-07593 2I
W74-07594 4A
W74-07595 5C
W74-07596 3F
W74-07597 5C
W74-07598 2K
W74-07599 8I
W74-07600 4A

ABSTRACT SOURCES

Source	Accession Number	Total
A. Centers of Competence		
Battelle Memorial Institute, Methods for Chemical and Biological Identification of Pollutants	W74-07544 – 07587	44
Colorado State University, Irrigation Return Flow Quality	W74-07433 07436 -- 07447 07449 -- 07452	17
Cornell University, Policy Models for Water Resources Systems	W74-07296 – 07300 07302 – 07312	16
Franklin Institute, Municipal Wastewater Treatment Technology	W74-07255 -- 07274	20
Institute of Paper Chemistry, Water Pollution from Pulp and Paper Industry	W74-07375 – 07411	37
University of Arizona, Arid Land Water Resources	W74-07089 – 07100 07102 – 07111	22
University of Florida, Eastern U.S. Water Law	W74-07112 -- 07120 07275 – 07278 07280 – 07284 07286 – 07295 07465	29
University of North Carolina, Metropolitan Water Resources Planning and Management	W74-07057 -- 07083 07085	28
University of Wisconsin, Eutrophication	W74-07466 – 07475 07477 -- 07481 07483 – 07491 07493 -- 07499	31
University of Wisconsin, Water Resources Economics	W74-07122 – 07125 07127 – 07150 07492, 07500	30
U.S. Geological Survey, Hydrology	W74-07153 -- 07170 07172 – 07179 07181 -- 07195 07225 – 07229 07231 – 07234 07236 – 07250 07313 – 07333 07412 -- 07430 07454 – 07457 07501 – 07529	138
B. State Water Resources Research Institutes		
Arkansas Water Resources Research Center	W74-07052	1
Connecticut Institute of Water Resources	W74-07530	1
Delaware Water Resources Center	W74-07086, 07252	2
Hawaii Water Resources Research Center	W74-07531	1
Idaho Water Resources Research Institute	W74-07087	1
Illinois Water Resources Center	W74-07335	1
Indiana Water Resources Research Center	W74-07088 07431 – 07432 07458 – 07464	10

Source	Accession Number	Total
B. State Water Resources Research Institutes (Cont'd)		
Missouri Water Resources Research Center	W74-07532	1
New Jersey Water Resources Research Institute	W74-07533	1
North Carolina Water Resources Research Institute	W74-07053	1
Oregon Water Resources Research Institute	W74-07054	1
Pennsylvania Institute for Research on Land and Water Resources	W74-07055	1
South Carolina Water Resources Research Institute	W74-07534	1
Texas Water Resources Institute	W74-07369	1
Virginia Water Resources Research Center	W74-07336 – 07337	2
Wisconsin Water Resources Center	W74-07338 – 07340	3
Wyoming Water Resources Research Institute	W74-07056	1
C. Other		
BioSciences Information Service	W74-07101, 07121 07126 07151 – 07152 07171, 07180 07230, 07235 07279, 07285 07301 07344 – 07368 07434 – 07435 07448, 07453 07476, 07482 07535 – 07543 07588 – 07600	65
Environmental Protection Agency	W74-07253 – 07254 07341 – 07343 07370 – 07374	10
Ocean Engineering Information Service (Patents)	W74-07196 – 07224	29
Office of Water Resources Research	W74-07051, 07251 07334	3

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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

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- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

6 WATER RESOURCES PLANNING

7 RESOURCES DATA

8 ENGINEERING WORKS

9 MANPOWER, GRANTS, AND FACILITIES

10 SCIENTIFIC AND TECHNICAL INFORMATION

INDEXES

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

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SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

VOLUME 7, NUMBER 15
AUGUST 1, 1974

W74-07601 -- W74-08150

The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

CONTENTS

FOREWORD_____iii

SUBJECT FIELDS AND GROUPS

(Use Edge Index on back cover to Locate Subject Fields and Indexes in the journal.)

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Non-Water Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1B. Aqueous Solutions and Suspensions

ADHESION OF ICE FROZEN FROM DILUTE ELECTROLYTE SOLUTIONS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2C.
W74-07618

2. WATER CYCLE

2A. General

THE METHODOLOGY OF BAYESIAN INFERENCE AND DECISION MAKING APPLIED TO EXTREME HYDROLOGIC EVENTS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
E. F. Wood, I. Rodriguez-Iturbe, and J. C. Schaake.
Available from the National Technical Information Service as PB-232 009, $6.75 in paper copy, $1.45 in microfiche. Ralph M. Parsons Laboratory for Water Resources and Hydrodynamics, Technical Report No 178, January 1974. 297 p, 56 fig, 42 tab, 50 ref. OWRR/C-4118(No 9021)(2).

Descriptors: Floods, Rainfall-runoff relationships, Model studies, *Risks, *Decision making, Rhode Island, *Flood discharge, *Flood frequency, *Flood protection, Flood damage, Statistical methods, Statistical models.
Identifiers: *Bayesian analysis.

This study presents the methodology of Bayesian inference and decision making applied to extreme hydrologic events. Inference procedures must consider both the natural or 'modelled' uncertainty of the hydrologic process and the statistical uncertainty due to a lack of information. Two types of statistical uncertainty were considered. The first type is the uncertainty in modelling the hydrologic process, and the second type is the uncertainty in the values of the model parameters. The uncertainty is reduced by considering prior sources of information (regional regression, theoretical flood frequency analysis or subjective assessment) and historical flood data. A 'Bayesian distribution' of flood discharges is developed that fully accounts for parameter uncertainty. In an analogous manner, model uncertainty is analyzed, which leads to a 'composite Bayesian distribution'. The uncertainty in flood frequency curves from rainfall-runoff models is also analyzed, due to the uncertainty in the parameters of the models. The Bayesian inference model is then applied to a Bayesian decision model, where the decision rule is the maximization of expected net monetary benefits. A case study of determining the optimal size of local flood protection for Woonsocket, Rhode Island, was considered, using realistic flood damage and cost functions. The results indicate that Bayesian inference procedures can be used to fully account for statistical uncertainty and that Bayesian decision procedures provide a rational approach for making decisions under uncertainty.
W74-07601

A STREAMFLOW MODEL FOR METROPOLITAN PLANNING AND DESIGN,
Metropolitan Sanitary District of Greater Chicago, Ill.
R. F. Lanyon, and J. P. Jackson.
Available from National Technical Information Service as PB-232 181, $3.75 in paper copy, $1.45 in microfiche. American Society of Civil Engineers, New York, N.Y., Urban Water Resources Research Program Technical Memorandum No 20, January, 1974, 49 p, 4 tab, 18 fig, 4 ref. OWRR C-4048(9009)(3). 14-31-0001-9009.

Descriptors: *Computer models, *Urbanization, *Streamflow, *Drainage systems, *Project planning, *Design, *Storm runoff, Surface runoff, Rainfall-runoff relationships, Flood routing, Flood protection, Remote control, Cities, Mathematical models, *Illinois.
Identifiers: *Metropolitan studies, *Storm sewers, *Combined sewers, Urban areas, *Chicago(Ill).

The mathematical model described is quite unusual. While sufficiently simple and flexible to serve as a planning tool, it is adequately detailed for use in at least preliminary design. Developed by The Metropolitan Sanitary District of Greater Chicago, the computer program has been employed by the MSD in the analysis of streamflows and sewer systems and for sizing several reservoirs. That it was developed by an operating agency and not a research organization is particularly significant. A disadvantage of the present version of the model is that it does not include provision for generating water quality characteristics. Using the model, adequate approximations of observed hydrographs for several catchments in the Chicago region were obtained without modification of the programming or the constants involved. The model appears to have a good potential for satisfactory application to watersheds in other parts of the country with possible alteration of the constants being the only change necessary. The computer program in the form of a FORTRAN IV card deck is available. (McPherson-ASCE)
W74-07721

ALTERATIONS IN THE HYDROLOGIC CYCLE INDUCED BY URBANIZATION IN NORTHERN NEW CASTLE COUNTY, DELAWARE: MAGNITUDES AND PROJECTIONS,
Delaware Univ., Newark.
For primary bibliographic entry see Field 4C.
W74-07729

HYDROLOGICAL ASPECT OF SURFACE RUNOFF,
Jadavpur Univ., Calcutta (India).
B. Bose, and M. Bandyopadhyay.
Science and Culture, Vol 39, No 6, p 248-252, June, 1973. 1 fig, 1 tab, 5 ref.

Descriptors: *Hydrologic aspects, *Surface runoff, *Model studies, *Rational formula, Rainfall intensity, Frequency analysis, Estimating equations, *Runoff forecasting.
Identifiers: *India(Calcutta).

The problems associated with the hydrologic aspect of surface runoff with particular reference to the city of Calcutta, India are discussed briefly. A model based on rainfall-intensity-frequency was obtained from the available data. This model then was used to estimate the runoff by the rational method. (Sanduski-Franklin)
W74-07756

DOCUMENTATION OF PROSPER - A MODEL OF ATMOSPHERE-SOIL-PLANT WATER FLOW,
Oak Ridge National Lab., Tenn.
R. A. Goldstein, J. B. Mankin, and R. J. Luxmoore.
Available from NTIS, Springfield, Va., as Rept. No. EDFB-IBP-73-9; $5.45 per copy, $1.45 microfiche. Report No. EDFB-IBP-73-9, February 1974. 76 p, 1 fig, 23 ref.

Descriptors: *Model studies, *Hydrologic models, *Hydrologic data, *Hydrologic cycle, Atmosphere, Soils, Soil-water-plant relationships, Water balance, Phenology, Ecology, Ecosystems, Evapotranspiration, Vegetation, Flow, Precipitation, Deciduous forests, Computer programs.

A phenomenological model, PROSPER, has been developed that simulates atmosphere-plant-soil moisture relations on a day-to-day basis. The model is explained in detail, and a computer program of the model is listed. Computer output resulting from an application of PROSPER to a forested watershed is also presented. This report has been produced with the sole objective of documentation and no attempt is made to interpret the results of the application which is included. (Houser-ORNL)
W74-07785

HYDROLOGIC MODELS OF THE GREAT LAKES,
State Univ. of New York, Buffalo. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2H.
W74-07826

GROUND-WATER QUALITY MODELS: WHAT THEY CAN AND CANNOT DO,
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 5B.
W74-07933

APPLICATION OF REMOTE SENSING TO HYDROLOGY--FINAL TECHNICAL REPORT,
IBM Electronics Systems Center, Huntsville, Ala.
R. Ambaruch, and J. W. Simmons.
September 1973. 104 p, 32 fig, 17 tab, 18 ref, 3 append. NASA Contract NAS8-14000/SA 2171.

Descriptors: *Remote sensing, *Mathematical models, *Rainfall-runoff relationships, Tennessee, Data collections, Hydrologic data, Aerial photography, *Model studies, Small watersheds, Computer programs, *Simulation analysis, *Watersheds(Basins).
Identifiers: *Tennessee River Valley.

Data produced by remote observation from space and aircraft were tested for use in reducing the time and expense normally involved in predicting the hydrological behavior of an ungaged watershed. Such a capability can enhance effective planning for urban and industrial development, flood control, hydroelectric power, navigation, and water resources management. The continuous simulation model chosen for the study is the Kentucky Watershed Model (KWM). This model is based upon the Stanford Watershed Model IV, adapted and refined for application to this project. The area from which test watersheds are chosen for the study is the Tennessee River Valley, a major watershed of approximately 104,000 sq kms in the southeastern United States. This is a well-instrumented, throughly photographed and mapped area for which copious historical data records are available. The remote sensing imagery used to determine watershed physical characteristics was actually aerial photographs, mostly at a scale of 1:24,000. The five validation runs produced simulated streamflows which correlated remarkably well with observed streamflow. Daily correlation coefficients ranged from 0.83 to 0.87; monthly, from 0.92 to 0.97. Many major storms were reasonably well matched with respect to peak flows and timing of peaks. For a multiyear open-loop simulation, this is adequate for most applications, and it strongly indicates the feasibility of using remotely sensed data to forecast the hydrologic performance of an ungaged watershed. (Knapp-USGS)
W74-07940

INTERNATIONAL COOPERATION OF HYDROLOGISTS (MEZHDUNARODNOYE SOTRUDNICHESTVO GIDROLOGOV),
Gosudarstvennyi Gidrologicheski Institut, Leningrad (USSR).
For primary bibliographic entry see Field 7A.
W74-08047

NATIONAL WEATHER SERVICE RIVER FORECASTING SYSTEM,
National Oceanic and Atmospheric Administration, Silver Spring, Md. Office of Hydrology.
For primary bibliographic entry see Field 4A.
W74-08057

2B. Precipitation

PRECIPITATION CHARACTERISTICS OF THE NORTHERN NEW JERSEY, NEW YORK CITY METROPOLITAN AREA,
Rutgers-The State Univ., New Brunswick, N.J.
A. R. Greenway.
Available from the National Technical Information Service as PB-231 981, $7.00 in paper copy, $1.45 in microfiche. M Sc Thesis, May 1972. 71 p, 26 fig, 9 tab, 27 ref. OWRR B-044-NJ(2). 14-31-0001-3615.

Descriptors: *Precipitation, *Meteorological data, *Rainfall disposition, *Weather patterns, *Temporal distribution, Rain, Local precipitation, Meteorology, Climatology.

The precipitation process in the New York metropolitan area has been studied from physical and synaptic points of view. Influences of topography and urban growth have been considered. Relevant synaptic conditions include extra tropical cyclones and air mass thunderstorms. With these controlling factors in mind, monthly and annual precipitation characteristics were analyzed for trends and variability. The area of maximum decade mean precipitation has been shown to be moving eastward, possibly under the influence of increasing population and industrialization. However, no large urban-induced maximum appears to be present.
W74-07607

METEOROLOGICAL AND HYDROLOGICAL INVESTIGATIONS,
For primary bibliographic entry see Field 5B.
W74-07658

THE SIGNIFICANCE OF RAINFALL ON SALT AND SODIUM ACCUMULATIONS UNDER IRRIGATION,
South Dakota State Univ., Brookings. Dept. of Plant Science.
For primary bibliographic entry see Field 3C.
W74-07743

PROJECT SKYWATER 1972 ANNUAL REPORT.
Bureau of Reclamation, Denver, Colo. Office of Atmospheric Water Resources.
For primary bibliographic entry see Field 3B.
W74-07928

SOME CLIMATOLOGICAL CHARACTERISTICS OF SEEDABLE UPSLOPE CLOUD SYSTEMS IN THE HIGH PLAINS,
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
For primary bibliographic entry see Field 3B.
W74-07929

2C. Snow, Ice, and Frost

ADHESION OF ICE FROZEN FROM DILUTE ELECTROLYTE SOLUTIONS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
H. H. G. Jellinek.
Research Report 317, March 1974. 8 p, 3 fig, 2 tab, 10 ref.

Descriptors: *Ice, *Cryology, *Adhesion, Freezing, *Electrolytes, Crystallography, Deicers, Snow removal.

The adhesion of ice frozen from a number of electrolyte solutions to a wax-treated aluminum surface was tested at -10 deg C. The adhesive strength measured by the stress needed to shear the ice off the substrate surface is mainly due to a liquid interfacial solution layer between the ice and the substrate surface. The thickness of such a layer is largely determined by the same considerations as the thickness of grain boundary layers in ice obtained from dilute electrolyte solutions. (Knapp-USGS)
W74-07618

HYDROLOGIC RESPONSE OF ICE-COVERED STREAMS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 2E.
W74-07832

APPLICATION OF ELECTRICAL ENERGY TO CULVERT ICING PROBLEMS--A LABORATORY STUDY,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 8C.
W74-07909

ISUA, GREENLAND: GLACIOLOGICAL INVESTIGATIONS DURING 1973,
Cold Regions Research and Engineering Lab., Hanover, N.H.
S. C. Colbeck, and A. J. Gow.
Research Report 318, March 1974. 13 p, 8 fig, 1 tab, 9 ref.

Descriptors: *Glaciohydrology, *Glaciology, Glaciers, Melt water, Boreholes, Ice, Core drilling, Mining.
Identifiers: *Greenland(Isua).

Two holes were drilled through the Greenland ice sheet during 1973, and temperature measurements were made in one hole drilled during 1972. These measurements show that the area of liquid water beneath the ice cap extends to ice depths as shallow as 100 m. The consequences of removing the frozen margin of glacial ice could be serious. Petrographic studies of a few ice cores revealed a strongly oriented crystal fabric and an appreciable surface accumulation of superimposed ice. (Knapp-USGS)
W74-07910

ICELANDIC GEOTHERMAL ACTIVITY AND THE MERCURY OF THE GREENLAND ICECAP,
Hawaii Univ., Honolulu. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W74-07944

APPLICATION OF SATELLITE DATA FOR HYDROLOGIC PURPOSES (ISPOL'ZOVANIYE SPUTNIKOVOY INFORMATSII DLYA GIDROLOGICHESKIKH TSELEY),
Gosudarstvennyi Gidrologicheski Institut, Leningrad (USSR).
For primary bibliographic entry see Field 7B.
W74-08049

2E. Streamflow and Runoff

HISTORIC FLOOD INFORMATION FOR NORTHERN CALIFORNIA STREAMS FROM GEOLOGICAL AND BOTANICAL EVIDENCE,
Geological Survey, Washington, D.C.
E. J. Helley, and V. C. LaMarche, Jr.
For sale by Sup Doc, GPO, Washington, D.C. 20402, Price $1.45 Professional Paper 485-E, 1973. 16 p, 7 fig, 1 tab, 27 ref

Descriptors: *Historic floods, *California, *Sedimentation, *Sedimentary structures, Stratigraphy, Dating, Radioactive dating, Dendrochronology, Floods, Flood frequency

Severe flooding in the mountainous region of northern California has produced texturally and morphologically distinct gravel deposits. Study of the erosion and deposition produced by the devastating floods of December 1964 allowed comparison and identification of ancient flood deposits. Long-lived coniferous trees, both living and those killed by the 1964 floods, were used to assign minimum ages to these deposits. Maximum ages were determined on the basis of radiocarbon dating of material entrained in the same deposits. Comparison with historic records at the four detailed study sites suggests that severe floods of magnitude similar to that of December 1964 have occurred several times in the last few hundred years. (Knapp-USGS)
W74-07646

WATER RESOURCES DATA FOR NEBRASKA, 1972: PART I. SURFACE-WATER RECORDS,
Geological Survey, Lincoln, Nebr.
For primary bibliographic entry see Field 7C.
W74-07647

CHESTER RIVER STUDY, VOLUMES I, II, AND III.
For primary bibliographic entry see Field 5B.
W74-07653

EVOLUTION OF MEANDER LOOPS,
Washington Univ., St Louis, Mo. Dept. of Earth Sciences.
For primary bibliographic entry see Field 2J.
W74-07661

ESTIMATING THE MAGNITUDE OF PEAK DISCHARGES FOR SELECTED FLOOD FREQUENCIES ON SMALL STREAMS IN EAST TEXAS,
Geological Survey, Austin, Tex.
E. E. Schroeder.
Open-file report, Febraury 1974. 16 p, 4 fig, 2 tab, 6 ref.

Descriptors: *Floods, *Texas, *Stage-discharge relations, *Peak discharge, Flood frequency, Flood recurrence interval, Regression analysis.

Peak-discharge data from 28 stream-gaging stations with long-term records (10-33 years) and 60 stations with short-term records (less than 10 years) were used in multiple linear-regression procedures to obtain equations for estimating the peak discharge of floods with recurrence intervals of 10, 25, and 50 years on small rural streams in East Texas. The significant independent variables were drainage area, channel slope, and channel length. The relationships are presented in nomographs that can be used for estimating the peak discharges on small streams for floods of the selected recurrence intervals, provided that the magnitude of the independent variables is within the range of those used to develop the relationships. (Knapp-USGS)
W74-07664

ANNUAL PEAK DISCHARGES FROM SMALL DRAINAGE AREAS IN MONTANA, THROUGH SEPTEMBER 1972,
Geological Survey, Helena, Mont.
M. V. Johnson, and R. J. Omang.
Open-file report, 1973. 141 p, 1 fig.

Descriptors: *Peak discharge, *Small watersheds, *Montana, Water levels, Stage-discharge relations, Data collections, Hydrologic data, Floods, Flood forecasting, Gaging stations.

Annual peak stage and discharge at each crest-stage gaging station in Montana are tabulated. At each gaging station one or more standard Geological Survey crest-stage gages record the maximum stage reached by the water surface. Throughout the 1972 water year, 182 gages were in operation. The gaging stations provide information on drainage areas that range in size from less than 1 square mile to several hundred square miles and that represent various hydrologic conditions. The network presently has 24 stations having drainage areas less than 1 sq mi, 92 stations having from 1 to 10 sq mi, 50 stations having from 10 to 50 sq mi, and 16 stations having more than 50 sq mi. (Knapp-USGS)
W74-07667

DRAINAGE AREA AND RIVER MILEAGE OF NEBRASKA STREAMS: PART 1--SALT AND WEEPING WATER CREEKS, BIG AND LITTLE NEMAHA RIVERS, AND MINOR STREAMS IN SOUTHEASTERN NEBRASKA,
Geological Survey, Lincoln, Nebr.
G. G. Jamison.
Open-file report 7404, April 1974. 111 p, 6 fig.

Descriptors: *Drainage area, *Watersheds(Basins), *Nebraska, Hydrologic data, River basins, Drainage density, Drainage patterns(Geologic).

Drainage areas and river mileages for streams in southeastern Nebraska drainage basins are presented in two tables. The first table for each basin is a list of distances in river miles above stream mouth and corresponding drainage areas for selected sites and features. The second table is a list of distances above stream mouth for all contour-line crossings as shown on 7 1/2-minute topographic quadrangles. In addition to giving the name of the stream basin, the heading of each table indicates in parentheses the rank of the stream in relation to those of higher rank within the Missouri River basin. (Knapp-USGS)
W74-07669

QUALITY OF SURFACE WATERS IN THE COLORADO RIVER BASIN, TEXAS, 1966-72 WATER YEARS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 5B.
W74-07670

HETEROGENEITIES IN SALINITY IN A RIVER PLUME,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 2L.
W74-07672

A SIMPLE, SEGMENTED PRISM MODEL OF TIDAL MIXING IN WELL-MIXED ESTUARIES,
Institute of Oceanographic Sciences, Taunton (England).
For primary bibliographic entry see Field 2L.
W74-07673

A SIMILARITY SOLUTION FOR STEADY-STATE GRAVITATIONAL CIRCULATION IN FJORDS,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W74-07675

THE 7-DAY 10-YEAR LOW FLOWS OF ILLINOIS STREAMS,
Illinois State Water Survey, Urbana.
K. P. Singh, and J. B. Stall.
Bulletin 57, 1973. 24 p, 12 fig, 15 tab, 39 ref.

Descriptors: *Low flow, *Illinois, Streamflow forecasting, Data collections, Hydrologic data, Waste dilution, Water pollution control.

Low flow values expected for a 7-day period at a recurrence interval of 10 years are given at intervals along the course of each stream in Illinois. These flows are useful for calculating the in-stream dilution available for waste-water effluents. Flow records from 266 stream-gaging stations were the primary data used. The amount of effluent waste-water flow during low-flow periods was obtained for about 300 existing waste-water treatment plants now discharging into Illinois streams. These locations and flow amounts are shown on maps. The hydrologic effects of natural lakes, manmade lakes, gains and losses from groundwater, navigation dams, and evaporation from the river surface are considered. The timing, or season, of the 7-day 10-year low flows is described. The special cases of the controlled waterways within the Metropolitan Sanitary District of Greater Chicago, the Illinois River, the Mississippi River, and the Ohio River are also described. (Knapp-USGS)
W74-07677

QUALITY OF SURFACE WATER IN ILLINOIS, 1966-1971,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 5A.
W74-07678

ALTERATIONS IN THE HYDROLOGIC CYCLE INDUCED BY URBANIZATION IN NORTHERN NEW CASTLE COUNTY, DELAWARE: MAGNITUDES AND PROJECTIONS,
Delaware Univ., Newark.
For primary bibliographic entry see Field 4C.
W74-07729

THE NUMERICAL SOLUTION OF TRANSIENT SUPERCRITICAL FLOW BY THE METHOD OF CHARACTERISTICS WITH A TECHNIQUE FOR SIMULATING BORE PROPAGATION,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 8B.
W74-07732

HYDROLOGY AND STRUCTURAL DESIGN (IN RUSSIAN),
For primary bibliographic entry see Field 8B.
W74-07767

HYDROLOGIC RESPONSE OF ICE-COVERED STREAMS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
P. P. Paily, E. O. Macagno, and J. F. Kennedy.
Available from the National Technical Service as PB-232 212, $3.25 in paper copy, $1.45 in microfiche. Iowa Water Resources Research Institute, Ames, Completion Report ISWRRI-56, June 1973. 34 p, 9 fig, 1 tab, 13 ref. OWRR B-018-IA(1). 14-31-0001-3280.

Descriptors: *Hydrodynamics, *Rivers, Temperature, *Thermoelectric power, Ice, Mathematical models, Heat transfer, *Thermal pollution, Waste disposal, Dispersion, Heat exchangers, Convection, *Illinois.
Identifiers: Cordova(Ill), *Temperature distribution.

The increase in water temperature in natural streams due to waste heat disposal from thermal power plants leads to extensive ice-free reaches during winter periods. Once the hot water is completely mixed with the streamflow, the temperature distribution in the stream is mainly controlled by the surface heat exchange between water and the atmosphere; the mathematical formulation of the temperature distribution is represented by the one-dimensional convection-diffusion equation. Generally, the surface heat exchange between water and the atmosphere is a complex function of the water temperature; however, it is shown that it can be expressed, for most practical purposes, as a linear function of the water temperature. Using this approximation a closed-form solution of the one-dimensional unsteady convection-diffusion equation is developed to predict temperature distributions in streams and the lengths of ice-free reaches downstream from the thermal discharge sections.
W74-07832

DATA ON FRESH-WATER INFLOW, APRIL 14-JULY 28, 1973, FOR ANALOG-MODEL STUDY OF THE HOUSTON SHIP CHANNEL, HOUSTON, TEXAS,
Geological Survey, Houston, Tex.
For primary bibliographic entry see Field 7C.
W74-07921

TRANSIT LOSSES AND TRAVEL TIMES FOR RESERVOIR RELEASES, UPPER ARKANSAS RIVER BASIN, COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4A.
W74-07931

TRENDS AND PROBLEMS IN INVESTIGATION OF LONG-TERM FLUCTUATIONS OF RIVER RUNOFF (NAPRAVLENIYA I ZADACHI ISSLEDOVANIYA MNOGOLETNIKH KOLEBANIY RECHNOGO STOKA),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
S. N. Kritskiy, M. F. Menkel', and D. Ya. Ratkovich.
Meteorologiya i Gidrologiya, No 10, p 55-62, October 1973. 26 ref.

Descriptors: *Runoff, *Streamflow, *Discharge(Water), *Fluctuations, *Statistical methods, Correlation analysis, Stochastic processes, Markov processes.
Identifiers: *USSR, Probability distribution.

The present state of science in the field of prediction and description of fluctuations of river runoff was investigated in light of the problems of engineering hydrology. Studies of probability laws in long-term runoff fluctuations can be divided into three basic parts: (1) establishment of probability distribution types expressing the recurrence rate of runoff values; (2) estimation of numerical parameters individualizing distributions as applied to individual basins and runoff characteristics; and (3) expression of autocorrelation functions which reflect a tendency toward formation of extended periods of increased and reduced water discharges. Further studies are needed to (1) improve methods and technical procedures for effective evaluation of probability distribution parameters; (2) study of distributions of errors of a sample estimate of parameters and quantiles in the application of effective evaluation methods; and (3) improve methods for a combined analysis of observations on the basis of sets of analog basins. Basic objectives of future investigations include: (1) refinement of the type of correlation and of the type and parameters of conditional probability distributions of annual runoff; (2) detailed analysis of relations between discharges of successive years on rivers with small runoff; (3) study of the laws of runoff variability of lacustrine rivers; and (4) testing and further investigation of hypotheses on the causes of occurrence of stochastic relations between runoff of successive years. (Josefson-USGS)
W74-08051

NATIONAL WEATHER SERVICE RIVER FORECASTING SYSTEM,
National Oceanic and Atmospheric Administration, Silver Spring, Md. Office of Hydrology.
For primary bibliographic entry see Field 4A.
W74-08057

DAM COLLAPSE WAVE IN A RIVER,
Tippetts-Abbett-McCarthy-Stratton, New York.
A. Balloffet, E. Cole, and A. F. Balloffet.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY5, Paper 10523, p 645-665, May 1974. 13 fig, 1 tab, 10 ref, append.

Descriptors: *Flood waves, *Dam failure, *Mathematical models, Bores, Flood control, Flood protection, Numerical analysis, *Computer programs.
Identifiers: *Morocco(Bou Regreg Dam).

Dam failure flood waves may be solved by numerical analyses made with the use of computer programs which calculate propagation of transient flow. The continuity equation is written for the node instead of the link. This allows the analysis of more complex networks. The hypothetical gradual collapse of the cofferdam of the Bou Regreg Dam in Morocco was studied to assist in the preparation of emergency plans. These results are compared to those of an instantaneous collapse of the same project and of a dam in a rectangular channel. (Knapp-USGS)
W74-08060

HYDROLOGICAL INVESTIGATIONS IN FOREST.
Akademiya Nauk SSSR, Moscow. Laboratoriya Lesovedeniya.
For primary bibliographic entry see Field 4C.
W74-08140

2F. Groundwater

PACKING-INDUCED RADIAL PARTICLE-SIZE SEGREGATION: INFLUENCE ON HYDRODYNAMIC DISPERSION AND WATER TRANSFER MEASUREMENTS,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2G.
W74-07630

PLANNING A DOMESTIC GROUNDWATER SUPPLY SYSTEM,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W74-07639

GROUND-WATER RESOURCES OF MONTGOMERY COUNTY, INDIANA,
Geological Survey, Washington, D.C.
L. W. Cable, and T. M. Robison.
Indiana Dept. of Natural Resources, (Indianapolis), Division of Water, Bulletin No 36, 1974. 20 p, 4 fig, 4 tab, 16 ref, append.

Descriptors: *Hydrogeology, *Indiana, Water sources, Aquifers, Groundwater, Water quality, Water yield, Shales, Sandstones, Glacial drift, Alluvium.
Identifiers: *Montgomery County(Ind).

Both consolidated bedrock and unconsolidated deposits contain significant water-bearing zones which may serve as a water supply in Montgomery County, Indiana. The uppermost part of the consolidated rocks consist of a wide variety of lithologic types, with shale predominating. Shales and siltstones of the Bordon Group of Mississippian age are the best aquifers. All rock types yield ample domestic supplies and in some places yield supplies adequate for small to moderate municipal or industrial needs. The maximum reported yield from the consolidated rock is 270 gpm. The chief aquifers in the unconsolidated rocks are the sand and gravel beds of the glacial outwash deposits. Valley-train aquifers in buried bedrock valleys offer the best potential for large municipal or industrial supplies. Water in both the unconsolidated rocks and in the shallow consolidated rocks is potable and of the calcium bicarbonate type. (Knapp-USGS)
W74-07645

GEOHYDROLOGY AND WATER RESOURCES OF THE TUCSON BASIN, ARIZONA,
Geological Survey, Washington, D.C.
E. S. Davidson.
Available from Sup Doc, GPO, Washington, D.C. 20402; Price $6.40 paper cover (includes plates). Water-Supply Paper 1939-E, 1973. 81 p, 3 fig, 7 plate, 3 tab, 75 ref.

Descriptors: *Groundwater, *Hydrogeology, *Arizona, Aquifer characteristics, Water yield, Water levels, Water supply, Water balance, Recharge, Transmissivity.
Identifiers: Tucson basin(Ariz).

The major source of water in the Tucson basin of Arizona is groundwater in storage in the aquifer underlying the basin. Groundwater is pumped for irrigation, public supply, and industrial uses and is only partially replenished by the infiltration of streamflow along the major streams and the basin perimeter. The basin is a broad northwest-trending valley bounded by mountain ranges on the eastern and western sides. The mean annual precipitation is about 12 inches on the basin surface and 25 inches or slightly more in the mountains. Because most of the precipitation is evaporated or transpired, the mean annual streamflow is only about 10,000 to 20,000 acre-feet. The major streams generally are dry during more than 300 days each year, and the flows generally last 3 days or less. Because of the erratic occurrence and quantity of flow, streamflow is not used directly as a water supply. The mean annual streamflow out of the basin is slightly more than 17,000 acre-feet. The aquifer that underlies the basin surface consists of the Pantano Formation and Tinaja beds of Tertiary age and the Fort Lowell Formation and surficial deposits of Quaternary age. These units are more than 2,000 feet thick and are composed mainly of loosely consolidated to moderately cemented silty sand to silty gravel. The chemical quality of the groundwater in most of the basin is suitable for public supply. The dissolved solids are mainly calcium, sodium, and bicarbonate. The amount of groundwater in storage to a depth of 500 feet below the 1966 water table was about 30.5 million acre-feet, and that to a depth of 1,000 feet below the water table was about 52 million acre-feet. Less than 2 million acre-feet of water was withdrawn from storage in 1940-65. Transmissivity values for the aquifer average about 50,000 gallons per day per foot and range from 1,000 to almost 500,000 gallons per day per foot. About 85,000 acre-feet of groundwater was removed from storage in 1965. (Knapp-USGS)
W74-07648

GROUND-WATER LEVELS IN OBSERVATION WELLS IN KANSAS, 1966-70,
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 7C.
W74-07650

A GROUND-WATER MONITORING NETWORK FOR KOOTENAI FLATS, NORTHERN IDAHO,
Geological Survey, Boise, Idaho.
For primary bibliographic entry see Field 7A.
W74-07662

HYDROLOGIC RECONNAISSANCE OF T NORTHERN GREAT SALT LAKE DESE AND SUMMARY HYDROLOGIC RECONNA SANCE OF NORTHWESTERN UTAH,
Geological Survey, Salt Lake City, Utah
J. C. Stephens.
Utah Department of Natural Resources Techni Publication No 42, 1974. 55 p, 5 fig, 2 plate, 12 t 44 ref, append.

Descriptors: *Deserts, *Groundwater, *Ut Great Salt Lake, Brines, Saline water, Wa balance, Hydrologic budget, Hydrogeology, A lands, Hydrologic data, Aquifers.
Identifiers: *Great Salt Lake Desert(Utah).

In the northern Great Salt Lake Desert in the ce tral part of northwestern Utah, average annu precipitation ranges from about 4.5 to slight more than 12 inches. Runoff is scanty and reach the desert floor only during or immediately aft thunderstorms and periods of rapid snowme Drainage is internal except for the part of the ar immediately adjacent to Great Salt Lake. Surfa outflow to Great Salt Lake is estimated to avera less than 500 acre-feet annually. Three aquifers a present in much of the northern Great Salt Lak Desert. An aquifer composed of crystalline s and jointed lakebed deposits at and just benea the land surface averages 25 feet in thickness, u derlies about 1,650 square miles of the dese floor, and yields brine. An aquifer of unknow thickness and extent is present in surficial and b ried alluvial fans along the mountain flanks ar yields fresh to moderately saline water. The mo extensive aquifer underlies the entire area whe consolidated rocks are exposed and is made up o unconsolidated to partly consolidated valley fil This aquifer yields brine to wells completed depths of 1,000 to 1,600 feet below land surface i the Bonneville Salt Flats area. Locally in th mountains and peripheral alluvial slopes, fresh t moderately saline groundwater is present. I northwestern Utah, groundwater is present in allu vium, valley fill, and consolidated rocks. Recharg from infiltration of precipitation is estimated t average about 100,000 acre-feet annually. Subsur face inflow supplies at least 43,000 acre-feet o recharge annually. An estimated 5.6 million acre feet of groundwater could be recovered fro storage in the upper 100 feet of saturated aquife material in northwestern Utah. At least three-quar ters of the recoverable water would be highl saline or briny. (Knapp-USGS)
W74-07665

DEFORMATION MODULI OF WATER-BEARING FORMATIONS AT ELEVATED TEMPERATURES,
California Univ., Berkeley. Coll. of Engineering.
For primary bibliographic entry see Field 4B.
W74-07726

THE TRANSPORT OF RADIOISOTOPES BY FINE PARTICULATE MATTER IN AQUIFERS,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 5B.
W74-07730

SOIL MOISTURE TRANSPORT IN ARID SITE VADOSE ZONES,
Atlantic Richfield Hanford Co., Richland, Wash.
For primary bibliographic entry see Field 2G.
W74-07780

MICROPOROSITY IN CARBONATE ROCKS,
Amoco Research Center, Tulsa, Okla.
For primary bibliographic entry see Field 4B.
W74-07861

PLEISTOCENE-HOLOCENE SEDIMENTS INTERPRETED BY SEISMIC REFRACTION AND

/ASH-BORE SAMPLING, PLUM ISLAND-CAS-LE NECK, MASS.,
rmy Coastal Engineering Research Center, Fort elvoir, Va.
or primary bibliographic entry see Field 2L.
/74-07875

YDROLOGY OF LIMESTONE KARST IN REENBRIER COUNTY, WEST VIRGINIA,
eological Survey, Morgantown, W. Va.
. K. Jones.
Vest Virginia Geological and Economic Survey, Morgantown, Bulletin 36, 1973. 49 p, 23 fig, 3 late, 2 map, 5 tab, 26 ref.

Descriptors: *Karst hydrology, *West Virginia, Karst, Hydrogeology, Caves, Limestones, Water pollution, Path of pollutants, *Sinks, Springs, Aquifers.
Identifiers: *Greenbrier County(W. Va.).

n the Fort Spring--Spring Creek karst area, Greenbrier County, W. Va., karst drainage is ominant over surface drainage. All surface runoff s diverted through sinkholes or sinking streams nto subsurface flow channels in cavernous Mis-issippian limestones. Subsurface drainage basins nd flow directions were determined by dye-trac-ng techniques and by utilizing maps of un-erground conduits. The direction of subsurface low is generally independent of the topography. Traced subsurface flow paths cross under surface idges and often trend opposite to surface slope. The overall direction of underground flow routes s toward lower base level streams but is in-luenced locally by the combined effects of com-plex variations in geologic structure, lithology, egetal cover, climate, former surface and subsur-ace flow paths, and the length of time the aquifer ad undergone development. The karst water is sed locally for domestic purposes, and the cave conduits and water are used for sewage and waste lisposal. The dye-tracer studies showed that con-aminated waste water could easily enter the karst quifer and be transmitted through it. (Knapp-USGS)
W74-07908

BURIED TRIASSIC BASIN IN THE CENTRAL SAVANNAH RIVER AREA, SOUTH CAROLINA AND GEORGIA,
Geological Survey, Aiken, S.C.
I. W. Marine, and G. E. Siple.
Geological Society of American Bulletin, Vol 85, p 311-320, February 1974. 12 fig, 1 tab, 13 ref.

Descriptors: *Aquifers, *South Carolina, *Georgia, *Groundwater basins, Hydrogeology, Stratigraphy, Aquifer characteristics.
Identifiers: *Dumbarton Triassic basin(So. Car-Geo).

A basin filled with Triassic red beds, located on the South Carolina-Georgia line about 32 km southeast of Augusta, Georgia, is buried beneath about 350 m of Coastal Plain sediments. An extensive aeromagnetic survey, seismic refraction and reflection surveys, and geophysical logs and samples from three wells define the extent and character of the basin. This basin is 50 km long, 10 km wide, and trends northeast. Near the center of the Triassic basin, a well passed through 902 m of Triassic mudstone and sandstone of fluvial origin without penetrating the bottom of the basin. The permeability of the Triassic rock is extremely low, and water-transmitting fractures were not penetrated. Even slight water-level disturbances in the Triassic wells require many years to recover. Total dissolved solids of the water from the Triassic basin are about twice that in the crystalline metamorphic rocks that surround it. (Knapp-USGS)
W74-07916

HYDROLOGY AND CHLORIDE CONTAMINATION OF THE PRINCIPAL ARTESIAN AQUIFER IN GLYNN COUNTY, GEORGIA,
Geological Survey, Atlanta, Ga.
R. L. Wait, and D. O. Gregg.
Georgia Earth and Water Division, Atlanta, Water Resources Survey of Georgia Hydrologic Report, 1, 1973. 93 p, 38 fig, 16 tab, 54 ref, 2 append.

Descriptors: *Hydrogeology, *Saline water intrusion, *Artesian aquifers, *Georgia, Withdrawal, Hydrologic data, Drawdown, Water yield, Aquifer testing, Potentiometric level.
Identifiers: Glynn County(Ga).

The principal artesian aquifer in Glynn County, Georgia, yielded 122.3 million gallons of water per day in 1964. This limestone aquifer is at a depth of 500 feet and is about 500 feet thick. A permeable zone at the top ranges from 86 to 140 feet in thickness and a basal permeable zone at a depth of 860 feet ranges from 16 to 110 feet in thickness. Dense dolomites, from 1,000 to 1,060 feet and 1,350 to 1,385 feet, generally confine a zone of brackish water with as much chloride as 2,000 mg/liter. Pressure head increases irregularly with depth from 1.6 feet at 500 feet below the surface to over 30 feet at 1,500 feet. Transmissivity of the principal artesian aquifer is 1,500,000 gpd per foot as determined by short-term tests, and 1,600,000 gpd per foot by long-term tests. Storage coefficient is 0.0006 by short-term tests and 0.004 by long-term tests. Native groundwater in the principal artesian aquifer is of the calcium bicarbonate type, very hard, alkaline, and low in chloride. In a roughly triangular area of downtown Brunswick, brackish water in the zone confined by dolomites is rising through a locally porous part of the upper dolomite and is spreading northward in both permeable zones of the principal artesian aquifer at rates up to 700 feet per year. Any increase in pumpage which would enlarge present cones of depression would accelerate this rate. (Knapp-USGS)
W74-07919

EXPLORATION FOR A BURIED VALLEY BY RESISTIVITY AND THERMAL PROBE SURVEYS,
Harshbarger and Associates, Tucson, Ariz.
E. M. Smith.
Ground Water, Vol 12, No 2, p 78-83, March-April 1974. 12 fig, 14 ref.

Descriptors: *Geophysics, *Geothermal studies, *Hydrogeology, *Alluvial channels, *Glacial aquifers, Glacial drift, *Ohio, Electrical resistance, Resistivity.
Identifiers: *Buried valleys.

Electrical resistivity and thermal probe surveys were conducted in the vicinity of Morning Sun, Ohio, to locate a buried glacial valley. The resistivity survey along six roughly parallel traverse lines was able to distinguish buried valley gravel from glacial till and Upper Ordovician limestone bedrock. Two buried valleys east of Morning Sun coalesce under Morning Sun, then continue as one valley to its junction with the Four Mile Creek buried valley at the northeast corner of Action Lake. The thermal probe survey was unable to distinguish a summer low-temperature anomaly trend, indicative of a buried valley. The depth of the buried valley under the till overburden is 90 to 150 feet which is too deep to contact the summer segment of the annual wave; therefore, a near-surface low-temperature anomaly is not produced. (Knapp-USGS)
W74-07935

2G. Water In Soils

IRRIGATION OF CITRUS WITH CITRUS WASTE WATER,
Florida Univ., Lake Alfred. Inst. of Food and Agricultural Sciences.
For primary bibliographic entry see Field 5D.
W74-07603

NITROGEN TRANSFORMATIONS IN SOIL DURING LEACHING: I. THEORETICAL CONSIDERATIONS,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 5B.
W74-07619

NITROGEN TRANSFORMATION IN SOIL DURING LEACHING: II. STEADY STATE NITRIFICATION AND NITRATE REDUCTION,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 5B.
W74-07620

NITROGEN TRANSFORMATIONS IN SOIL DURING LEACHING: III. NITRATE REDUCTION IN SOIL COLUMNS,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 5B.
W74-07621

DISTRIBUTION OF FREE IRON AND ORGANIC CARBON AS RELATED TO AVAILABLE WATER IN SOME FORESTED SANDY SOILS,
Michigan Technological Univ., L'Anse. Ford Forestry Center.
S. G. Shetron.
Soil Science Society of America Proceedings, Vol 38, No 2, p 359-362, March-April 1974. 4 fig, 2 tab, 22 ref.

Descriptors: *Soil water, *Iron, *Organic matter, *Forest soils, Productivity, Moisture availability, Available water.
Identifiers: *Organic carbon.

The amount of available water (0.1-15 bar tension) in the B21 horizons of six sandy soil series increased as amount of free iron and organic carbon increased. Soils of the Typic Udipsamment subgroup had the lowest, and soils of the Typic Haplorthod subgroup the highest available water retention values. Retention of available water in the C horizons of these soils was positively correlated with free iron and specific surface. Growth of hardwood and pine stands increased as amounts of free iron, organic carbon, and available water increased. (Knapp-USGS)
W74-07622

NITROGEN TRANSFORMATIONS DURING CONTINUOUS LEACHING,
California Univ., Davis. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 5B.
W74-07623

BIODEGRADATION OF NITRILOTRIACETATE (NTA) IN SOILS,
Michigan State Univ., East Lansing. Dept. of Crop and Soil Sciences.
For primary bibliographic entry see Field 5B.
W74-07624

A KINETIC STUDY OF AMMONIUM AND NITRITE OXIDATION IN A SOIL FIELD PLOT,
California Univ., Berkeley. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 5B.
W74-07625

EFFECT OF MONOSILICIC ACID ON HYDROLYTIC REACTIONS OF ALUMINUM,
Saskatchewan Univ., Saskatoon. Inst. of Pedology.
G. M. Luciuk, and P. M. Huang.
Soil Science Society of America Proceedings, Vol 38, No 2, p 235-244, March-April 1974. 7 fig, 4 tab, 41 ref.

Descriptors: *Hydrolysis, *Aluminum, *Weathering, *Silica, Soil chemistry, Water chemistry, Chemical precipitation, Soil formation, Nutrients, Path of pollutants.
Identifiers: *Monosilicic acid.

The hydrolytic reactions of Al ions as influenced by Si(OH)4 were studied under the experimental parameters of degree of hydrolysis of Al, Si/Al molar ratios, Al concentrations, and time. The results clearly show that the presence of Si(OH)4 affects the hydrolytic reactions of Al at all degrees of hydrolysis and thus greatly alters the nature of the reaction products as revealed by X-ray diffraction, electron-optical observations, infrared adsorption, and thermal and chemical analyses. (Knapp-USGS)
W74-07626

ADSORPTION OF FENURON AND MONURON (SUBSTITUTED UREAS) BY TWO MONTMORILLONITE CLAYS,
Louvain Univ. (Belgium). Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W74-07627

THE SURFACE CATALYZED HYDROLYSIS OF PARATHION ON KAOLINITE,
Agricultural Research Organization, Bet-Dagan(Israel). Inst. of Soils and Water.
For primary bibliographic entry see Field 5B.
W74-07628

FIXATION OF ZINC BY CLAY MINERALS,
Georgia Agricultural Experiment Station, Athens.
M. R. Reddy, and H. F. Perkins.
Soil Science Society of America Proceedings, Vol 38, No 2, p 229-230, March-April 1974. 3 tab, 15 ref.

Descriptors: *Clay minerals, *Adsorption, *Zinc, *Clays, Bentonite, Illite, Kaolinite, Ion exchange, Soil chemistry, Ion transport.
Identifiers: *Ion entrampment.

Samples of bentonite, illite, and kaolinite clays were studied for their Zn fixation properties under various pH levels, alternate wetting and drying conditions, and incubation at moisture saturation. Bentonite and illite fixed significant quantities of Zn under wetting and drying. Fixation was directly related to pH and the amount of Zn added. Incubation of treated samples at moisture saturation resulted in approximately half the amount of Zn fixed as when subjected to repeated wetting and drying. Kaolinite fixed relatively small amounts of Zn as compared to bentonite and illite regardless of treatment. X-ray and DTA did not reveal mineralogical change; therefore it is concluded that Zn was fixed as a result of precipitation, physical entrapment in clay lattice wedge zones, and strong adsorption at the exchange sites. Cation exchange capacity values were inversely related to Zn fixation. (Knapp-USGS)
W74-07629

PACKING-INDUCED RADIAL PARTICLE-SIZE SEGREGATION: INFLUENCE ON HYDRODYNAMIC DISPERSION AND WATER TRANSFER MEASUREMENTS,
Geological Survey, Menlo Park, Calif.
C. D. Ripple, R. V. James, and J. Rubin.
Soil Science Society of America Proceedings, Vol 38, No 2, p 219-222, March-April 1974. 3 fig, 8 ref.

Descriptors: *Sediment sorting, *Dispersion, *Soil water movement, Particle size, Diffusivity, Leaching, Path of pollutants, Infiltrometers, Bulk density.
Identifiers: Soil columns.

Radial particle-size segregation occurs when soil columns are prepared with the aid of vibratory compaction. This segregation is characterized by a greater proportion of coarser particles near the periphery than in the central region of the column. A specially devised, alternative repacking technique, utilizing a vibration-free impacting apparatus, reduced such segregation in soil columns to an acceptably low level. Soil columns prepared by the above two packing procedures exhibited significant differences in their water flow and salt transport properties. Miscible displacement tests could be interpreted by one-dimensional dispersion theory in the case of nonsegregated soil columns. The results from segregated soil columns could not be reconciled with this theory. Horizontal infiltration into either segregated or nonsegregated soil columns produced significantly different moisture content profiles. (Knapp-USGS)
W74-07630

ANION EXCLUSION AND COUPLING EFFECTS IN NONSTEADY TRANSPORT THROUGH UNSATURATED SOILS: II. LABORATORY AND NUMERICAL EXPERIMENTS,
Agricultural Research Organization, Bet-Dagan (Israel). Dept. of Soil Physics.
E. Bresler, and A. Laufer.
Soil Science Society of America Proceedings, Vol 38, No 2, p 213-218, March-April 1974. 8 fig, 1 tab, 11 ref.

Descriptors: *Ion transport, *Leaching, *Soil water movement, Osmosis, Dispersion, Convection, Ion exchange, Chlorides, Mathematical models, Numerical analysis.

A numerical model for the simultaneous transport of anions and water was compared with measured chloride and water flow data. Laboratory soil-column experiments were conducted under conditions of infiltration, redistribution, and evaporation of water in the upper part of the soil profile. The effects of convection, ionic diffusion, mechanical dispersion, anion exclusion, and water flow in response to salt concentration gradients were considered jointly. The agreement between theory and experiment, as expressed by flow into and out of the soil column and by water content and salt distribution profiles, was generally good. The results were relatively insensitive to anion exclusion and osmotic effects. Estimates of dispersivity as obtained from miscible displacement experiments were sufficient for prediction. For the conditions studied, osmotic gradients and anion exclusion effects are of minor importance. (See also W74-00611) (Knapp-USGS)
W74-07631

ANION ADSORPTION BY ALLOPHANIC TROPICAL SOILS: I. CHLORIDE ADSORPTION,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
H. Gebhardt, and N. T. Coleman.
Soil Science Society of America Proceedings, Vol 38, No 2, p 255-259, March-April 1974. 1 fig, 5 tab, 12 ref.

Descriptors: *Adsorption, *Anions, *Soil chemistry, Laterites, Chlorides, Weathering, Leaching, Sulfates, Phosphates, Mexico, Hawaii.
Identifiers: *Volcanic soils, Colombia, Tropical soils, Andepts, Allophane.

The adsorption of Cl by Andepts from Mexico, Colombia, and Hawaii was measured in solutions of HCl, HCl + NaCl, and AlCl3. Chloride adsorption varied from 0-8 meq/100 g at pH 6 to as much as 32 meq/100 g at pH 3.8. At given pH, adsorption was concentration-dependent in a manner consistent with the Langmuir adsorption equation. For a B-horizon sample from San Gregorio, Mexico, the Cl adsorption maxima, in meq/100 g, were 7.4 at pH 6, 10.7 at pH 4.8, 13.4 at pH 4.4, 17.3 at pH 4.2, and 31.6 at pH < 4. The average a from the Langmuir equation was 0.04 liter/meq. Adsorbed Cl was removed by leaching with water, and was exchanged by NO3. Chloride adsorption from HCl or HCl-NaCl was accompanied by the consumption of protons; adsorption from AlCl3 resulted in the hydrolysis and precipitation of Al. Protons consumed or Al hydrolyzed exceeded Cl adsorbed by amounts corresponding closely to the effective CEC. The results suggest that protons are adsorbed to produce positively charged sites, which bind Cl nonspecifically. Chloride adsorption capacity can be conveniently measured by shaking soil with AlCl3 solution and measuring Cl uptake. Chloride capacities of soils and clay minerals determined by the AlCl3 procedure, were, in meq/100 g, 7-30 for Dystrandepts; 16-18 for Hydrandepts; 2-4 for acid soils containing crystalline clay and oxide minerals; 4 for kaolinite; zero for montmorillonite and illite. (See also W74-07635 and W74-07636) (Knapp-USGS)
W74-07634

ANION ADSORPTION BY ALLOPHANIC TROPICAL SOILS: II. SULFATE ADSORPTION,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
H. Gebhardt, and N. T. Coleman.
Soil Science Society of America Proceedings, Vol 38, No 2, p 259-262, March-April 1974. 2 fig, 2 tab, 15 ref.

Descriptors: *Adsorption, *Anions, *Soil chemistry, Laterites, Chlorides, Weathering, Leaching, Sulfates, Phosphates.
Identifiers: *Volcanic soils, Tropical soils, Andepts, Allophane.

Volcanic ash-derived soils (Andepts) from Mexico, Colombia, and Hawaii have large capacities for sulfate adsorption: 10-20 meq/100 g for surface soils and 15-60 meq/100 g for subsoils. The sulfate adsorption capacity is pH-dependent. For a typical case, B-horizon material from San Gregorio, Michoacan, Mexico, capacity in meq/100 g was 13 at pH 6.3, 22 at pH 5.1, 38 at pH 4.4, and 48 at pH 4.1. Sulfate adsorption was accompanied by and dependent upon the simultaneous adsorption, or consumption, of protons. Increasing solution concentration of sulfate beyond 5-10 meq/liter at a given pH resulted in relatively minor additional uptake by the soil. At a given pH, sulfate adsorption capacities, expressed as mmole/100 g soil, nearly equaled Cl adsorption maxima. This, together with the consumption of 1 meq H for each mmole of HCl or H2SO4 absorbed, suggests that the two anions are adsorbed on the same sites and that site protonation is a prerequisite for adsorption. Sulfate adsorbed by the San Gregorio soil at pH 4 was strongly bound against hydrolysis (removal by water leaching) and was only partly displaced by 1 N KNO3. It was completely displaced by 1 N NH4OAc, pH7. Sulfate may be adsorbed by Andepts, specifically, by ligand exchange. Its affinity for soil is at least 10 times that of nonspecifically adsorbed anions such as Cl and NO3. (See also W74-07634) (Knapp-USGS)
W74-07635

ANION ADSORPTION BY ALLOPHANIC TROPICAL SOILS: III. PHOSPHATE ADSORPTION,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
H. Gebhardt, and N. T. Coleman.
Soil Science Society of America Proceedings, Vol 38, No 2, p 263-266, March-April 1974. 2 fig, 2 tab, 18 ref.

Descriptors: *Adsorption, *Anions, *Soil chemistry, Laterites, Chlorides, Weathering, Leaching, Sulfates, Phosphates.
Identifiers: *Volcanic soils, Tropical soils, Andepts, Allophane.

Andepts from Mexico and Hawaii bound 30-70 millimoles P/100 g air-dry soil at pH 4.3-4.7 during a 1-hour reaction with 0.05M mixed H3PO4-NaH2PO4 solution. As much as 130 millimoles P/100 g were taken up from H3PO4 at pH 2.4. A B-horizon sample, San Gregorio from Michoacan, Mexico, adsorbed P from H3PO4 and consumes H in nearly equimolar amount, with 38 millimoles/100 g of each removed from solution in bringing soil from an initial pH of 5.4 to 4.3. Larger additions of H3PO4 dissolved appreciable Al, gave pH < 4, and yielded solutions that were supersaturated with respect to variscite. High-affinity adsorption of P from H3PO4 appeared limited by the supply of H-ions to protonate sites or react with displaced OH. Phosphate uptake from NaH2PO4 was accompanied by coadsorption of Na. At a given pH and level of tightly bound P established with H3PO4, addition of NaH2PO4 resulted in low-affinity adsorption of P and coadsorption of Na. Around half of the P bound from NaH2PO4 was readily eluted with water. Phosphate bound from H3PO4 was virtually insoluble in water. Some P was eluted by 0.5M arsenate or selenite. The Andepts bound P through at least three mechanisms: high-affinity adsorption on protonated sites; low-affinity adsorption with coadsorption of Na; and formation of insoluble variscite-like substances. (See also W74-07634) (Knapp-USGS)
W74-07636

THE RELATIONSHIPS BETWEEN SOIL WATER AND ENGINEERING PROPERTIES OF THE CLAYEY SOILS, (IN JAPANESE),
Tokyo Univ. (Japan). Dept. of Argicultural Engineering.
M. Komamura, and H. Takenaka.
J Agric Sci Tokyo Nagyo Daigaku. Spec. Issue. p 151-162. 1971. Ilus. Engl summ.
Identifiers: *Clayey soils, Compaction pressure, *Japan, *Soil water, Soils, *Mositure tension, *Soil physical properties, Loam, Volcanic ash soils.

Soil water contents are shown by moisture tension (pF), and relationships are examined between soil water and engineering properties. The samples were from Kanto loam volcanic ash soil, Shinshu loam volcanic ash soil and Iwate red-yellow soil. Soil structure and water holding capacity have much effect on dry density and porosity. Kanto loam (subsoil), Shinshu loam and Iwata red-yellow soil have a blocky structure. Kanto loam (surface soil) has an aggregated structure. Optimum moisture content is evaluated about pF3 which is closely related to compaction pressure. Optimum moisture content of Kanto loam (surface soil) is a low-pF because of the interlocking of soil aggregates. In the compaction test, permeability is changed by soil moisture and minimum permeability is observed at nearly pF2. This report shows that pF is closely related to the cohesion and internal friction angle of soils. Consolidation yield point is nearly equal to the compaction pressure of a rummer.--Copyright (c) 1973, Biological Abstracts, Inc.
W74-07679

AERIAL POLLUTION AND THE RAPID EVOLUTION OF COPPER TOLERANCE,
Liverpool Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 5B.
W74-07713

THE TRANSPORT OF RADIOISOTOPES BY FINE PARTICULATE MATTER IN AQUIFERS,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 5B.
W74-07730

SOIL MOISTURE TRANSPORT IN ARID SITE VADOSE ZONES,
Atlantic Richfield Hanford Co., Richland, Wash.
R. E. Isaacson, L. E. Brownell, R. W. Nelson, and E. L. Roetman.
Available from NTIS, Springfield, Va., as Rept. No. ARH-SA-169; $4.00 per copy, $1.45 microfiche. Report No. ARH-SA-169 (SM-182/6), January 1974. 25 p, 6 fig, 1 tab, 28 ref.

Descriptors: Hydrology, *Soil moisture, *Measurement, *Transport depletion, *Ion transport, Movement, Transfer, Fallout, *Tritium, Hydrogen, Radioactivity, Soil water movement, Arid lands, Precipitable water, Water table, Temperature, Lysimeters, Humidity, Model studies, Research and development, *Washington, Groundwater.
Identifiers: Hanford site(Wash).

Soil moisture transport processes in the arid soils of the Atomic Energy Commission's Hanford site are being evaluated. The depth of penetration of meteoric precipitation has been determined by profiling fallout tritium at two locations where the water table is about 90 meters below ground surface. In situ temperatures and water potentials were measured with temperature transducers and thermocouple psychrometers at the same location to obtain thermodynamic data for identifying the factors influencing soil-moisture transport. Neutron probes are being used to monitor soil moisture changes in two lysimeters, three meters in diameter by 20 meters deep. The lysimeters are also equipped to measure pressure, temperature, and relative humidity as a function of depth and time. Theoretical models based on conservation of momentum expressions are being developed to analyze nonisothermal soil moisture transport processes. Future work will be concerned with coupling the theoretical and experimental work and determining the amount of rainfall required to cause migration of soil-moisture to the water table. (Houser-ORNL)
W74-07780

STRUCTURE AND FUNCTION OF HARDWOOD LITTER AND SOIL SUBSYSTEMS AFTER CHRONIC GAMMA IRRADIATION, I. MESOFAUNA, NITROGEN, AND TOTAL SOIL RESPIRATION,
Georgia Univ., Athens. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W74-07824

STRUCTURE AND FUNCTION OF HARDWOOD LITTER AND SOIL SUBSYSTEMS AFTER CHRONIC GAMMA IRRADIATION. II. MICROFUNGI,
South Carolina Univ., Columbia. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W74-07825

AXISYMMETRIC INFILTRATIONS,
Oregon State Univ., Corvallis. Dept. of Agricultural Engineering.
R. H. Brooks, P. J. Leclercq, R. R. Tebbs, and W. Rawls.
Available from the National Technical Information Service as PB-232 228, $3.75 in paper copy, $1.45 in microfiche. Oregon Water Resources Research Institute, Corvallis, Completion Report, WRRI-22, January 1974. 61 p, 22 fig, 1 tab, 20 ref. OWRR A-009-ORE(1).

Descriptors: *Infiltration, Soil drainage, Porous media, Hydraulic properties, Saturation, *Pore pressure, Mathematical models, *Model studies, *Soil water, Soil properties.
Identifiers: *Axisymmetric infiltration, *Similitude requirements.

Infiltration of water into soils from a constant circular source was studied through the use of a mathematical model and a physical model. The boundary conditions were selected for the purpose of deducing the soil hydraulic properties from the infiltration process. Infiltration rate was related to the properties of the soil, to the initial condition of the soil, and to the size of the infiltration source. The similitude requirements were specified for studying infiltration using models. Some experimental data was presented to show the need for considering similitude. A general expression was presented relating capillary pressure with soil-water content during imbibition. The relationship is given in terms of the parameters obtained from a drainage capillary pressure-desaturation curve. The similitude requirements depend upon the imbibition and drainage curves. A tentative theoretical equation was presented for determining the pore size distribution of the soil from the infiltration capacity. It is suggested that small scale infiltration experiments in the field may be used to characterize the soils according to their hydraulic properties.
W74-07839

SUBSURFACE EXPLORATION AND SAMPLING OF SOILS FOR CIVIL ENGINEERING PURPOSES,
Army Engineers, Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8D.
W74-07905

INFLUENCE OF TEMPERATURE AND MOISTURE STRESS FROM SODIUM CHLORIDE SALINIZATION ON OKRA EMERGENCE,
Florida Univ., Dover. Agricultural Research Center.
For primary bibliographic entry see Field 3C.
W74-08073

AN OSCILLATOR CIRCUIT FOR AUTOMATED SALINITY SENSOR MEASUREMENTS,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
R. S. Austin, and J. D. Oster.
Soil Science Society of America Proceedings, Vol 37, No 2, p 327-329, March-April, 1973. 3 fig, 1 tab, 10 ref.

Descriptors: *Salinity, *Electrical conductance, Specific conductivity, *Soil chemistry, Water chemistry, *Saline soils, Measurement.

An oscillator circuit is described that enables automatic reading of salinity sensors and other a.c. conductivity cells by measuring frequency of oscillation. The oscillator frequency varies between 0.13 to 30 KHz and changes linearly with conductance in the range of 0.03 to 10 mmho/cm. The temperature sensitivity of the frequency of the oscillator is negligible between 8 and 31 C. The calibration curves between frequency and conductance obtained with the oscillator circuit for both the electrical conductivity and thermistor elements of the salinity sensor are linear and readings can be obtained with lead lengths of several hundred meters. (Skogerboe-Colorado State)
W74-08074

EFFECT OF TEMPERATURE AND PLANT WATER STRESS ON PHOTOSYNTHESIS DIFFUSION RESISTANCE, AND LEAF WATER POTENTIAL IN SPRING WHEAT,
Agricultural Research Service, Mandan, N.Dak. Northern Great Plains Research Center.
For primary bibliographic entry see Field 3F.
W74-08075

EFFECT OF NARROW TRENCHING IN HARLINGEN CLAY SOIL ON PLANT GROWTH, ROOTING DEPTH, AND SALINITY,
Agricultural Research Service, Weslaco, Tex. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 3F.
W74-08078

TOLERANCE OF RICE (ORYZA SATIVA L.) TO SALT DURING BOOT, FLOWERING, AND GRAIN-FILLING STAGES,
Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
For primary bibliographic entry see Field 3C.
W74-08080

NITROGEN REMOVAL BY SOIL MECHANISMS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 5D.
W74-08081

INFILTRATION AND LANDFILL BEHAVIOR,
Waterloo Univ. (Ontario).
For primary bibliographic entry see Field 5B.
W74-08083

MODEL FOR ESTIMATING SOIL WATER, PLANT, AND ATMOSPHERIC INTERRELATIONS: I. DESCRIPTION AND SENSITIVITY,
Utah Water Research Lab., Logan.
M. N. Nimah, and R. J. Hanks.
*Drainage, *Soil-water-plant relationships, *Soils water, Evapotranspiration, *Computer models, Root systems, Soil water movements, Model studies.

A model and its numerical solution were developed to predict water content profiles, evapotranspiration, water flow from or to the water table, root extraction, and root water potential under transient field conditions. Soil properties needed are hydraulic conductivity and soil water potential as functions of water content. Plant properties needed are rooting depth and limiting root water potential. Climatic properties needed are potential evaporation and potential transpiration. The model predicted significant changes in root extraction, evapotranspiration, and drainage due to the variations in pressure head-water content relations and root depth. Variations in the limiting root water potential had a small influence on estimated evapotranspiration, drainage, and root extraction. (See also W74-08085) (Skogerboe-Colorado State)
W74-08084

MODEL FOR ESTIMATING SOIL WATER, PLANT, AND ATMOSPHERIC INTERRELATIONS: II. FIELD TEST OF MODEL,
Utah Water Research Lab., Logan.
M. N. Nimah, and R. J. Hanks.

Descriptors: *Drainage, *Soil-water-plant relationships, *Soil water, Evapotranspiration, *Computer models, Root systems, Soil water movement, Model studies.

A mathematical model was developed to predict water content profiles, evapotranspiration, water flow from or to the water table, root extraction, and root water potential at the surface under transient conditions. The model was field tested in 1970 and 1971. With alfalfa as the crop, predicted and computed water content-depth profiles show best agreement 48 hours after any water addition. The poorest agreement for all crops tested was right after irrigation. The computed cumulative upward water flow from the water table was 4.80 cm as compared to 0.0 cm measured for the whole 1971 season of 116 days. (See also W74-08084) (Skogerboe-Colorado State)
W74-08085

EFFECTS OF DRAINAGE AND ORGANIC AMENDMENTS ON THE RECLAMATION OF A SODIC SOIL CROPPED WITH RICE,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 3C.
W74-08087

QUALITY OF DRAINAGE WATER FROM A HEAVY-TEXTURED SOIL,
Ohio State Univ., Columbus. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W74-08088

EFFECT OF HUMIDITY AND TEMPERATURE ON MICROBIAL ACTIVITY IN MOOR PEAT SOILS, (IN RUSSIAN),
T. G. Zimenko, and L. S. Revinskaya.
Mikrobiologiya. Vol 41, No 5, p 891-895, 1972. Illus. (English summary).
Identifiers: Actinomycetes, Bacteria, *Microbial activity, Microorganisms, Moor, *Peat soils, Minerals, Organic compounds, Ammonia, *Soil humidity, *Soil temperature.

Mineralization of organic compounds in moor peat soils depended on humidity and temperature. Ammonification was sufficiently active when the soil humidity was 10-80% of the pore volume. The maximal energy of nitrification was found when the soil humidity was 40% of the pore volume; nitrification was inhibited at the humidity of 10-20% and almost absent at 80%. The microbiological processes in moor peat soils were most intensive at 35 deg. The decrease of temperature down to 15 deg. inhibited the activity of ammonifying and nitrifying bacteria, microorganisms assimilating mineral nitrogen, actinomycetes and spore-forming bacteria. The activity of cellulose-decomposing, oligonitrophilous and other microorganisms also decreased. The intensive microbial activity in moor peat soils with the humidity of 40% of the pore volume resulted in a higher loss of total organic substances, nitrogen and carbon than at other values of the humidity.--Copyright (c) 1973, Biological Abstracts, Inc.
W74-08089

FLOOD AND SEEPAGE WATER SAMPLING TECHNIQUES IN RICE FIELDS UNDER DIFFERENT WATER MANAGEMENT PRACTICES,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 5B.
W74-08090

LEACHATE TREATMENT BY COAGULATION AND PRECIPITATION,
Camp, Dresser, and McKee, Boston, Mass.
For primary bibliographic entry see Field 5D.
W74-08091

IONIC ACTIVITY COEFFICIENTS IN WATER SOLUTIONS CALCULATED BY MEANS OF NOMOGRAPHS,
For primary bibliographic entry see Field 2K.
W74-08093

RELATIONSHIP BETWEEN SOIL OXYGEN DIFFUSION RATE AND YIELD OF OATS IN A COASTAL ALLUVIAL SOIL AT CRITICAL SALINITY LEVEL,
Department of Agriculture, Fredericton (New Brunswick). Research Station.
For primary bibliographic entry see Field 3C.
W74-08094

EFFECT OF WATER-SOLUBLE DECOMPOSITION PRODUCTS OF HERBACEOUS PLANTS ON UPTAKE OF RADIOISOTOPES IN SOIL. (I RUSSIAN),
Akademiya Nauk SSSR, Sverdlovsk Inst. of Pla and Animal Ecology
M. Ya. Chebotina, and N. V. Kulikov
Ekologiya. Vol 4, No 1, p 102-103, 1973
Identifiers: Cerium, Cesium, Cobal *Decomposition(Herbaceous plants), *Soil Strontium, Yttrium, *Absorption, *Radioisotopes

Water-soluble products of the decomposin aboveground mass of herbaceous plants reduc the uptake of radioisotopes in soil, thereby in creasing their content in the liquid phase. The ex tracts had the strongest effect on the mobility o Co60 and Sr90 in the soil-solution system. The dis tribution coefficients of these radioisotopes in th presence of the extracts decreased on the average by more than an order of magnitude, whereas th distribution coefficients of Y91, Cs137 and Ce14 decreased on the average by a factor of 2-4.-- Copyright 1973, Biological Abstracts, Inc
W74-08117

CORRELATIONS BETWEEN P, FE AND MN AVAILABILITY IN WATER-LOGGED SOIL AT DIFFERENT FERTILITY LEVELS,
Uttar Pradesh Inst. of Agricultural Sciences, Kanpur (India). Div. of Soils and Agricultural Chemistry.
A. N. Pathak, Shri Krishna, and K. N. Tiwari.
J Indian Soc Soil Sci. Vol 20, No 4, p 385-389, 1972.
Identifiers: Iron, *Manganese, *Phosphorus, Rice, *Soils(Waterlogged), *Fertilizers.

Correlations between P, Fe and Mn availability in waterlogged soils at different levels of fertility were studied. The available P, Mn++ and Fe++ content of soil increased up to the 70th day after transplanting (of rice plants) and decreased thereafter until the 90th day. Application of fertilizers increased the amount of available soil P as well as Mn. The availability of Fe, however, decreased with increasing fertility levels. Significant positive correlations were recorded between available soil P and Mn and negative values between P and Fe and also between Mn and Fe.-- Copyright 1973, Biological Abstracts, Inc.
W74-08134

EFFECT OF DILUTE SALT SOLUTIONS ON CHERNOZEM SOIL ESTIMATED THROUGH THE HYDRATION PROPERTIES OF THE COLLOIDS,
Indian Inst. of Tech., Kharagpur. Dept. of Agricultural Engineering.
B. Datta, and I. Szabolcs.
J Indian Chem Soc. Vol 49, No 11, p 1131-1136. 1972.
Identifiers: *Chernozem soils, Colloids, Differential thermal analysis, Hydration, *Illite, Moisture, *Montmorillonite, *Salt solutions, Soils, X-ray analysis, Sodium.

Samples of chernozem soil (containing initially illite and montmorillonite) enriched with 3 levels of pure illite and bentonite were leached for a number of times in columns with single salt solution of Na2CO3, NaCl and MgCl2, and their clay fractions were studied by differential thermal and X-ray methods. Illite treated samples adsorbed less moisture at maximum hygroscopicity than montmorillonite treated ones, and the energy needed to drive off the moisture from the illite treated samples, as indicated by differential thermal analysis, was relatively higher than for montmorillonite samples. The location and force of Na bonding on the surfaces of illite and montmorillonite indicated that Na ions had a tendency towards less hydration on illite than on montmorillonite.--Copyright 1973, Biological Abstracts, Inc.
W74-08135

ALCULATION OF CAPILLARY RISE FROM ROUNDWATER TABLE INTO THE ROOT ONE UNDER STEADY-STATE CONDITIONS, N GERMAN),
Niedersaechsisches Landesmat fuer odenforschung, Hannover (West Germany).
V. Giesel, M. Renger, and O. Strebel.
Pflanzenernaehr Bodenkd. Vol 132, No 1, p 17-0, 1972, Illus. English summary.
dentifiers: *Capillary action, Flow, Germany(Lower Saxony), Ground water table, Hydraulic conductivity, *Soil moisture suction, teady-state(Conditions), Velocity, Root zone, oil profiles, Darcy's Law.

he capillary rise from groundwater table to the ottom of the effective root zone under steady-tate conditions was calculated numerically for 20 dealized single-layer and multi-layer soil profiles ommonly found in large areas of Lower Saxony, ermany. The calculations are based on Darcy's aw, using the relations between soil moisture suc-ion and hydraulic conductivity experimentally etermined on soil cores. Both the height of capil-ary rise and the capillary flow rate very strongly epend on soil texture and on soil structure. mong the single-layer soil profiles the height of apillary rise at the same flow rates is greatest in lay silt (loess) and loamy sand, and lowest in ravelly sand and silty clay. On 2-layer soil rofiles besides texture and structure of the layers he depth of groundwater table below the layer-oundary is also of great importance on height and low rate of capillary rise.--Copyright 1973, Biological Abstracts, Inc.
W74-08139

2H. Lakes

SEASONAL CHANGES IN WATER QUALITY AND PRIMARY PRODUCTIVITY IN DOE VALLEY LAKE,
Kentucky Univ., Lexington. Water Resources Research Inst.
For primary bibliographic entry see Field 5C.
W74-07605

WORLD'S GREATEST SOURCE OF FRESH WATER,
Geological Survey, Albany, N.Y. Water Resources Div.
R. M. Waller.
Journal of the American Water Works Associa-tion, Vol 66, No 4, p 245-247, April 1974. 2 fig.

Descriptors: *Great lakes, *Great lakes region, *Water resources, Groundwater, Lakes, Water supply, Hydrologic cycle, Water reuse, Water resources development.

The Great Lakes are the largest system of fresh-water lakes in the world. As such, they offer opportunities for virtually unlimited supplies of freshwater to their region, provided the water is properly treated for reuse. The abundance of the basin's water resources is not the result of exceptionally high precipitation, which averages only 31 in. annually. Runoff is not exceptional either, with a general range of 30-40 per cent of the precipitation. The large storage capacity of the lakes and, to a lesser extent, the storage capacity of the glacial deposits and underlying bedrock cause retention and slow release of runoff and modify extremes of outflow from the lake system. The average annual discharge of the St. Lawrence River is 239,000 cfs, or 154,000 mgd. The range in discharge is extremely small in comparison with that of other major streams. (Knapp-USGS)
W74-07643

INVESTIGATION OF THE SEDIMENTS AND POTENTIAL MANGANESE NODULE RESOURCES OF GREEN BAY, WISCONSIN,
Wisconsin Univ., Madison. Geo-Environmental and Mineral Resources Program.
For primary bibliographic entry see Field 2J.
W74-07652

SEDIMENT DISTRIBUTION IN A BEACH RIDGE COMPLEX AND ITS APPLICATION TO ARTIFICIAL BEACH REPLENISHMENT,
Geological Survey, Urbana, Ill.
For primary bibliographic entry see Field 2J.
W74-07666

ENVIRONMENTAL CONTROL OF NITROGEN FIXATION IN LAKES, I. IN SITU NITROGEN FIXATION BY FREE LIVING BLUE-GREEN ALGAE, AND II. NITROGEN FIXATION BY THE DUCKWEED-ALGAL ASSOCIATION,
Michigan State Univ., East Lansing. Dept. of Crop and Soil Sciences.
For primary bibliographic entry see Field 5C.
W74-07716

AN INVESTIGATION OF THE WATER QUALITY AND PRODUCTIVITY OF POLSON BAY, FLATHEAD LAKE, MONTANA,
Montana Univ., Missoula. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W74-07717

TESTACEA (PROTOZOA: SARCODINA) AS INDICATORS OF WATER QUALITY IN WESTERN MONTANA,
Montana Univ., Missoula. Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W74-07718

CHARACTERIZATION OF SUSPENDED SEDIMENTS IN WATER FROM SELECTED WATERSHEDS AS RELATED TO CONTROL PROCESSES, NUTRIENT CONTENTS, AND LAKE EUTROPHICATION,
Washington State Univ., Pullman. Dept. of Agronomy and Soils.
For primary bibliographic entry see Field 5B.
W74-07736

SEASONAL AND SPATIAL CHANGES IN PRIMARY PRODUCTION AND NUTRIENTS IN LAKE MICHIGAN,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
For primary bibliographic entry see Field 5C.
W74-07773

HYDROLOGIC MODELS OF THE GREAT LAKES,
State Univ. of New York, Buffalo. Dept. of Civil Engineering.
D. D. Meredith.
Available from the National Technical Information Service as PB-232 163, $3.25 in paper copy, $1.45 in microfiche. Illinois Water Resources Center, Urbana, Research Report No 81, April 1974. 38 p, 2 tab, 27 ref. OWRR B-062-ILL(2). 14-31-0001-3580.

Descriptors: *Great Lakes, *Precipitation(Atmospheric), Evaporation, Runoff, Hydrology, *Model studies, *Statistical methods, *Water balance, Regression analysis.
Identifiers: Statistical analysis.

It is demonstrated that net basin supply values (equivalent to precipitation on the lake minus the evaporation from the lake plus the runoff into the lake) obtained from water balance studies without accounting for the thermal expansion and concentration of water may be in error by as much as 100 percent during some months for each lake. The individual hydrologic components are assumed to be normally distributed for each month and linear regression equations are estimated for predicting the value of the individual monthly hydrologic components. It is shown that some of the hydrologic components for down wind (in this case downstream) lake are dependent upon hydrologic events for the upwind lakes. This is particularly so for precipitation in the down wind lake basins which appears to be highly dependent upon evaporation values for up wind lakes.
W74-07826

FACTORS CONTROLLING THE DYNAMICS OF NON-IONIC SYNTHETIC ORGANIC CHEMICALS IN AQUATIC ENVIRONMENTS,
Purdue Univ., Lafayette, Indiana, Dept. of Forestry and Conservation.
For primary bibliographic entry see Field 5B.
W74-07831

THE FATE AND EFFECTS OF PESTICIDES IN THE AQUATIC ENVIRONMENT OF THE FLATHEAD LAKE DRAINAGE AREA,
Montana Univ., Missoula. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W74-07835

DETERMINING A RECREATIONAL LAKE'S TOLERANCE FOR DEVELOPMENT AND USAGE,
New Hampshire Univ., Durham. Water Resources Research Center.
For primary bibliographic entry see Field 5A.
W74-07836

SURVIVAL OF ENTERIC PATHOGENS AND INDICATOR ORGANISMS IN NATURAL WATERS,
Tennessee Univ., Knoxville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W74-07840

BIG EDDIES AND MIXING PROCESSES IN THE GREAT LAKES,
Waterloo Univ. (Ontario).
For primary bibliographic entry see Field 5B.
W74-07926

REGIONAL ENERGY-WATER PROBLEMS, OHIO-GREAT LAKES.
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 6D.
W74-07973

THE BIOLOGY AND ECOLOGY OF RIVER CARPSUCKER, CARPIODES CARPIO (RAFINESQUE), IN THE LITTLE MISSOURI ARM OF LAKE SAKAKAWEA, NORTH DAKOTA,
North Dakota Univ., Grand Forks.
D. J. Trzpuc.
Available from the National Technical Information Service as COM-73-11531. MS thesis, December 1972. 49 p. 3 fig, 13 tab, 47 ref.

Descriptors: *Carpsucker, *North Dakota, *Distribution, *Life history studies, Turbidity, Water temperature, Animal growth, Spawning, Reproduction, Age, Fish diets, Sexual maturity, Fecundity, Water levels.
Identifiers: *Carpiodes carpio, Little Missouri Arm(N.D.), Lake Sakakawea(N.D.).

The life history, growth, and ecologic distribution of river carpsucker were studied in the Little Missouri Arm of Lake Sakakawea, North Dakota, between May 15 and August 14, 1970. The distribution of the carpsucker seemed to be governed by water level, temperature, and turbidity. Dissolved oxygen concentration, which was near saturation, throughout the study, did not seem to affect their distribution. Hydrogen ion concentra-

tion was optimal for fish throughout the study. The size of carpsuckers taken at the nine stations was found to vary considerably; those taken at four stations in the eastern segment of the arm had mean lengths and mean weights greater than the average of the total catch. This growth rate may be a result of the high concentrations of zooplankton, especially Daphnia, which were taken at these stations. The larger sized carpsuckers at these stations may also indicate that adults prefer a less turbid habitat. Limited observations of reproduction and spawning habits were made, and the evidence indicated that carpsuckers spawn in the Little Missouri River upstream from the area studied. (Jones-Wisconsin)
W74-07991

PHYTOPLANKTON COMMUNITY STRUCTURE AND NUTRIENT RELATIONSHIPS IN LAKE CARL BLACKWELL, OKLAHOMA,
Oklahoma State Univ., Stillwater.
A. R. Faust.
Available from the National Technical Information Service as ORD-4254-13, $5.00 in paper copy, $1.45 in microfiche. PhD thesis, July 1973. 59 p. 12 fig, 9 tab.

Descriptors: *Algae, *Phytoplankton, *Biological communities, *Nutrients, *Aeration, Oklahoma, Light penetration, Dissolved oxygen, Water temperature, Nitrates, Phosphorus, Carbon, Organic matter, Limiting factors, Reservoirs, Chlorella, Taste, Hydrogen ion concentration, Carbon dioxide, Cyanophyta, Diatoms, Odor, Eutrophication, Montmorillonite, Turbidity, Sediments, Fish, Zooplankton, Insects.
Identifiers: *Lake Carl Blackwell(Okla.), Species diversity.

Phosphorus, nitrogen, carbon, and other physiochemical parameters were studied to provide basic data on limiting factors of planktonic algae which impart malflavors. Number-based diversity of phytoplankton enclosed in enriched, isolated columns was compared to diversity in Lake Carl Blackwell, Oklahoma. Taste and odor in the water supply were related to algal blooms. Species diversity of phytoplankton as indicators of eutrophic conditions was reviewed. Data are presented to support the theory that no single limiting nutrient hypothesis is applicable to Lake Carl Blackwell. Blue-greens probably contribute more than diatoms or greens to taste and odor in late summer. Taste and odor in spring months prior to June algal blooms may be due to bacterial decomposition of allchthonous organic material washed in by rains. Aeration did not affect algal numbers but slightly reduced surface temperature and water clarity and increased oxygen content of the bottom water. Release of sedimentary phosphorus and addition of orthophosphate produced significant increases in algal numbers in two days for a juvenile community and in four days for a senile community. Blue-greens responded less than greens to added phosphorus. Diatoms did not respond. (Jones-Wisconsin)
W74-07992

ECOLOGICAL FACTORS AFFECTING ANADROMOUS FISHES OF LAKE PONCHARTRAIN AND ITS TRIBUTARIES,
Louisiana Wild Life and Fisheries Commission, New Orleans.
J. T. Davis, and B. J. Fontenot.
Available from the National Technical Information Service as COM-72-11047, $3.00 in paper copy, $1.45 in microfiche. National Marine Fisheries Service, Arlington, Va., Report No. NOAA-72070612, May 1969. 96 p. 1 fig, 42 tab, 7 ref. 7301000. PL 89-304.

Descriptors: *Striped bass, *Fish populations, Louisiana, Anadromous fish, Shellfish, Systematics, Salinity, Brackish water, Fish establishment, Sampling, Freshwater, Water quality, Estuarine fisheries, Fish food organisms.
Identifiers: *Lake Ponchartrain(La.), Atlantic sturgeon, Alabama shad, Lake St. Catherine(La.), Lake Borgne(La.), Lake Maurepas(La.).

The extent and significance of anadromous fishes in Louisiana were evaluated by trawl and trammel net sampling in Lakes Pontchartrain, Borgne, Maurepas, and St. Catherine and hoop-net and electro-fishing sampling was conducted of their tributary streams. The species caught are listed. Water quality data was compiled to extract pertinent or limiting factors. The striped bass population formerly present in fishable numbers in the coastal areas of eastern Louisiana in now extinct. There is a reproducing Atlantic sturgeon population in the coastal streams that is supporting a very minor commercial fishery. No sport fishing has been observed. Alabama shad were recorded both as juveniles and adults which indicates that at least a reproducing population is present although in insufficient numbers to comprise a fishery. Inasmuch as the water quality in the study area has improved during the past ten years and there is a plentiful supply of forage organisms to support an introduced striped bass population, attempts should continue to introduce this species. No evidence was discovered to indicate the presence of direct competition from other species. (Jones-Wisconsin)
W74-07993

THE FRESHWATER MOLLUSKS FROM THE DUNE AREA NORTH OF THE HAGUE,
W. J. Kuijper.
Basteria. Vol 37, No 1/2, p 1-20. 1973. Illus. (English summary).
Identifiers: Ducks, *Dune lakes, *Mollusks, *Netherlands(Hague), Aquatic insects, *Species migration.

The mollusks found in the dune lakes and pools in the catchment area of the waterworks of the Hague, Netherlands, were surveyed during 1966-1970. These lakes and pools were formed by infiltration of Rhine water from 1955. Before that time the area was dry with the exception of 3 localities. The hydrology of the infiltrated water is described, as well as general aspects of flora and fauna of the newly formed waters. Two types of water are distinguished here: lakes which receive river water by means of a pipeline and pools caused by rising of the ground water table. Drought periods caused by interruption of the infiltration greatly influence the local distribution of the mollusks. The shallow pools may dry out easily and completely. Deep, permanent pools harbor comparatively more species than shallow ones. The mollusks probably populated the new lakes and pools in the dunes by means of transport of birds, among which ducks are common, and aquatic insects. All species found are common in the Netherlands, except for Gyraulis laevis. In the future more species will probably migrate to this by now well watered dune area.--Copyright 1973, Biological Abstracts, Inc.
W74-07996

A PREDICTION OF CHANGES IN THE THERMAL CYCLE OF A STRATIFIED LAKE USED TO COOL A 1000 MW POWER PLANT,
Cornell Univ., Ithaca, N.Y. Dept. of Thermal Engineering.
For primary bibliographic entry see Field 5C.
W74-07998

ECOLOGY OF THE EULITTORAL ZONE OF LAKES,
Warsaw Univ. (Poland). Lab. of Hydrobiology.
For primary bibliographic entry see Field 5C.
W74-08003

PLANKTON PRODUCTION AND WATER QUALITY IN SPANISH RESERVOIRS. FIRST REPORT ON A RESEARCH PROJECT,
Centro de Estudios Hidrograficos, Madrid (Spain).
For primary bibliographic entry see Field 5C.
W74-08005

OXYGEN DEPLETION MODEL FOR CAYU LAKE,
California Univ., Berkeley. Dept. of Civil and E vironmental Engineering
For primary bibliographic entry see Field 5C.
W74-08007

PRESENT AND FUTURE OF LAKE SEV (SOVREMENNOYE SOSTOYANIYE I B DUSHCHEYE OZERA SEVAN),
G. G. Vardumyan.
Meteorologiya i Gidrologiya, No 10, p 94-103, C tober 1973. 1 fig, 3 tab, 5 ref.

Descriptors: Lakes, *Lake morphology, *La morphometry, *Diversion, *Alteration of flo Diversion tunnels, Reservoirs, Pumping plan Hydroelectric plants, Irrigation canals, Therm properties, Water temperature, Dissolved oxyge Water balance, Runoff, Water storag Hydrobiology, Maps, Forecasting, Investment.
Identifiers: *USSR(Lake Sevan-Armenia).

Lake Sevan basin in northern Armenia is a hu tectonic depression having the shape of a triang bounded by the Gegamskiy, Vardenis, Aregu and Sevan mountain ridges. The height of ridg above the lake varies between 500 and 1,800 The lake is a large high-mountain body of wat The area of the lake drainage basin, including t water surface area, is 4,890 sq km. Between 19 and 1971, the level of the lake declined by 18 The volume of water in the lake dropped from 58 billion cu m to 35.0 billion cu m. The water surfa area was reduced from 1,420 sq km to 1,254 sq k The lake level declined from 1,916 m and as January 1, 1972 was 1,898.02 m. Measures divert flow to Lake Sevan include: (1) annu transfer of 250 million cu m of runoff from th Arpa River beginning in 1976; (2) annual transf of 50 million cu m of runoff from the Vorot River beginning in 1981 and later, if necessar transfer of 100-150 million cu m of runoff per yea (3) annual transfer of 40 million cu m of runo from the Getik River (right tributary of the Agst River) beginning in 1981; and (4) annual transfer 100 million cu m of runoff from the Azat and Ve Rivers beginning in 1991. Provisions have bee made to divert a total of 440 million cu m of wat to the lake annually. Upon completion of all me sures the lake level can conceivably be raised by m by the year 2000. Data are presented on use long-term water storage of the lake for hydroelec tric power and irrigation and on the state of th lake's physicochemical and biological regimes connection with lowering of the lake level. Annua water balances of the lake for 1927-71 and forecast of the lake's water balances for differen periods between 1972 and the year 2000 are tabu lated. (Josefson-USGS)
W74-08048

APPLICATION OF SATELLITE DATA FO HYDROLOGIC PURPOSES (ISPOL'ZOVANIY SPUTNIKOVOY INFORMATSII DLY GIDROLOGICHESKIKH TSELEY),
Gosudarstvennyi Gidrologicheski Institut, Leni grad (USSR).
For primary bibliographic entry see Field 7B.
W74-08049

ZONATION OF MOSSES ON THE BANKS O THE NOVY CEPSKY POND. (IN CZECH.),
Jihoceske Muzeum Ceske Budejovic (Czechoslovakia).
M. Rivola, and M. Vondracek.
Preslia (Prague). Vol 44, No 4, p 359-363, 1972.
Identifiers: Bolboschoenus-maritmus, *Czechoslovakia(Novy Cepsky pond), Forests, Glyceria, Mineral, *Mosses, Phragmites-communis, Pine, Ponds, Sedges, Sphagnum-fallax, Substrates, Typha-angustifolia, *Vegetation zones.

A total of 6 vegetation zones were differentiated on the banks of the Novy Cepsky pond (near Cep, Trebon district, Bohemia, Czechoslovakia) in the summer of 1971: pine forest on mineral substrate similar to associations of the alliance Pino-Quercion, pine forest on peat (originally probably belonging to the alliance Rhynchosporion albae, now forming a transition to the alliance Pino-Ledion), a muddy phase of the pond with Sphagnum fallax and other loosely distributed species, sedge stands with isolated areas of Phragmites communis, stands of Bolboschoenus maritimus and Glyceria maxima with island-like occurrence of Typha angustifolia, the bare pond bottom with typical associations. Occurrence and distribution of 24 moss species in the individual zones are presented.--Copyright 1973, Biological Abstracts, Inc.
W74-08119

RELICS OF THE BOGGY VEGETATION IN SODIC TERRITORIES, (IN HUNGARIAN),
Lajos Kossuth Univ., Debrecen (Hungary). Dept. of Botany.
M. Balogh.
Acta Biol Debrecina. 9, p 111-112, 1971.
Identifiers: *Boggy areas(Dystrophic), Floristics, *Hungary(Velence Lake), Organic matter, Peat, Relics, *Sodic steppe areas, Vegetation, *Dystrophy.

The dystrophic bogs of the Velence Lake in Hungary are now assumed not to have been formed in alkaline water, but to form relics preserved through the accumulation of masses of acidic peat and other organic substances with high adsorption capacity. The new hypothesis is fortified by well-known erosion phenomena, by floristic observations by Kerner in the 19th century and by data on a recently discovered bog relic in a sodic steppe in Hungary.--Copyright 1973, Biological Abstracts, Inc.
W74-08122

GROWTH OF THE CASPIAN ROACH IN THE MINGECHAUR RESERVOIR, (IN AZERBAIJARIAN),
S. E. Memmedova, and Sh. R. Ibragimov.
Uch Zap Azerb Univ Ser Biol Nauk. 1, p 43-47. 1972.
Identifiers: *Caspian roach, Condition factors, *Growth, Length, Reservoirs, Rivers, *Roach, Rutilus-Rutilus-Caspicus, *USSR(Kura River), Weight.

The Caspian roach (Rutilus rutilus caspicus) in the Mingechaur reservoir on the Kura river (USSR) is distinguished by a rapid increase in length and gain in weight and high condition factor. The average length of the females is 23.3 cm and of males 22 cm. The condition factor according to Fulton is 2.32 for females and 2.08 for males.--Copyright 1973, Biological Abstracts, Inc.
W74-08123

INVESTIGATIONS ON THE OCCURRENCE AND DECOMPOSITION OF FATS AND FATTY ACIDS IN LAKES, (IN GERMAN),
Biochemisches Institut Umweltcarciogene, Ahrensburg (West Germany).
For primary bibliographic entry see Field 5C.
W74-08141

2I. Water In Plants

STUDY ON THE PERIPHYTIC COLONIZATIONS OF A LATERAL ENVIRONMENT OF THE RIVER PO(ITALY), (IN ITALIAN),
Milan Univ. (Italy). Laboratorio di Zoologia.
Paola Chierici Magnetti, Milvia Dotti, Andreina Paoletti Di Chiara, Elio Smedile, and Ettore Tibaldi.
Atti Accad Naz Lincei Rend Cl Sci Fis Mat Nat Sez III. Vol 51, No 5, p 414-421, 1971. Illus.
Identifiers: Colonizations, Environment, *Italy(River Po), Marsh, *Periphytic populations, Rivers, Seasonal, Vegetation, *Aquatic animals.

The composition of periphytic populations by the immersion of natural substrata (stones) in a stretch of low river marsh land was studied. The results obtained with seasonal experiments are reported. Colonization of the substrata is vast during the entire year and, in terms of biomass, is larger in autumn for vegetation, and in winter for animals.--Copyright 1973, Biological Abstracts, Inc.
W74-07702

LEAD DETECTION IN LIVING PLANT TISSUE USING A NEW HISTOCHEMICAL METHOD,
California Univ., Los Angeles. School of Engineering and Applied Science.
For primary bibliographic entry see Field 5A.
W74-07711

STUDIES ON SOUTHEASTERN AQUATIC INSECTS,
Georgia Univ., Athens. Dept. of Entomology.
For primary bibliographic entry see Field 5C.
W74-07740

AN ECOLOGICAL STUDY OF THE MISSOURI RIVER PRIOR TO CHANNELIZATION,
Univ., South Dakota Vermillion. Dept. of Biology.
J. C. Schmulbach.
Available NTIS as PB-232 150, microfiche $1.45. South Dakota Water Resources Institute, Brookings, Completion Report, March 1974, 34 p. OWRR B-024-SDAK(1) 14-31-0001-3333.

Descriptors: *Missouri River, Aquatic environment, *Benthos, Aquatic drift, Zooplankton, Fish, Food habits, *Fish populations, *Periphyton, *South Dakota, Ecology, Production, Caddisflies, Marshes, Fish diets, *Biota.
Identifiers: *Sturgeon(Shovelnose).

Aquatic biota in the unchannelized Missouri River (South Dakota) was studied prior to construction of bank-stabilizing structures. Cattail-dominated marsh habitat adjacent to the main channel was important to the production of benthos, aufwuchs, drift, fishes and, to a lesser extent, zooplankton. The importance of this habitat to the integrity and stability of the biota of this large botic ecosystem was emphasized. Colonization rates and taxonomic diversity on artificial samplers by aufwuchs macroinvertebrates were faster and larger and the standing crop was 71% greater in the unchannelized river than in the bank-stabilized river. The drift was dominated by aufwuch taxa, principally caddisflies (Hydropsyche spp.); many originated from substrates in chutes which course the marshes. Fishes from 35 species utilized marsh habitat; primarily as a nursery while immature. Fish standing crop and annual production values (dry wt.) conservatively were estimated as 48.2 kg/ha and 121 kg/ha, respectively. An unexplained movement of all fishes from the marshes was observed in late summer. Shovelnose sturgeon populations were high (2500/linear km) in the spring and fall. Extensive seasonal movement and very slow growth was characteristic of this species. Sturgeon subsisted on a minimal ration except in the early winter when benthic and aufwuchs macroinvertebrates became accessible in the main stream as a result of mancontrolled water level changes. (Wiersma-South Dakota)
W74-07744

DOCUMENTATION OF PROSPER - A MODEL OF ATMOSPHERE-SOIL-PLANT WATER FLOW,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 2A.
W74-07785

MODELS OF MATTER FLOW IN A SOUTHERN MIXED HARDWOOD FOREST IN FLORIDA: PRELIMINARY RESULTS,
Florida Univ., Gainesville. Dept. of Botany.
For primary bibliographic entry see Field 5B.
W74-07813

EFFECTS OF IONIZING RADIATION ON PROCESSES INFLUENCING TOLERANCE OF TREE SEEDLINGS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5C.
W74-07815

THE EFFECTS OF RIVER FLUCTUATIONS RESULTING FROM HYDROELECTRIC PEAKING ON SELECTED AQUATIC INVERTEBRATES,
Idaho Univ., Moscow. Coll. of Forestry, Wildlife and Range Sciences.
C. MacPhee, and M. A. Brusven.
Available from the National Technical Information Service as PB-232 268, $3.25 in paper copy, $1.45 in microfiche. Idaho Water Resources Research Institute, Moscow, Completion Report, January 1974. 21 p, 2 fig, 3 tab, 3 ref. OWRR A-035-IDA(2). 14-01-0001-3512.

Descriptors: *Aquatic insects, *Littoral drift, Intertidal areas, Diel migration, *Idaho, *Invertebrates, Hydroelectric power, *River flow, Caddisflies, Stoneflies, Mayflies.
Identifiers: Dworshak Dam(Ida), Clearwater River(Ida), Dicosmoecus spp., Pteronarcys californica, Nymphs.

Near-shore variation in number and weight of riffle insects was shown to be affected by changes in depth (15, 30 and 45 cm) and current velocity, interacting with data and station of sampling. This differential littoral distribution of riffle insects resulted in variation of the littoral community structure. In the non-fluctuating system, community diversity and diversity per individual decreased with increasing depths of 45 cm and current velocity to 1.1 m/sec. Fluctuating flows appear to reverse the order of the community structure, i.e., community diversity and diversity per individual increase with increasing depth to 45 cm and current velocity to 1.1 m/sec. A flow reduction exponentially increased the number of drifting insects in zones adjacent to the exposed substrate in the shoreline. Insects tested in the laboratory demonstrated variability in temperature-exposure tolerances. The case-bearing caddisfly, Dicosmoecus sp., was generally more tolerant than the stonefly, Pteronarcys californica, at most temperature regimes. Older age-class nymphs of the latter were more tolerant than younger nymphs. Shore migration studies indicated stoneflies were much more successful in maintaining contact with the water column during flow reductions than caddisflies and mayflies; mayflies were most vulnerable.
W74-07830

TRICHOPTERA IN THE RESERVATION AREA HEILIGES MEER IN WESTPHALIA,
W. Wichard, and H. Beyer.
Decheniana. Vol 125, No 1/2, p 43-48. 1972. Illus.
Identifiers: Ecnomidae, *West Germany(Westphalia), Hydroptilidae, Leptoceridae, Limnephilidae, Molamnidae, Phyrganeidae, Polycentropodidae, Psychomyiidae, Reservation areas, *Trichoptera, *Distribution patterns.

The distribution of Trichoptera species in surf and silted-up areas of the Heiliges Meer in Westphalia (West Germany) was determined from collections conducted from 1961-1970. Of the 36 spp. identified, Phyrganeidae, Hydroptilidae and Limnephilidae showed above average representation in silted-up areas, while the representation of Polycentropodidae and Ecnomidae was medium, and that of Leptoceridae, Molamnidae and

Psychomyliidae was below average. The populations of Trichoptera in water areas decreased in the order Psychomyiidae, Leptoceridae, Molamnidae, Economidae, Polycentropodidae, Limnephilidae, and Hydrophilidae.--Copyright 1973, Biological Abstracts, Inc.
W74-07997

ON SOME ASPECTS OF THE PARASITES OF CEYLONESE FRESH WATER CRABS,
Ceylon Univ., Colombo. Dept. of Parastitology.
D. W. W. Kannangara.
Ceylon J Sci Biol Sci. Vol 10, No 1, p 32-38, 1972. Illus.
Identifiers: Achillurbainia-Sp, *Ceylon, *Crabs, Metacercariae, Nematode, Paraclepsis - Vulnifera, *Paragonimus-Spp, *Parasites(Crabs), Pleurogenoides-Sitapurii, Spirurid, Trematode.

The parasites found in Ceylonese freshwater crabs are described. They include larval stages of 3 spp. of Paragonium, a species of Achillurbainia, Pleurogenoides sitapurii, 8 other unidetntified trematode matacercariae, a larval spirurid nematode, an encysted nematode larva, an adult nematode and the leech Paraclepsis vulnifera. A brief note is added on in vitro development of the Pleurogenoides sitapurii metacercaria.--Copyright 1973, Biological Abstracts, Inc.
W74-08002

TRICLADIUM VARIUM, AN AQUATIC HYPHOMYCETE ON WOOD IN WATER-COOLING TOWERS,
Portsmouth Polytechnic (England). Dept. of Biological Sciences.
E. B. Gareth Jones, and R. J. Stewart.
Trans Br Mycol Sol., Vol 59, No 1, p 163-167. 1972, Illus.
Identifiers: *Aquatic plants Beech, Ceratosphaeria-Lampadophora, Dactylella-Sp, Growth, Humicola-Alopallonella, Humicola-Sp, *Hyphomycetes, Monodictys-Sp, Morphology, Nais-Inornata, Phaenectriella-Lignicola, Pine(Scotch), Reproduction, Septonema-Hormiscium, Spores, Tricladium-Angulatum, Tricladium-Attenuatum, *Tricladium-Varium.

Tricladium varium sp. nov. is described. Details of growth on beech and Scots pine test blocks are given for this species and Ceratosphaeria lampadophora, Monodictys sp., Humicola sp. and H. alopallonella, Septonema hormisclum, Dactylella sp., Nais inornata, and Phaenectriella lignicola. Spore measurements of T. varium, T. angulatum, and T. attentuatum are given with information on growth and reproduction of T. varium on various media at various temperatures.--Copyright 1973, Biological Abstracts, Inc.
W74-08011

EFFECT OF THE MOISTURE AND TEMPERATURE ON THE LEACHING OF ASH ELEMENTS FROM PLANT RESIDUES (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Pedology.
N. N. Bolyshev, and V. S. Gromova.
Vestn Mosk Univ Ser 6 Biol Pochvoved. Vol 27, No 5, p 70-75, 1972. English summary.
Identifiers: *Ash elements, *Decomposition(Plant residues), *Leaching, Moisture, *Potassium, *Sodium, Solubility, Temperature.

Intensive decomposition of wet plant residues is affected by high temperature (38 deg, 70 deg), the higher the moisture content the greater amounts of ash elements became extractable by water. Low temperatures (40 deg, -70 deg) increase the solubility of Na and K.--Copyright 1973, Biological Abstracts, Inc.
W74-08016

MODEL FOR ESTIMATING SOIL WATER, PLANT, AND ATMOSPHERIC INTERRELATIONS: I. DESCRIPTION AND SENSITIVITY,
Utah Water Research Lab , Logan
For primary bibliographic entry see Field 2G.
W74-08084

MODEL FOR ESTIMATING SOIL WATER, PLANT, AND ATMOSPHERIC INTERRELATIONS: II. FIELD TEST OF MODEL,
Utah Water Research Lab , Logan
For primary bibliographic entry see Field 2G.
W74-08085

USE OF MORSHIN MINERAL WATER IN DISEASE OF THE LIVER AND BILIARY TRACTS IN CHILDREN, (IN UKRAINIAN),
Meditsinskii Institut, Kiev (USSR)
P. O. Velychkovs'kyi, R. Yu. Kol'ner, and R. Ye. Samoilovych.
Pediatr Akush Hinekol. Vol 33, No 6, p 8-10, 1971.
Identifiers: Biliary tract(Human), Cholepathia, *Hepatitis, Liver, *Mineral water, *USSR(Morshin spring), *Human diseases.

Observations were made on 113 children with chronic hepatitis (44) and cholepathia (69) who received as part of treatment mineral water prepared from the Morshin spring. The expediency of this brine for therapeutic purposes is substantiated by the indices of the clinical improvement of the condition of the patients and laboratory data obtained before and after treatment, and also by the advantage of this mineral water over other such waters in the simplicity of its use, cheapness and transportability.--Copyright 1973, Biological Abstracts, Inc.
W74-08101

TREATMENT OF CHILDREN WITH CHRONIC HEPATOANGIOCHOLECYSTITIS AT THE LAKE UCHUM HEALTH RESORT,
Meditsinskii Institut, Tomsk (USSR).
L. S. Chueva.
Vopr Kurortol Fizioter Lech Fiz Kul't. Vol 36, No 6, p 554-555, 1971.
Identifiers: Brine baths, *Cholecystitis, Chronic diseases, Lakes, Mud, Resorts, Therapy, *USSR(Lake Uchum), Human diseases.

An investigation of 86 children with chronic hepatoangiocholecystitis treated at the Lake Uchum health resort by means of mud applications, brine baths and inductothermopelo-therapy showed that the last method is most effective according to clinical and laboratory results.--Copyright 1973, Biological Abstracts, Inc.
W74-08102

GROUND BEETLES (COLEOPTERA, CARABIDAE) FROM THE BOGGY AREAS OF THE CRIMEA, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Zoologii.
A. A. Petrusenko, and S. V. Petrusenko.
Vestn Zool. Vol 7, No 1, p 30-33, 1973. English summary.
Identifiers: Boggy areas, *Carabidae, *Coleoptera, *Ground beetles, Invertebrates, *USSR(Crimea), Vertebrates.

Species composition of ground beetles and ecological and zoogeographical analyses of Carabidae fauna from the bog areas of the Crimea (USSR) are presented. Biocenotic relations of ground beetles with different invertebrates and vertebrates living here substantiate the peculiarity of the bog habitat (plavni, bed kettle, spring fens) as an independent unit enjoying equal significance with other flood-plain biogeocenoses of the penisula.--Copyright 1973, Biological Abstracts, Inc.
W74-08103

DATA ON THE REPRODUCTION OF THE STRIPED RIFFLE MINNOW (ALBURNOIDES TENIATUS KESSER) IN THE ZERAVSHAN RIVER, (IN RUSSIAN),
E. V. Kiseleva
Tr Samark Univ. 211. p 57-61. 1972
Identifiers: Age, Alburnoides Teniatus Kesser, Length, Minnows, *Reproduction, Rivers, *Striped riffle minnows, Temperature, *USSR(Zeravshan River), Weight

A total of 108 female striped riffle minnows (Alburnoides teniatus kesser) (length 135-180 mm, weight 25-75 g, age 3-6 yr) were collected. The time of reproduction varied and depended on the water temperature. The absolute and relative fecundity increases with age and increase of body weight of the female.--Copyright 1973, Biological Abstracts, Inc.
W74-08104

GAMBUSIA IN THE ZERAVSHAN RIVER BASIN, (IN RUSSIAN),
E. V. Kiseleva
Tr Samark Univ. 211. p 51-57, 1972
Identifiers: Basin, Crustaceans, Fish, Food, *Gambusia, Insects, Larvae, *Reproduction, Rivers, *Sexual variability, *USSR(Zeravshan River).

The Gambusia inhabiting the Zeravshan river basin (USSR) is characterized by variability related to sex. Plants, insect larvae, crustaceans, and fish comprise the food of the gambusias. Reproductive rate is rather high, 1 female giving birth to about 217 embryos/liter.--Copyright 1973, Biological Abstracts, Inc.
W74-08105

REGULARITIES OF THE GROWTH OF THE BODY AND BRAIN OF THE COMMON CARP IN BODIES OF WATERS OF THE AMU-DAR'YA DELTA, (IN RUSSIAN),
A. B. Baimuratov.
Ekologiya. Vol 3, No 6, p 69-74, 1972. Illus.
Identifiers: Asia, *Brain weight(Fish), *Carp, Delta, Environmental conditions, *Growth, *USSR(Amu-Dar'ya delta), *Bioindicators.

A regular decrease was found in the relative weight of the brain of carp from different bodies of water of the Amu-Dar'ya delta (Asia); the changes of the weight of the body and brain are specific for each individual population. The brain weight of the fishes can serve as an indicator of their environmental conditions.--Copyright 1973, Biological Abstracts, Inc.
W74-08106

FRESHWATER FAUNA AND FLORA IN HASWELL ISLAND (QUEEN MARY LAND, EASTERN ANTARCTICA),
Polish Academy of Sciences, Warsaw. Inst. of Experimental Biology.
K. W. Opalinski.
Pol Arch Hydrobiol. Vol 19 No 4, p 377-381, 1972. Illus.
Identifiers: *Antarctica(Haswell Island), Bidulphia-sp., Birds, Charcotia-actinochilus, Chlorella-Antarctica, Eastern, *Fauna, *Flora, Fragilariopsis-Antarctica, Fragilariopsis-rhombica, Gloeocapsa-cohaerens-Antarctica, Gulls, Islands, Mineral, Organic matter, Oscillatoriales, Penguins, Prasiola, Rotatoria, Sediments, Tardigrada.

In December 1969, qualitative samples of organic sediments were drawn from the bottom of the freshwater lake in Haswell Island (Queen Mary Land, Eastern Antarctica). Numerous colonies of birds live in the island. The lakes in the island are supplied with several organic and mineral substances originating from guano of gulls and penguins. Among flora and fauna of the investigated lake, the following groups were found: Tardigrada and Rotatoria (2% of the total density of flora and

fauna), Cyanophyta (53%), Diatomeae (23%) and Chlorophyta (17%). Only 2 among 19 plant species (Gloeocapsa cohaerens var. antarctica (Breb) Wille (Cyanophyta) and Chlorella antarctica (Fritsch) Wille (Chlorophyta)) are endemic plants in Antarctica. Among Diatomeae, 4 brackish species were found, characteristic for Antarctic seas (Fragilariopsis rhombica Hust., F. antarctica (Castr.) Hust., Charcotia actinochilus Hust, and Bidulphia sp.). These species were probably brought to the lake by birds. The inflow of allochthonic matter into lakes makes the development of nitrofil forms, such as Prasiola and Oscillatoriales, possible. The investigated lake is similar, as to its flora and fauna composition, to other lakes in the shore oases of Eastern Antarctica.--Copyright 1973, Biological Abstracts, Inc.
W74-08107

INVERTEBRATE FAUNA OF THE BODIES OF WATER OF THE STATIONARY 'AGAPA' (WESTERN TAIMIR). (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Vertebrate Zoology.
N. M. Shalaeva.
Vestn Mosk Univ Ser 6 Biol Pochvoved. Vol 27, No 4, p 98-100, 1972. English summary.
Identifiers: Acanthocyclops-viridis, Asplanchna-priodonta, Biomass, Cyclops-strenuus, Daphnia-pulex, Eurycercus-glacialis, *Fauna, Heterocope-borealis, *Invertebrate, Lepidurus-arcticus, Stationary, *USSR(Taimir).

Altogether 12 lakes and 4 rivers were investigated for the species composition of zooplankton, bottom fauna and the fauna of the zone of vegetation beds. A list of all the invertebrate species recorded in the bodies of water of the stationary is given. The greatest variety of fauna was observed in middle Aug. This seemed also to be the period of its maximum biomass. In analyzing the general character of the hydrofauna a group of widespread forms is noted (Acanthocyclops viridis, Cyclops strenuus, Daphnia pulex, Asplanchna priodonta), and a number of species in herent in northern bodies of water (Heterocope borealis, Eurycercus glacialis, Lepidurus arcticus).--Copyright 1973, Biological Abstracts, Inc.
W74-08110

STUDIES ON THE OCCURRENCE OF PLANKTONIC ROTATORIA IN URBAN WATERS AND THEIR RELATIONSHIP TO SAPROBISM. (IN GERMAN),
Hamburg Univ. (West Germany). Museum of Zoology.
H. Wilkens.
Mitt Hamb Zool Mus Inst. 68, p 1-20, 1972. Illus. English summary.
Identifiers: Anuraeopsis-fissa, Asplanchna-priodonta, Brachionus-angularis, Brachionus-calyciflorus, Brachionus-rubens, Brachionus-urceolaris, Epiphanes-senta, Filinia-longiseta, Keratella-cochlearis, Keratella-quadrata, *Plankton, Pollution, Polyarthra, Pompholyx-sulcata, *Rotatoria, *Saprobism, Synchaeta, *Urban waters.

A series of planktonic rotifers can be observed in moderately as well as nonpolluted urban water: Keratella cochlearis, K. quadrata, Anuraeopsis fissa, Brachionus angularis, B. calyciflorus, Asplanchna priodonta, Filinia longiseta, Pompholyx sulcata, Synchaeta and Polyarthra spp. Only one member of the community, B. calyciflorus, was found in heavily polluted conditions. All other rotifers to be observed here as well, B. urceolaris, B. rubens and Epiphanes senta, are littoral forms in nonpolluted waters, but they become planktonic and numberous in heavy pollution.--Copyright 1973, Biological Abstracts, Inc.
W74-08111

ZOOPLANKTON OF FRESH AND BRACKISH WATERS OF THE BERING ISLAND (COMMANDER ISLANDS). (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Invertebrate Zoology.
N. V. Vekhov.
Zool Zh. Vol 52, No 2, p 185-190, 1973. Illus. English summary.
Identifiers: Anostraca, Biomass, Brackish water, Cladocera, Copepods, Freshwater, Islands, Plankton, Rotifers, Succession, *USSR(Commander Islands), *Zooplankton.

Zooplankton of brackish water (Commander Island, USSR) consisted of rotifers (Notholcaacuminata, N. labis, N. foliacea, Synchaeta sp.) and a copepod Eurythemora Kurenkovi. Lakes are usually populated by various rotifers (Filinia major, Keratella cochlearis, Polyarthra dolichoptera) and Cyclops scutifer. Small freshwater 'puddles' of the island can be divided into 3 groups: non-overgrown, weakly overgrown and strongly overgrown. Each of them is characterized by its own complex of zooplankton: non-overgrown snow type: Branchinecta paludosa (Phyllopoda), Acanthocyclops vernalis, Chydorus sp.; non-overgrown type: wide-spread lake rotifers (F. major, P. dolichoptera et al.) and copepods, few Cladocera; weakly overgrown type: lake and thicket rotifers (family Euchlanidae and Ascomorpha ecaudis) and Cladocera (Daphnia pulex, Bosmina longirostris, Simocephalus sibiricus); strongly overgrown type: numerous Cladocera and thicket rotifers, no lake rotifers. The community biomass grows during succession; diversity is insignificant in the beginning, then sharply increases and decreases at the final stages of succession.--Copyright 1973, Biological Abstracts, Inc.
W74-08114

GROWTH FEATURE OF INTRODUCED PLANTS IN CONNECTION WITH THEIR ADAPTATION TO DROUGHT. (IN RUSSIAN),
S. K. Kabulov.
Probl Osvoeniya Pustyn'. 1. p 80-82, 1973. English summary.
Identifiers: *Acer, Cessation(Growth), *Drought, Growth(Plants), *Padus, Spring, *Desert plants.

In spring, under favorable climatic conditions, plants (Acer, Padus) introduced into desert grow like the natives. Plants avoid atmospheric drought and its harmful influence on plant growth by assuming the state of delayed growth or stopping growth.--Copyright 1973, Biological Abstracts, Inc.
W74-08118

EXPERIMENTS ON THE MOVEMENT BEHAVIOR OF UNICELLULAR ALGAE IN FLOWING WATER,
Oekologiska Stationen, Meassaure (Sweden).
A. Mueller-Haeckel.
Hydrobiologia. Vol 41, No 2, p 221-246,1973. Illus. English summary.
Identifiers: *Algae(Unicellular), Diurnal, Movement, Periodicity, Model studies, *Drift, *Algal growth, *Colonization(Algae).

A schematic model is given of the drifting and recolonization of algal cells in an artifical channel with algal growth on the bottom when water free of algae was flowing through, as well as of the colonization of a clean channel by algal cells, when water of a brook was flowing through. Both phenomena are compared with drift and colonization in a natural channel by means of quantitative samplying. Before settling down again after drifting awary, a single algal cell may cover a distance no greater than 38 m. Multiple sampling over a period of 24 hr demonstrated diurnal periodicity in the drifting and colonization of various algal species from running water.--Copyright 1973, Biological Abstracts, Inc.
W74-08120

PHYTOSOCIOLOGICAL OBSERVATIONS IN INUNDATION ZONE FARMLANDS IN THE NORTHERN UPPER RHINE VALLEY, (IN GERMAN),
A. Oesau, and H. A. Froebe.
Beitr Naturkd Forsch Suedwestdtsch. 31, p 65-86. 1972. Illus.
Identifiers: Agrostideum-stoloniferae, Cyperetum-flavescenti, Cypero-limoselletum, Farmlands, Floods, *Inundation, Kickxietum, *Phytosociological studies, Polygono-bittingeri-chenopodietum-ru, Rorippo-silvestris, Setario, Valley, Veronicetum-politae, *West Germany(Upper Rhine Valley).

Phytosociological investigations of plow-lands in the inundation area of the Rhine in the Northern part of the Upper Rhine Valley (W. Germany) in 1970, following 2 consecutive floods in the same year revealed the associations Cypero-Limoselletum, Cyperetum flavescenti-fusci, Polygono bittingeri-Chenopodietum rubri, and Rorippo silvestris-Agrostideum stoloniferae in deep zones. The associations identified in similar farmlands unaffected by flood are Setario-Veronicetum politae and Kickxietum.--Copyright 1973, Biological Abstracts, Inc.
W74-08121

BIOLOGICAL CHARACTERISTICS OF THE VOLGA SCHOOL OF BELUGA AND STELLATE STURGEON, (IN RUSSIAN),
L. M. Pashkin.
Tr Volgogr Otd Nauchno-Issled Inst Ozern Rechn Rybn Khoz. 6, p 28-47. 1972.
Identifiers: Acipenser-Huso, Age, *Beluga, Biological studies, Fecundity, Size, Spawning, *Stellate, *Sturgeon(Stellate), USSR(Volgagrad), Weight.

The maximum concentrations of beluga (Acipenser huso) in the dam zone of the Volgograd (USSR) hydroelectric development (VHD) were observed in Oct. and remain at a high level until May. The size of the females was 181-320 cm (most often 220-270 cm) and of the males from 171-340 cm (190-270cm); females weighing 80-140 kg and males 50-110 kg predominate. The long stay of the fishes at the VHD had an adverse effect on the development of sexual products; mass resorption of eggs was observed. The fecundity of the Volga beluga increased markedly with increase of the size of the females: it was 250,000-400,000 eggs for fishes 200-220 cm long and 1.0-1.3 million eggs for those 280-300 cm long; the average fecundity/female for the present-day population structure was about 700,000 eggs. The age composition of the spawning population of the beluga was relatively constant, from 9-36 yr. The males of 1 generation participated in spawning for the first time within 11 yr and females 12 yr (both sexes, 17 yr); the beluga matured at an age of 15-23 yr, repeated spawning occurred on the average after 5 yr. The stellate sturgeon spawners appeared at the VHD in May, the maximum concentrations were found in June, and the total time of stay was about 60 days. The constant predominance of females and 'aging' of the spawning school on the whole was reflected in the change of the size-weight structure of the population of stellate sturgeons. The age of the stellate sturgeons in the region of the VHD was 8-26 yr (males aged 11-14 yr and females 15-18 yr predominated). Maturation of 1 generation occurred within 15 yr, ranging from 8-22 yr (females in 12 yr and males in 9). Repeated spawning occured after 3-5 yr.--Copyright 1973, Biological Abstracts, Inc.
W74-08126

EFFECT OF CLIMATIC AND PHYTOCENOTIC FACTORS ON ANNUAL INCREMENT OF TREES IN STANDS, (IN RUSSIAN),
Ural Science Center, Sverdlovsk (USSR). Inst. of Plant and Animal Ecology.
G. E. Komin.
Ekologiya. Vol 4, No 1, p 74-83. 1973. Illus.

Identifiers: *Annual increment, Climatic factors, *Phytocenotic factors, *Trees(Stands).

Phytocenotic factors have a substantial effect on the dynamics of the annual increment of trees in dense stands, especially in multiple-species uneven-aged stands, close stands and successional stands. Therefore, the increment of trees from such stands cannot always be used as an indicator of changes of climatic elements in past years. When trees from dense stands are used, a preliminary analysis is needed to ascertain that the increment of trees in them is determined to a greater degree by annually varying climatic factors than by phytocenotic factors.--Copyright 1973, Biological Abstracts, Inc.
W74-08127

THE MOSS VEGETATION OF THE FORESTS IN THE RHINE LOWLAND BETWEEN BASEL AND MANNHEIM, (IN GERMAN),
Landessammlunge fuer Naturkunde, Karlsruhe (West Germany).
G. Philippi.
Beitr Naturkd Forsch Suedwestdtsch. 31, p 5-64. 1972. English summary.
Identifiers: Acidity, Anthropogenous, Deciduous trees, *Flooding, *Forests, *West Germany(Rhine lowland), Lowlands, *Moss, Pinus, Soils, Species, Vegetation.

The moss vegetation of the forests in the Rhine lowland between Basel and Mannheim (W. Germany) is described. On periodically inundated localities on the bole of Salix alba and Populus canadensis the Tortulo-Leskeetum characterized by Leskea polycarpa, Tortula latifolia, Dialytrichia mucronata and Zygodon viridissimus var. occidentalis is found. On the uninundated base of deciduous trees, the following moss communities are observed: Basi- to neutro-philous communities: the Neckero-Anomodontetum characterized by Anomodon viticulous, A. attenuatus, Homalia trichomanoides, Neckera complanata, Porella platyphylla, rarely Anomodon longifolius, especially in the subassociation with Homalia trichomanoides, the Mnietum cuspidati and the Brachythecietum populei, communities with Fissidens cristatus, Taxiphyllum depressum and Mnium stellare; acidophilous (to neutrophilous) communities: the Isothecietum myuri and a community with Dicranum viride. In the lower and middle part of the bole of deciduous trees the following moss communities are found: Basi- to neutrophilous communities: the Neckero-Anomodontetum, especially in the typical subassociation, the Leucodontetum sciuroidis, the Homalothecietum sericei and the Neckeretum crispae; acidophilous moss communities: the Isothecietum myosuroidis, the Dicrano-Hypnetum cupressiformis, the Dicranoweisietum cirratae and a community with Microlejeunea ulicina; other moss communities: the Pylaisietum polyanthae, the Ulotetum crispae and communities with Tortula papillosa and Orthotrichum obtusifolium (both nitrophilous). The frequency of the occurrence of epiphytic mosses on the single phorophytes and in the single forest communities was examined. The moss vegetation on the soil of the forest communities which is forming only synusia is described.--Copyright 1973, Biological Abstracts, Inc.
W74-08131

FLUCTUATIONS IN GULF OF MAINE SEA TEMPERATURE AND SPECIFIC MOLLUSCAN ABUNDANCE,
Maine Dept. of Sea Shore Fisheries, Augusta.
R. L. Dow.
J Cons Int Explor Mer. Vol 34, No 3, p 532-534. 1972, Illus.
Identifiers: *Gulf of Maine, *Sea temperature, *Mollusks, *Water temperature, *Clams.

The coefficient of correlation between mean annual sea temperature in the Gulf of Maine, and total annual production of hard clams from data obtained for 37 yr is +0.73. The relationship of temperature to approximate natural abundance is noted in connection with predicting future abundance fluctuations by species based on long-range climate forests.--Copyright 1973, Biological Abstracts, Inc.
W74-08145

VEGETATION AND SOIL RELATIONSHIPS IN SOUTHERN BEAUFORT COUNTY, NORTH CAROLINA,
Organisation for Tropical Studies, San Jose (Costa Rica).
For primary bibliographic entry see Field 2K.
W74-08150

2J. Erosion and Sedimentation

OBSERVATIONS AND ANALYSIS OF BOTTOM TURBID LAYERS ON THE OREGON CONTINENTAL SHELF,
Oregon State Univ., Corvallis. School of Oceanography.
P. D. Komar, L. D. Kulm, and J. C. Harlett.
Journal of Geology, Vol 82, No 1, p 104-111, January 1974. 3 fig, 16 ref. USGS Contracts 14-08-001-10766, -11941, -12187 NSF Grant GA-32122.

Descriptors: *Turbidity currents, *Continental shelf, *Oregon, *Sediment transport, Suspended load, Littoral drift, Density currents, *Bottom sediments.

Turbid layers were observed on the Oregon continental shelf. These turbid layers are confined to valleys or swales, flowing around topographic highs. They are probably initiated by water currents associated with surface and internal tides, wind-driven currents, and by sediment stirring due to surface wave activity. A velocity maximum is found within 2 m of the bottom, the velocity decreasing both toward the bottom due to bottom drag and upward in the water column. This near-bottom velocity maximum is produced by the flow of a turbid layer whose highest density core is within approximately 2 m of the bottom. The maximum velocity is approximately 20 cm/sec, but unreasonably high sediment concentrations would be required to generate this velocity. Alternatively, the velocity maximum could be produced by a density flow of 3-5 cm/sec superimposed on a normal water current of about 15 cm/sec; these concentrations and currents are reasonable for the Oregon shelf. Sedimentation rates off Oregon are highest on the lower continental slope and within submarine canyons, where they are several times higher than the adjacent upper continental slope. These slope deposits may be derived from turbid layer transport from the continental shelf. (Knapp-USGS)
W74-07632

A DERIVATION OF THE HYDRAULIC GEOMETRY OF STEADY-STATE CHANNELS FROM CONSERVATION PRINCIPLES AND SEDIMENT TRANSPORT LAWS,
University of Western Ontario, London. Dept. of Geography.
T. R. Smith.
Journal of Geology, Vol 82, No 1, p 98-104, January 1974. 1 fig, 5 ref.

Descriptors: *Channel morphology, *Sediment transport, Erosion, Sedimentation, Alluvial channels, Discharge(Water), Slopes, Velocity.

It is possible to build an analytical model of channel growth using necessary conditions for the existence of a river channel of finite width; namely, that sediment mass is conserved, that the channel form is sufficient to transport the water, and that the channel form is sufficient to transport the total load of sediment, using reasonable approximations to laws of sediment transport. The following geometry is derived: channel width varies as the 0.6 power of Q, channel depth varies as the 0.3 power of Q, stream velocity varies as the 0.1 power of Q, and water slope varies as the 0.2 power of Q, where Q is the total stream discharge. (Knapp-USGS)
W74-07633

INVESTIGATION OF THE SEDIMENTS AND POTENTIAL MANGANESE NODULE RESOURCES OF GREEN BAY, WISCONSIN,
Wisconsin Univ., Madison. Geo-Environmental and Mineral Resources Program.
J. R. Moore, R. P. Meyer, and C. L. Morgan.
Wisconsin University Sea Grant Program Report WIS-SG-73-218, 1973. 144 p, 52 ref.

Descriptors: *Lake Michigan, *Wisconsin, *Bottom sediments, *Manganese, Mineralogy, Sedimentology, Bays, Sampling, Chemical precipitation.
Identifiers: *Green Bay(Wisc), Manganese nodules.

A comprehensive survey was made of the sediments, sub-lake geologic structures, and manganese nodule resources of Green Bay, Wisconsin. A low-grade manganese resource in the form of small nodules (1.5 to 10.0 mm in diameter) was identified and mapped. While the manganese content varies from 4.4% to 16.0% by weight, the nodules in themselves are of potential economic value due to their high specific surface area and possible use in catalysis and chemical adsorption applications. The Mn-rich nodules are largely confined to two sites in the middle bay area, and the largest nodules--potentially useful in adsorption processes--are confined to the area around Sturgeon Bay. A fairly strong correlation was found between Mn and Mg, Sr, and Ba. The Green Bay sands are predominantly quartzose and feldspathic with low concentration of carbonate minerals. (Knapp-USGS)
W74-07652

GEOLOGICAL INVESTIGATIONS,
Westinghouse Electric Corp., Pittsburgh, Pa.
For primary bibliographic entry see Field 5B.
W74-07657

EVOLUTION OF MEANDER LOOPS,
Washington Univ., St Louis, Mo. Dept. of Earth Sciences.
J. C. Brice.
Geological Society of America Bulletin, Vol 85, No 4, p 581-586, April 1974. 6 fig, 15 ref.

Descriptors: *Meanders, *Stream erosion, *Channel morphology, Geomorphology, Sediment transport, Alluvial channels, Terrain analysis, Aerial photography.

The evolution of the meanders on reaches of 10 alluvial streams in the United States was reconstructed. A scheme for the evolution and classification of meander loops was derived from a study of the meandering pattern of 125 alluvial streams. In the main evolutionary trend, a low symmetrical arc of approximately constant curvature tends to increase in height but decrease in radius as it grows. When its length exceeds its radius, the arc is termed a simple symmetrical meander loop. A simple loop becomes asymmetrical by the growth on its perimeter of a second arc of constant curvature, which is commonly tangent to the first and curved toward the same side of the stream. A simple loop becomes compound when a second arc on its perimeter has developed into a loop. Four main categories of loops (simple symmetrical, simple asymmetrical, compound symmetrical, and compound asymmetrical) and about 16 form types are proposed. The compound loops are regarded as aberrant forms of indefinite radius and length, but the meandering patterns can be analyzed into simple loops whose properties can be measured and treated statistically. (Knapp-USGS)

W74-07661

SEDIMENT DISTRIBUTION IN A BEACH RIDGE COMPLEX AND ITS APPLICATION TO ARTIFICIAL BEACH REPLENISHMENT,
Geological Survey, Urbana, Ill.
G. S. Fraser, and N. C. Hester.
Environmental Geology Note 67, March 1974. 26 p, 20 fig, 1 tab, 17 ref.

Descriptors: *Beach erosion, *Lake Michigan, *Illinois, *Erosion control, Coastal engineering, Shore protection.

Severe erosion of much of the beach ridge complex is occurring along the Illinois shore of Lake Michigan east of Zion and Waukegan. One proposed method for solving the problem involves replenishing the eroded shore, either by filling or feeding. The material supplied should match that now found on the shore, and the material must be available in sufficient quantities nearby to make the project economically possible. The sand body along the Illinois shore is approximately 7 miles long and 2.5 miles wide, including a subaqueous platform 1.5 miles wide, and it is as much as 35 feet thick, The subaqueous portion consists of an offshore segment of fine to very fine sand and a nearshore area where sand and granules occur. The shore material ranges from medium-sized sand to pebbles. West of the shore, medium-sized sands are found in dunes and on eolian sand plains. Material similar to that currently being deposited on the shore is available in sufficient quantity for use in a replenishment program. (Knapp-USGS)
W74-07666

INFLUENCE OF OLDER RELIEF ON THE LOCATION OF SAND WAVES IN A PART OF THE SOUTHERN NORTH SEA,
British Petroleum Co. Ltd., Sunbury-on-Thames (England). Research Centre.
V. N. D. Caston, and A. H. Stride.
Estuarine and Coastal Marine Science, Vol 1, No. 4, p 379-386, October 1973. 4 fig, 1 plate, 20 ref.

Descriptors: *Sand waves, *Sounding, *Atlantic Ocean, Surveys, Sediment transport, Ocean currents, Tides.
Identifiers: *North Sea.

A field of large sand waves occupies much of the southern bight of the North Sea. The large sand waves occur as narrow tongues up to about 11.5 km long by 3.5 km broad, which lie between low, northerly-trending ridges presumed to be of Pleistocene age. Evidence of the growth of a new sand wave implies an effective localized movement of the boundary of 1,450 m to the north. (Knapp-USGS)
W74-07676

THE ROLE OF SEDIMENT GRADATION ON CHANNEL ARMORING,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
W. C. Little, and P. G. Mayer.
Available from the National Technical Information Service as PB-232 164, $9.25 in paper copy, $1.45 in microfiche. Report No ERC-0672, May 1972, 104 p, 34 fig, 20 tab, 21 ref, 1 append.

Descriptors: *Channel erosion, Stream erosion, Scour, Channel morphology, *Stream stabilization, Erosion control, *Sediment transport.
Identifiers: *Channel armoring.

The effects of sediment gradation on channel armoring were systematically investigated. A geometric mean diameter of 1.0 mm was used for sediments with geometric standard deviations of 1.12, 1.50, 2.00, 2.50, and 3.00 mm. These five mixtures of crushed quartz were each placed in a flume, and depths and flows were kept constant to induce armoring. The armour was considered stable when the sediment transport rate dropped to less than one percent of the initial rate. The surface layer of particles was then removed by the wax method and the distribution of the armored particles determined. An empirical equation was developed relating the properties of the original and armored sediment distributions to the flow properties. The geometric mean diameter of the armored material is calculated from flow conditions and sediment properties. Criterion was also developed to determine if a sediment bed will armor for given sediment and flow properties. With the broadly graded materials where channel armoring occurred, the bed degraded uniformly along its length. For uniform materials, little armoring could be induced, and the bed degraded more at the entrance and less at the outlet end resulting in a reduced bed slope. Armoring of the surface had no significant change on the average bed shear stress throughout the armoring process. After an 'armor coat' had developed, sediment transport continued at a low rate for a long time. This transport was by scour of fine material 'hiding' in the wake or zone of separation of the large particles. (James-Georgia Tech)
W74-07731

TRANSPORT OF RADIONUCLIDES IN SEDIMENTS,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Center for Inland Waters.
For primary bibliographic entry see Field 5B.
W74-07814

SEDIMENT TRANSPORT BY STREAMS IN THE UPPER COLUMBIA RIVER BASIN, WASHINGTON, MAY 1969-JUNE 1971,
Geological Survey, Tacoma, Wash.
L. M. Nelson.
Water-Resources Investigations 39-73, 1974. 69 p, 11 fig, 22 tab, 12 ref.

Descriptors: *Sediment transport, *Columbia River, *Washington, *Sediment yield, Sediment discharge, Suspended load, Bed load, Land use, Soil erosion.
Identifiers: Columbia Plateau(Wash), Columbia River basin.

Sediment transport by streams in the upper Columbia River basin of eastern Washington was studied from 1969 to 1971. In the mountainous areas snowmelt transports most of the sediment during April through June. In the lower, semiarid parts of the basin most of the sediment is transported when warm rain falls on extensive accumulations of snow. During the 1970 and 1971 water years the measured suspended-sediment concentrations ranged from less than 1 mg per liter in many streams to more than 200,000 mg per liter in Providence Coulee. The estimated long-term annual suspended-sediment yields range from less than 10 tons per square mile in many basins to more than 500 tons per square mile in Providence Coulee. Man's activities have caused only a slight increase in the magnitude of sediment discharge to the Columbia River. Although cultivation has initiated a large increase in erosion on the Columbia Plateau, the sediment transport by streams has not increased greatly, because there is little surface runoff on the plateau to transport soils to streams. (Knapp-USGS)
W74-07911

PATTERNS OF WATER FLOW AND SEDIMENT DISPERSION ADJACENT TO AN ERODING BARRIER ISLAND,
Skidaway Inst. of Oceanography, Savannah, Ga.
G. F. Oertel.
Georgia Marine Science Center, Skidaway Island, Technical Report Series No 73-9, January 1974. 35 p, 19 fig, 2 tab, 9 ref.

Descriptors: *Sediment transport, *Tides, Littoral drift, *Georgia, Currents(Water), Sands, Bottom sediments, Beaches, Continental shelf.
Identifiers: *Tybee Island(Ga).

Hydrography and sediment transport were studied adjacent to Tybee Island, Georgia, to illustrate the role of tidal currents and residual currents in producing sediment transport patterns. Onshore currents associated with the flooding tide are the important mechanisms of sediment transport toward the Savannah River entrance. At two stations, there was a net flow of water in one direction and a potential net transport of sediment in the opposite direction. (Knapp-USGS)
W74-07920

DELIMITATION OF WEATHERING ZONES IN THE FIORD AREA OF EASTERN BAFFIN ISLAND, CANADA,
Colorado University, Boulder. Inst. of Arctic and Alpine Research.
S. J. Boyer, and D. R. Pheasant.
Geological Society of America Bulletin, Vol 85, No 5, p 805-810, May 1974. 5 fig, 8 tab, 10 ref. NSF Grants GA-20883 and GA-10992.

Descriptors: *Weathering, *Arctic, *Soil formation, *Canada, Statistical methods, *Distribution patterns, Mineralogy, Fjords.
Identifiers: *Baffin Island(Canada).

Three weathering zones are delimited near Maktak and Narpaing Fiord, Baffin Island. Detailed sampling of weathering characteristics in Maktak Fiord and subsequent use of character analysis and discriminant analysis techniques supports the tri-zonal classification. The best combination of weathering characteristics for use in statistical delimination of weathering zones was tested by multiple stepwise discriminant analysis procedures. Weathering zones appear to have a regional distribution. The zones are stratigraphic units that can be used as a framework upon which a late Cenozoic history of the Cumberland Peninsula and perhaps eastern Baffin Island could be constructed. (Knapp-USGS)
W74-07937

RANGER SUBMARINE SLIDE, NORTHERN SEBASTIAN VIZCAINO BAY, BAJA CALIFORNIA, MEXICO,
Minnesota Univ., Minneapolis. Dept. of Geology and Geophysics.
W. R. Normark.
Geological Society of America Bulletin, Vol 85, No 5, p 781-784, May 1974. 5 fig, 1 tab, 16 ref.

Descriptors: *Landslides, *Mass wasting, *Sediment transport, *Mexico, Continental shelf, Bottom sediments.
Identifiers: *Baja California, *Submarine landslides.

Ranger submarine slide, on the upper continental slope of the Pacific margin of Baja California, Mexico, covers more than 300 sq km. The slide involves partially indurated, late Pliocene and younger hemipelagic muds which moved down a 3 deg slope in late Pleistocene time. A detailed bathymetric survey of the surface of sliding and slide sheet shows that the sediments, which were as much as 125 m thick, moved down a gently folded, disconformable surface on probable Miocene sedimentary rock. The slide was probably initiated by earthquakes occurring within the Sebastian Vizcaino Bay region. (Knapp-USGS)
W74-07938

TIDAL CURRENTS AND ZIG-ZAG SAND SHOALS IN A WIDE ESTUARY ENTRANCE,
Old Dominion Univ., Norfolk Va. Inst. of Oceanography.
For primary bibliographic entry see Field 2L.
W74-07939

PROCESSES, PROCEDURES, AND METHODS TO CONTROL POLLUTION RESULTING FROM ALL CONSTRUCTION ACTIVITY.
Hittman Associates, Inc., Columbia, Md.
For primary bibliographic entry see Field 5B.
W74-07942

2K. Chemical Processes

EFFECT OF MONOSILICIC ACID ON HYDROLYTIC REACTIONS OF ALUMINUM,
Saskatchewan Univ., Saskatoon. Inst. of Pedology.
For primary bibliographic entry see Field 2G.
W74-07626

FIXATION OF ZINC BY CLAY MINERALS,
Georgia Agricultural Experiment Station, Athens.
For primary bibliographic entry see Field 2G.
W74-07629

ANION EXCLUSION AND COUPLING EFFECTS IN NONSTEADY TRANSPORT THROUGH UNSATURATED SOILS: II. LABORATORY AND NUMERICAL EXPERIMENTS,
Agricultural Research Organization, Bet-Dagan (Israel). Dept. of Soil Physics.
For primary bibliographic entry see Field 2G.
W74-07631

ANION ADSORPTION BY ALLOPHANIC TROPICAL SOILS: I. CHLORIDE ADSORPTION,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W74-07634

ANION ADSORPTION BY ALLOPHANIC TROPICAL SOILS: II. SULFATE ADSORPTION,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W74-07635

ANION ADSORPTION BY ALLOPHANIC TROPICAL SOILS: III. PHOSPHATE ADSORPTION,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W74-07636

QUALITY OF SURFACE WATERS IN THE COLORADO RIVER BASIN, TEXAS, 1966-72 WATER YEARS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 5B.
W74-07670

QUALITY OF SURFACE WATER IN ILLINOIS, 1966-1971,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 5A.
W74-07678

METHODS OF MERCUROMETRIC INVESTIGATIONS,
For primary bibliographic entry see Field 5A.
W74-07695

HYDROGEOLOGIC INVESTIGATION OF A SANITARY LANDFILL IN STRATIFIED GLACIAL DRIFT,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 5B.
W74-07728

DELIMITATION OF WEATHERING ZONES IN THE FIORD AREA OF EASTERN BAFFIN ISLAND, CANADA,
Colorado University, Boulder. Inst. of Arctic and Alpine Research
For primary bibliographic entry see Field 2J.
W74-07937

SOME NOVEL COMPLEXES OF CHROMIUM(I),
Leeds, Univ. (England). Dept. of Inorganic and Structural Chemistry
For primary bibliographic entry see Field 5A.
W74-07946

URANIUM, THORIUM, AND LEAD CONCENTRATIONS IN THREE SILICATE STANDARDS AND A METHOD OF LEAD ISOTOPIC ANALYSIS,
Geological Survey, Denver, Colo.
M. Tatsumoto, R. J. Knight, and M. H. Delevaux.
Professional Paper 800-D, p D111-D115, 1972. 5 tab, 16 ref.

Descriptors: *Isotope fractionation, *Heavy metals, *Rocks, *Standards, Analytical techniques, Chemical analysis, Lead, Thorium, Uranium, Basalts, Minerology, Samples, Laboratory tests, Measurements, Evaluation.

Lead, uranium and thorium concentrations in U.S. Geological Survey rock standards, BCR-1 (basalt) and AGV-1 (andesite) and in a basalt standard distributed by the National Aeronautics and Space Administration, were determined by the isotope dilution procedure. Concentrations were 1.73 ppm U, 5.99 ppm Th and 13.56 ppm Pb in BCR-1; 1.96 ppm U, 6.27 ppm Th and 36.53 ppm Pb in AGV-1; and 1.87 ppm U, 6.42 ppm Th and 5.13 ppm Pb in the NASA basalt. A comparison of lead contents for BCR-1 and the origional split sample indicated that the standard was contaminated by lead; however, homogeneity of the sample was established and variation of the concentration was less than 1%. A new technique for isotopic analysis of lead, the silica gel-phosphate method, was tested for analytical uncertainties. The lead isotopic composition for BCR-1 obtained by the method using double-spike fractionation correction is Pb 206/Pb 204 = 18.794, Pb 207/Pb 204 = 15.610, and Pb 208/Pb 204 = 38.660. (Jerome-Vanderbilt)
W74-07947

AN INSTRUMENTAL TECHNIQUE FOR THE DETERMINATION OF SUB-MICROGRAM CONCENTRATIONS OF MERCURY IN SOILS, ROCKS, AND GAS,
Geological Survey, Denver, Colo.
W. W. Vaughn, and J. H. McCarthy, Jr.
Professional Paper 501-D, Geological Survey Research, p D123-D127, 1964. 3 fig, 2 tab, 5 ref.

Descriptors: *Instrumentation, *Mercury, *Geological surveys, *On-site investigations, Soil investigations, Metals, Gold, Analytical techniques, Rocks, Gases, Sampling, Testing, Geochemistry.
Identifiers: *Atomic absorption spectroscopy, Sensitivity, Accuracy.

In the technique described and evaluated, detection of mercury is based on the principle of atomic absorption. An analog signal, produced when mercury vapor absorbs ultra-violet light, is converted to digital form and calibrated to mercury concentration. Interferences are eliminated by selectively trapping the mercury on gold. The lower limit of sensitivity, using a 1-gram sample, is 5 parts per billion. A model of the instrument mounted in a station wagon has been tested successfully in the field. (Olesziewicz-Vanderbilt)
W74-07948

DETERMINATION OF MERCURY IN VEGETATION WITH DITHIZONE - A SINGLE EXTRACTION PROCEDURE,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5A.
W74-07949

IRON AND ASSOCIATED TRACE MINERAL PROBLEMS IN MAN AND ANIMALS,
Food and Drug Administration, Washington, D.C. Div. of Nutrition
J. C. Fritz
Geological Society of America Bulletin, Vol 83, p 805-812, March, 1972, 5 tab, 51 ref.

Descriptors: *Iron, *Trace elements, *Human pathology, *Nutrient requirements, Animal pathology, Foods, Diets, Hazards, Livestock, Farms, Nutrients, Public health, Deficient elements.
Identifiers: Anemia, Iron deficiency

There is a high incidence of iron-deficiency anemia in the United States and throughout the world. The prevalence is high in adult women and infants because of their greater needs for iron. The typical human diet furnishes less than 6 mg iron per 1,000 kcal and does not meet the current recommended dietary allowance for critical groups because so much of the iron in whole, raw foodstuffs is removed in processing. Farm animals fare better because they receive fractions removed from human foods. A few livestock groups, notably baby pigs, do need supplemental iron. The cereal enrichment program failed to alleviate human anemia because of reduced consumption of cereals and because poorly utilized sources of supplemental iron were employed. The source of supplemental iron had more influence on bio-availability than did other diet components. It is recommended that the level of iron be increased in enriched cereals, that milk and other foods be fortified with iron, and that iron sources with good bioavailability be used in the fortification program. (Oleszkiewicz-Vanderbilt)
W74-07950

QUANTITY AND QUALITY OF SURFACE WATER IN MARION COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W74-08044

AN OSCILLATOR CIRCUIT FOR AUTOMATED SALINITY SENSOR MEASUREMENTS,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
For primary bibliographic entry see Field 2G.
W74-08074

EFFECT OF HUMIDITY AND TEMPERATURE ON MICROBIAL ACTIVITY IN MOOR PEAT SOILS, (IN RUSSIAN),
For primary bibliographic entry see Field 2G.
W74-08089

IONIC ACTIVITY COEFFICIENTS IN WATER SOLUTIONS CALCULATED BY MEANS OF NOMOGRAPHS,
A. Zanker.
Water Research, Vol 6, No 2, p 191-195, February, 1972. 2 fig, 2 ref.

Descriptors: *Ions, *Ion exchange, Solubility, Soil chemistry, *Water chemistry.

A knowledge of ionic activity coefficients is a matter of importance in water research. The ionic activity coefficients in water solutions are functions of the ionic strength, the valency of the ion, and the effective ionic radius (for low ionic strengths only). (Skogerboe-Colorado State)
W74-08093

FFECT OF DILUTE SALT SOLUTIONS ON HERNOZEM SOIL ESTIMATED THROUGH HE HYDRATION PROPERTIES OF THE COL-OIDS,
ıdian Inst. of Tech., Kharagpur. Dept. of Agricul-ıral Engineering.
or primary bibliographic entry see Field 2G.
V74-08135

EGETATION AND SOIL RELATIONSHIPS IN OUTHERN BEAUFORT COUNTY, NORTH AROLINA,
rganisation for Tropical Studies, San Jose (Costa ica).
. S. Hartshorn.
Elisha Mitchell Sci Soc. Vol 88, No 4, p 226-238. 972, Illus.
dentifiers: Acer-Rubrum, Bitterlich, Drainage, agus-Grandifolia, Hardwoods, Liquidambar-tyraciflua, Liriodendron-Tulipifera, *North arolina(Beaufort County), Nyssa-Sylvatica-Var-iflora,inus-Palustris, Pinus-Taeda, Quercus-lba, *Soil analysis, *Physiochemical analysis, Forest stands, *Vegetation.

nalyses of vegetation and soils in 27 forest stands n southern Beaufort County, North Carolina were ıade. The Bitterlich variable plot radius method vas used to sample relatively undistrubed stands. lants in the shrub and herbaceous layers were ampled by square quadrat. Samples of the redominant soil type in each stand were sub-ected to several physical and chemical analyses. exture and lack of drainage were determined to e the dominant soil features determining vegeta-on patterns. As a result of the marked influence f texture and drainage on vegetation and the resence of large areas of disturbed forest and lantations, vegetation patterns were developed or 3 soil families. The clayey, mixed, thermic amily and the fine-loamy, mixed, thermic family iffer only slightly in texture and have Pinus aeda, Liquidambar styraciflua and Liriodendron ulipifera as predominant trees. In addition, Fagus randifolia, Quercus alba and other mesic species re important on the better-drained sites, while Nyssa sylvatica var. biflora and Acer rubrum are mportant on the wetter sites. A strinkingly dif-erent vegetation pattern occurs on the siliceous, hermic family associated with the Suffolk Scrap, Pleistocene shoreline. P. taeda or P. palustris ominates the better-drained sites. A seepage zone n both flanks of the sand ridge is dominated by vergreen bays: Persea borbonia, Gordonia la-ianthus and Magnolia virginiana. Four vegetation ypes are recognized: open pine, evergreen bay, wamp forest and pine-mixed hardwood (which vas further differentiated into 3 phases: white ak, ravine slope and sweet gum-swamp tupelo).--opyright 1973, Biological Abstracts, Inc.
V74-08150

2L. Estuaries

COASTAL VEGETATION OF DELAWARE,
Delaware Univ., Newark. Coll. of Marine Studies.
V. Klemas, F. C. Daiber, D. S. Bartlett, O. W. Crichton, and A. O. Fornes.
Available from the National Technical Informa-ion Service as COM-73-11537, $3.00 in paper opy, $1.45 in microfiche. Sea Grant Program Re-ort DEL-SG-15-73, June 1973. 29 p, 4 fig, 7 ref.

Descriptors: *Mapping, *Wetlands, *Coasts, Delaware, *Vegetation, Remote sensing, Aerial hotography, Marshes, Swamps, Estuaries, Bays, Lagoons, Environment, Ecology, Planning, Land nanagement.

Delaware's coastal wetlands were mapped as part f an evaluation of the relative value of different arcels of marsh and the settling of priorities for se of these marshes. The mapping approach re-ied heavily on aerial photography and multispec-ral analysis, utilizing conventional ground recon-naissance only to aid and check the photoin-terpretation. Coastal wetlands of the type found along the entire East Coast of the United States are well suited to remote sensing techniques, particularly multispectral analysis. The uniform flatness of marsh topography eliminates variations in reflectance due to sloping surfaces and shadows. The most common marsh plant species are few in number, thus simplifying photointerpretation. Environmental changes generally take place over large horizontal distances in the marsh; therefore zones of relatively uniform vegetation are usually large enough to be discernible even on very high altitude imagery. The major plant species are different enough in their morphologies to have distinct reflectance characteristics, particularly in the near-infrared portion of the spectrum. The net result is that multispectral imagery can be used to make detailed wetlands maps sowing vegetation growth patterns which are related to local environmental factors. The fifteen maps of Delaware's coastal zone which follow were prepared to show the dominant species or groups of species of vegetation present. (Knapp-USGS)
W74-07616

OBSERVATIONS AND ANALYSIS OF BOTTOM TURBID LAYERS ON THE OREGON CONTINENTAL SHELF,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 2J.
W74-07632

USE OF FLUORESCENT DYE TRACERS IN MOBILE BAY,
Food and Drug Administration, Dauphin Island, Ala. Gulf Coast Technical Services Unit.
For primary bibliographic entry see Field 5B.
W74-07642

CHESTER RIVER STUDY, VOLUMES I, II, AND III.
For primary bibliographic entry see Field 5B.
W74-07653

TRACE METALS INVESTIGATIONS,
Westinghouse Electric Corp., Pittsburgh, Pa.
For primary bibliographic entry see Field 5B.
W74-07655

BIOLOGICAL INVESTIGATIONS,
For primary bibliographic entry see Field 5B.
W74-07656

GEOLOGICAL INVESTIGATIONS,
Westinghouse Electric Corp., Pittsburgh, Pa.
For primary bibliographic entry see Field 5B.
W74-07657

METEOROLOGICAL AND HYDROLOGICAL INVESTIGATIONS,
For primary bibliographic entry see Field 5B.
W74-07658

DATA MANAGEMENT,
For primary bibliographic entry see Field 5B.
W74-07659

EQUIPMENT AND INSTRUMENTATION,
For primary bibliographic entry see Field 5B.
W74-07660

HETEROGENEITIES IN SALINITY IN A RIVER PLUME,
Delaware Univ., Newark. Coll. of Marine Studies.
K-H. Szekielda, and S. Kupferman.
Estuarine and Coastal Marine Science, Vol 1, No 4, p 419-424, October 1973. 7 fig, 6 ref.

Descriptors: *Mixing, *Deltas, *Salinity, Internal waves, Path of pollutants, Sea water, Sampling, Density currents.
Identifiers: *France(Rhone River).

Continuous and discrete measurements of salinity off the mouth of the Rhone River show the effects of wind induced mixing and of internal waves on the salinity structure. Vertical salinity changes of up to 2.5% in 1 meter and internal waves with periods of two to three minutes were observed in the upper meter of the water column. (Knapp-USGS)
W74-07672

A SIMPLE, SEGMENTED PRISM MODEL OF TIDAL MIXING IN WELL-MIXED ESTUARIES,
Institute of Oceanographic Sciences, Taunton (England).
K. R. Dyer, and P. A. Taylor.
Estuarine and Coastal Marine Science, Vol 1, No 4, p 411-418, October 1973. 5 fig, 2 tab, 8 ref.

Descriptors: *Model studies, *Water circulation, *Estuaries, Mathematical models, Saline water intrusion, Path of pollutants.
Identifiers: *United Kingdom(Thames Estuary), Tidal prism models.

Segmented tidal prism models can incorporate mixing processes in an easily visualized, if over simplified, way. These models may be easily extended to include the flushing of pollutants from estuaries, either from instantaneous or continuous sources. The model is restricted to well mixed estuaries. To illustrate the model a computation was made at a point 11.5 miles below London Bridge. (Knapp-USGS)
W74-07673

CHEMICAL EVIDENCE FOR THE DISPERSAL OF RIVER MERSEY RUN-OFF IN LIVERPOOL BAY,
Liverpool Univ. (England). Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W74-07674

A SIMILARITY SOLUTION FOR STEADY-STATE GRAVITATIONAL CIRCULATION IN FJORDS,
Washington Univ., Seattle. Dept. of Oceanography.
D. F. Winter.
Estuarine and Coastal Marine Science, Vol 1, No 4, p 387-400, October 1973. 6 fig, 1 tab, 14 ref.

Descriptors: *Water circulation, *Fjords, Currents(Water), Estuarines, Stratified flow, Mathematical studies, Equations, Saline water intrusion, Path of pollutants, Convection, Density currents, *Washington, *Canada.
Identifiers: Hood Canal(Wash), Puget Sound(Wash), Knight Inlet(B.C.-Canada).

The dominant circulation mode in fjords which receive ample freshwater runoff is gravitational convection, which takes place primarily near the surface in a brackish phase with one or two current reversals. Approximate analytic expressions were obtained for the velocity components and the density distribution in a fjord segment where conditions for a similarity analysis are statisfied. The method is illustrated by applications to Hood Canal and the central basin of Puget Sound, Washington, and to Knight Inlet on the mainland coast of British Columbia, Canada. Comparisons of measured and computed salinity and velocity profiles indicate that the circulation patterns are reasonably well represented by the approximate solutions. The flow description given may be of use in studies of pollutant dispersal and biological production in fjords. (Knapp-USGS)
W74-07675

RESULTS OF RED TIDE FORMATION IN TOKYO BAY,
Tokyo Univ. (Japan). Faculty of Science.
For primary bibliographic entry see Field 5C.
W74-07770

CONCENTRATIONS OF MANGANESE, IRON, AND ZINC IN JUVENILES OF FIVE ESTUARINE-DEPENDENT FISHES,
National Marine Fisheries Service, Beaufort, N.C.
For primary bibliographic entry see Field 5C.
W74-07803

PROCESS CONTROL MODEL FOR OXYGEN REGENERATION OF POLLUTED RIVERS, PHASES IV AND V, AND SPACIALLY AND TEMPORALLY DISTRIBUTED DISCHARGE OF EFFLUENTS IN ESTUARIES,
Rutgers The State Univ., New Brunswick, N.J. Dept. of Chemical and Biochemical Engineers.
For primary bibliographic entry see Field 5B.
W74-07837

A STOCHASTIC MODEL FOR THE JAMES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W74-07843

PLEISTOCENE-HOLOCENE SEDIMENTS INTERPRETED BY SEISMIC REFRACTION AND WASH-BORE SAMPLING, PLUM ISLAND-CASTLE NECK, MASS.,
Army Coastal Engineering Research Center, Fort Belvoir, Va.
E. G. Rhodes.
Technical Memorandum No. 40, July 1973. 75 p, 34 fig, 1 tab, 31 ref, 1 append.

Descriptors: Seismology, *Subsurface mapping, *Seismic studies, *Coasts, Marshes, Shores, Coastal structures, Islands, *Massachusetts, Sedimentation.
Identifiers: *Refraction seismology, *Wash-bore sampling, Barrier bar, Point bar, Estuaries, Pleistocene, Coastal environment, Barrier beach, Plum Island-Castle Neck(Mass).

Refraction seismology and the 'wash-bore' method of soil sampling were combined to define the geology and the three-dimensional geometry of the coastal environment near Plum Island - Castle Neck, Massachusetts. Although refraction seismology was successful in defining the geometry of the Pleistocene-bedrock interface, many of the problems inherent to the refraction technique were encountered. These problems, which generally led to ambiguous interpretations and poor data quality, included the occurrence of (1) a 'Blind zone,' (2) non-zero time intercepts, (3) severe interface geometries, and (4) apparent velocities. The appropriated field input and recording techniques necessary to minimize their unwanted effects are discussed. It was found that the bedrock topography was quite irregular and that it had played a dominant role in the geologic development of the coastal environment since the Pleistocene. Barrier islands were found to anchor on bedrock highs, while thick sequences of estuarine and marsh sediments accumulated in estuaries behind these barrier beaches. As sea level rose the estuarine and marsh sediments migrated landward behind the migrating barrier. (Martino-NWWA)
W74-07875

PATTERNS OF WATER FLOW AND SEDIMENT DISPERSION ADJACENT TO AN ERODING BARRIER ISLAND,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 2J.
W74-07920

A NUMERICAL STUDY OF THE STEADY CIRCULATION IN AN OPEN BAY,
Florida State Univ., Tallahassee. Dept. of Oceanography., and Florida State Univ., Tallahassee. Geophysical Fluid Dynamics Inst.
Ya. Hsueh, and C-Y. Peng.
Journal of Physical Oceanography, Vol 3, No 2, p 220-225, April 1973. 9 fig, 4 ref. NSF Grants GA-26563 and GA-29374; ONR Contract N00014-67A-00235-0002.

Descriptors: *Water circulation, *Bays, *Continental shelf, Model studies, *Florida, Winds, Currents(Water), Path of pollutants, Numerical analysis, Tides.

The steady-state circulation in a rectangular bay was studied numerically in a model assuming homogeneous water and vertical coasts. The competing influences of surface winds and longshore currents flowing by the open side of the bay and the effects of the bathymetry are emphasized. For a wind-stress field that does not vary along the coast but decays linearly inshore from the open side of the bay, the mass-transport stream function contours form a gyre rotating in the sense of the wind-stress curl. A uniform continental shelf slope distorts the gyre by creating depth variations that cause vortex stretching. Consequently, the streamlines become more packed to the right of the downslope direction. The nonlinearity tends to destroy symmetry by crowding streamlines in the direction of the induced current. The influence of large-scale ocean currents along the open side is normally confined to the outer half of the bay. When the wind is blowing against these currents, the influence of the wind creates two gyres, one at each inshore corner of the bay. (Knapp-USGS)
W74-07924

RANGER SUBMARINE SLIDE, NORTHERN SEBASTIAN VIZCAINO BAY, BAJA CALIFORNIA, MEXICO,
Minnesota Univ., Minneapolis. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 2J.
W74-07938

TIDAL CURRENTS AND ZIG-ZAG SAND SHOALS IN A WIDE ESTUARY ENTRANCE,
Old Dominion Univ., Norfolk Va. Inst. of Oceanography.
J. C. Ludwick.
Geological Society of America Bulletin, Vol 85, No 5, p 717-726, May 1974. 8 fig, 4 tab, 38 ref. ONR-GP Contract N00014-70-C-0083.

Descriptors: *Sediment transport, *Chesapeake Bay, Shoals, Sand bars, Shores, *Tides, *Currents(Water), Sedimentation, *Estuaries.

Zig-zag shoals extend from the north cape three-fourths of the distance to the south across the entrance of Chesapeake Bay. This line of shaols consists of oppositely opening sinuses, or parabolas, which are alternately ebb dominated and flood dominated. The shoals represent spit-building action in the presence of strong reversing tidal currents which are mutually evasive. Other shoals in the entrance are due to subaqueous levee building marginal to main channels. Still other shoals in the entrance are constructed when a flood-dominated channel intersects the ebb-directed path of net sediment transport; the interdicted sediment then is flushed landward to form a secondary shoal when spreading of the flood current occurs. At ebb strength, surface current speed ranges from 132 to 64 cm/sec; near-bottom speed ranges from 79 to 24 cm/sec. At flood strength, surface current speed ranges from 104 to 57 cm/sec; near-bottom speed ranges from 65 to 35 cm/sec. Near the bottom at more than half the stations, flood flow dominates over ebb flow in both peak speed and duration. At ebb strength, stress ranges from 185 to 13 dynes per sq cm. At flood strength, this stress ranges from 80 to 4 dynes per sq cm. Peak flows at all stations are competent to move bed sediment. Net transport of bed sediment usually is ebb directed. Prominent indentations, or sinuses, in the margins of shoals are strongly dominated by net sediment transport toward the closed end of a channel. (Knapp-USGS)
W74-07939

MOLLUSCAN MORTALITY STUDIES,
Maryland Dept. of Natural Resources, Annapolis.
For primary bibliographic entry see Field 8I.
W74-07995

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

REVERSE OSMOSIS PROCESS AND ITS APPLICATION, (IN JAPANESE),
For primary bibliographic entry see Field 5D.
W74-07750

CELLULOSIC REVERSE OSMOSIS MEMBRANES HAVING HIGH FLUX AND HIGH SALT REJECTION,
Eastman Kodak Co., Rochester, N.Y. (Assignee)
B. M. Brown, and E. L. Ray.
U. S. Patent No 3,789,993, 5 p, 1 fig, 2 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 919, p 161, February 5, 1974.

Descriptors: *Patents, *Reverse osmosis, *Membranes, *Desalination, Water treatment, Water quality control.
Identifiers: Cellulose acetate, Formic acid.

The asymmetric cellulose ester reverse osmosis membrane is characterized by having only one active surface which can selectively exclude from passage under applied pressure dissolved sodium chloride ions. It has an integral porous substructure adjacent to the active surface with a substructure flux under 600 psi pressure of at least about 10,000 gallons of water per square foot per day. The membrane has 36 to about 41 percent combined acetyl and at least about one percent combined formyl and a porosity of at least 70 percent. (Sinha-OEIS)
W74-08022

SYSTEM FOR REVERSED OSMOSIS,
Industriele Onderneming Wavin, N.V., Zwolle (Netherlands). (Assignee)
For primary bibliographic entry see Field 5D.
W74-08037

METHOD AND EQUIPMENT FOR DESALINATION OF LIQUIDS,
Mannesmann A.G., Duesseldorf (West Germany). (Assignee)
H. Schug.
U. S. Patent No 3,796,320, 5 p, 3 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 920, No 2, p 393, March 12, 1974.

Descriptors: *Patents, *Desalination, *Filtration, *Water treatment, *Water purification, Water quality control, Ion exchange.

Liquids are desalinated in equipment from which filter material is continuously withdrawn, regenerated and mixed with the raw, saline liquid prior to charging the filter. The regenerated filter material may circulate through a post desalinated filter prior to recycling into the principal filter. Liquid to be desalinated is continuously contacted by fresh, regenerated ion exchange material and exhausted material is discharged from the filter on a continuous basis. The series connection or

ascading of two filters permits use of completely esh and regenerated ion exchange material in the nal and more critical desalination stage. The pre-esalinating filter is subdivided into an upper and wer chamber. Inflow of raw saline liquid is ixed with regenerated ion exchange material. he latter is flushed against the divider. Partially esalinated liquid is forced through nozzles in the ivider. Separate drainage systems below and bove the nozzle plate discharge desalinated or artially desalinated liquid from the filter con-ainer. (Sinha-OEIS)
W74-08038

COMMERCIAL DESALTING PLANT DATA AND ANALYSIS, VOLUMES I-VI,
OSS Engineers, Inc., Ft. Lauderdale, Fla.
C. D. Hornburg, R. E. Bailie, O. J. Morin, and W. J. Suratt.
Available from the National Technical Information Service as PB-226 808 SET/AS; $27.00 in paper copy, $1.45 in microfiche. Office of Saline Water, Reports INT-OSW-RDPR-74-906 thru 911, 1973. 1057 p, 181 fig, 106 tab, 43 ref.

Descriptors: *Desalination plants, *Data collections, Equipment, Failures, *Design, *Operating costs, Corrosion, *Corrosion control, *Waste water treatment, *Maintenance, Economics, Evaporators, Flash distillation, Sea water, Chemical analysis, Water utilization, Waste disposal, Water costs, Iron, Copper.
Identifiers: Operating experience, Virgin Island plants, Key West plant, Nassau plant.

A 6-volume report on commercial plant operating data and experiences. Separate volumes cover the following plants: 1.0 mgd, St. Croix; 1.0 mgd and 2.5 mgd, St. Thomas, 2.62 mgd, Key West; and 2.4 mgd, Nassau. Each volume includes background information covering water demand growth and plant history; design data, including flowsheets and layouts; reports on operational tests, visual inspections and eddy current testing of tubes; performance data and analysis for 3-year period; operating staff and their duties; documentation of material failures and corrosion of plant components; discussions of operating problems, including boilers, sea water supply, fouling and corrosion control problems; economic evaluations, including production cost analysis for a 3-year period; and steam allocation methods for dual-purpose plants. Each volume includes recommendations on modifications, improvements, and procedural changes. The first volume summarizes and compares the 5 plants giving insight into actual operating experiences. A separate section of Volume I contains chemical analysis of effluents from the plants. Emphasis was placed on quantities of iron and copper being discharged. (OSW)
W74-08061

THE POTENTIAL OF DESALTING FOR INDUSTRIAL WATER SUPPLIES IN NORTHEASTERN WYOMING,
R. L. Streeter.
Available from the National Technical Information Service as PB-226 649/AS; $15.50 in paper copy, $1.45 in microfiche. Office of Saline Water Report INT-OSW-74-904, June 1973. 281 p, 21 fig, 21 tab, 61 ref. (Prepared for Wyoming State Engineer's Office). OSW Contract 14-30-2975.

Descriptors: *Desalination, Desalination plants, *Water supply, Water utilization, Water costs, *Wyoming, *Industrial water, Membrane processes, *Planning, *Feasibility studies, Energy, Coals.

Under the Wyoming Water Planning Program, various water and resources studies have been made of N.E. Wyoming. This report supplements that program. The area has great future industrial potential because of its coal deposits which are estimated at 95 billion tons of mapped reserves. This is one of the most arid parts of the state and, hence, water is a key to development. Hence, the State of Wyoming entered into a cooperative agreement with OSW to conduct a reconnaissance-level desalting of brackish waters to augment the meager water supplies. The objectives of the study were to identify potential industrial applications, assess available water supplies, and prepare conceptual designs of water systems for identified applications and prepare reconnaissance-level costs for the total system, whether desalting was required or not. A location was assumed for the coal plant (power or conversion). For the plants, five potential groundwaters and six potential surface waters were evaluated. Reverse osmosis and electrodialysis were the desalting processes considered. It is concluded that in the long term importation of water will be required to fully develop the coal. For the short term, it will be necessary to depend on supplies available within the area. The report states that desalting must and will play an important role in this development. (OSW)
W74-08062

IMPROVING MUNICIPAL WATER SUPPLIES IN ARIZONA BY DESALTING,
Arizona Water Commission, Phoenix.
Available from the National Technical Information Service as PB-226 708/AS; $13.50 in paper copy, $1.45 in microfiche. Office of Saline Water, Report INT-OSW-74-919, March 1973. 212 p, 25 fig, 45 tab, 23 ref, 4 append. OSW Contract 14-30-2728.

Descriptors: *Desalination, Desalination plants, *Water supply, *Municipal water, Water costs, *Arizona, *Planning, Brackish water, *Feasibility studies.

This report examines the technical and economic feasibility of applying desalting technology to provide improved quality water supply to meet the future needs of selected communities in Arizona. Eight communities were selected for study as a representative cross-section of communities throughout the State with varying degrees of water quality, with the objective that the economic feasibility demonstrated would be applicable to other communities in the state with like water quality supplies. The selected communities were Apache Junction, Casa Grande, Gila Bend, Joseph City, Kearney, Parker, Safford, and Somerton. The study indicates that many Arizona communities could conceivably save money through the use of desalting. The study indicates that benefits to a community may exceed costs for desalting where water supplies exceed 1,000 ppm TDS, where the population exceeds 2,000 people and where the average family income equals or exceeds that for the State. It was concluded that a community which now has a satisfactory water supply but may need a future growth supply can economically justify desalting future saline sources which may be available. Processes found applicable to the various waters were ion exchange, electrodialysis, and reverse osmosis. (OSW)
W74-08063

POTENTIAL CONTRIBUTION OF DESALTING SYSTEFS TO MUNICIPAL WATER QUALITY AND SUPPLY IN SOUTH DAKOTA.
Banner (J.T.) and Associates, Inc., Brookings, S. Dak.
Available from the National Technical Information Service as PB-226 719/AS; $21.50 in paper copy, $1.45 in microfiche. Office of Saline Water, Report INT-OSW-74-918, March 1973. 390 p, 67 fig, 73 tab, 40 ref, 13 append. OSW Contract 14-30-2804.

Descriptors: *Desalination, Desalination plants, *Water supply, *Municipal water, Water costs, Benefits, *South Dakota, *Planning, Brackish water, Computer programs, *Feasibility studies.

This was a feasibility study performed under a cooperative agreement between the South Dakota Department of Health and the Office of Saline Water to determine the potential for desalting in South Dakota. Ten communities were selected for study from among 150 communities in South Dakota having water supplies of more than 1,000 ppm TDS. These communities were Bryant, Dupree, Eureka, Gettysburg, Lemmon, Madison, Miller, Parkston, Platte and Redfield. Following OSW cost calculating procedures and criteria, desalting processes were selected for each location based on the most favorable costs. Economic benefits to the community were assessed and a description provided of each desalting process. For the electrodialysis process, cost comparisons are made with the electrodialysis plant at Webster, S.D. To facilitate calculations, a computer program was established and the program is detailed in an appendix. (OSW)
W74-08064

THE FUTURE ROLE OF DESALTING IN NEVADA,
Southwest Research Inst., San Antonio, Tex.
W. L. Prehn.
Available from the National Technical Information Service as PB-226 760/AS; $14.25 in paper copy, $1.45 in microfiche. Office of Saline Water, Report INT-OSW-74-920, April 30, 1973. 234 p, 41 fig, 41 tab, 209 ref, 11 append. Prepared for Nevada Division of Water Resources. OSW Contract 14-30-2846.

Descriptors: *Desalination, Desalination plants, *Water supply, Municipal water, Water costs, *Nevada, *Planning, Brackish water, Geothermal studies, Water sources, *Feasibility studies.

An important aspect of the on-going development of the State Water Plan is the exploration of alternative sources of water supply. The purpose of this report is to determine the feasibility of desalting in Nevada and review the potential for its future applications. Detailed cost information is presented on ten representative Nevada water supply situations. Five of these studies dealt with community or area water needs: Fallon, Gabbs, Hawthorne, the Logandale/Moapa Valley, and Mesquite/Bunkerville. Of the five remaining sites, three were oriented toward agricultural or wildlife management needs: a dual-purpose desalt/nuclear power plant at Carson Sink to provide water for an entire valley's needs; a plant at Fallon to provide municipal water for the city and surrounding area as well as for Stillwater wildlife management area needs; and reduction of the level of dissolved solids in Walker Lake in order to maintain a safe environment for the fishery. In addition, one study situation dealt with development of a geothermal resource, and the final study was comprised of a series of evaluations of small desalt plants suitable for use in ranch-type applications. For four of the sites, conventional sources appeared more economical. Opportunities are indicated for developing the geothermal resources and ranch type units. The appropriate process was selected for each site with consideration given to reverse osmosis, electrodialysis, ion exchange, distillation and freezing. (OSW)
W74-08065

PRELIMINARY STUDY TO INVESTIGATE FEASIBILITY OF DESALTING GROUND WATER IN NORTH DAKOTA,
North Dakota State Water Commission, Bismarck.
T. C. Owens, A. M. Cooley, G. O. Fossum, and David Schaaf.
Available from the National Technical Information Service as PB-225 976; $10.75 in paper copy, $1.45 in microfiche. Office of Saline Water, Report INT-OSW-73-902, August 23, 1973. 163 p, 24 fig, 26 tab. OSW Contract 14-30-2875.

Descriptors: Costs, Brackish water, Conjunctive use, Municipal water, *North Dakota, *Desalination processes, Water supply, *Groundwater, *Economic feasibility, *Water quality, *Feasibility studies.

Groundwater in North Dakota is used by a large number of communities and by most of the farms in the state as a source of water. The quality of the water used varies widely, but very few community supplies satisfy the criteria established by the U.S. Public Health Service. The quality of water available for domestic uses on farms is probably lower because of the need for a well in close proximity to the farm buildings. The technical and economic feasibility of desalting groundwater for domestic, agricultural, and industrial purposes has been studied. The costs of desalting groundwater by a number of methods to provide municipal water for eleven communities were estimated. In addition, the availability of desalting units suitable for use by individual farms and homes was investigated. (OSW)
W74-08066

HIGH TEMPERATURE ELECTRODIALYSIS, PHASE I,
Ionics, Inc., Watertown, Mass.
F. B. Leitz.
Available from the National Technical Information Service as PB-226 825/AS; $4.00 in paper copy, $1.45 in microfiche. Phase I thru III available as PB-226 824-SET/AS, $11.00. Office of Saline Water, Report INT-OSW-RDPR-74-912, January 1974. 87 p, 16 fig, 23 tab. OSW Contract 14-01-0001-1158.

Descriptors: *Desalination, *Electrodialysis, *Ion transport, *Membrane processes, Membranes, Saline water, Brackish water, Plastics.
Identifiers: Polystyrene, Hittorf transport numbers.

An investigation was made of the properties of organic ion-transfer membranes at room temperature and at temperatures approaching the normal boiling point of water. Five parameters were measured: electrical resistance, Hittorf transport number, electroosmotic water transport, water permeation and salt diffusion. The membranes evaluated were of crosslinked polystyrene which had been polymerized around a fibrous material in the presence of a soluble nonpolymerizing agent and subsequently chemically reacted to form fixed positive or negative sites. Standard (22 mil) commercial membranes and thin (4 to 6 mil) experimental membranes were evaluated. (See also W74-08068 thru W74-08070) (OSW)
W74-08067

HIGH TEMPERATURE ELECTRODIALYSIS, PHASE II,
Ionics, Inc., Watertown, Mass.
F. B. Leitz, and H. I. Viklund.
Available from the National Technical Information Service as PB-226 826/AS; $4.00 in paper copy, $1.45 in microfiche. Office of Saline Water, Report INT-OSW-74-913, January 1974. 94 p, 19 fig, 20 tab, 3 ref. OSW Contract 14-01-0001-1158.

Descriptors: *Desalination, Desalination processes, *Electrodialysis, Membranes, Saline water, Sea water, *Ion transport, *Membrane process.
Identifiers: Polycarbonate, Polysulfone, Nylon, Hittorf transport numbers.

The economic evaluation of high temperature electrodialysis showed a large parameter region in which high temperature operation would be substantially cheaper than source temperature operation. This would be true in the case where the required number of stages is large or where cheap heat is available. Standard resins perhaps with a lower water content are suitable for high temperature application. Techniques and materials were developed for lamination of a high temperature thin spacer. The synthetic Webster, S D , plant water used in this program did not present any particular hazards at high temperature compared to sodium chloride solutions or synthetic desalted sea water. (See also W74-08067) (OSW)
W74-08068

HIGH TEMPERATURE ELECTRODIALYSIS, PHASE III,
Ionics, Inc., Watertown, Mass.
F. B. Leitz, M. A. Accomazzo, and H. I. Viklund.
Available from the National Technical Information Service as PB-226 827/AS; $5.00 in paper copy, $1.45 in microfiche. Office of Saline Water, Report INT-OSW-74-914, January 1974. 156 pages, 3 references, 29 tables, 42 figures. OSW Contract 14-01-0001-2322.

Descriptors: *Desalination, *Electrodialysis, Ion transport, *Membrane processes, Membranes, Saline water, Brackish water, *Design, Testing.
Identifiers: Economic analysis.

The program covered the development and testing of a thin spacer (20 mil), which could be utilized with thin membranes (6 mil) in a high temperature (160 deg - 180 deg F) field test unit. Results indicated that a low cut per pass (20-30%) is desirable for good area utilization. Hence, for a thin spacer, this requires a fairly short flow path. The relationship between (CN/N)o and velocity plus the relationship between pressure drop and velocity were used to predict the performance of a unit as a function of total pressure drop. The Phase III report summarizes the following: (1) analytical studies, (2) experimental results from short term and long term tests, (3) design and testing of a thin spacer for utilization in high temperature electrodialysis, and (4) design of a field test unit. (See also W74-08067) (OSW)
W74-08069

HIGH TEMPERATURE ELECTRODIALYSIS, PHASE IV,
Ionics, Inc., Watertown, Mass.
M. A. Accomazzo, F. B. Leitz, H. I. Viklund, and R. L. Sampson.
Available from the National Technical Information Service as PB-227 280/AS; $6.50 in paper copy, $1.45 in microfiche. Office of Saline Water, Report INT-OSW-73-915, November 1973. 70 p, 17 fig, 18 tab, 12 ref. OSW Contract 14-30-2963.

Descriptors: *Desalination, Desalination processes, *Electrodialysis, Pilot plants, *Membrane processes, *Design, Testing, *Cost comparisons.
Identifiers: Spacers.

The overall objective of this program is the development of improved electrodialysis technology. On previous contracts the effect and applicability of two process improvements: high temperature operation and use of thinner than standard components were determined. The technical and economic aspects of these developments are discussed. The present program has dealt with the design, fabrication, testing and specification of a means of manufacture of thin spacers and membranes for use at temperatures up to 80 deg C. Satisfactory means of manufacture were developed for both spacers and membranes. Design equations and empirical relationships for the new components are presented. Performance and economics are predicted for plants of 3780 cubic meters/day (1 MGD) and two lower capacities. An economic comparison is made between these plants and conventional plants in sea water service. These estimates indicate that in this capacity range, electrodialysis can be competitive with distillation for sea water desalting. (See also W74-08067) (OSW)
W74-08070

3B. Water Yield Improvement

WATER RESOURCES OF LEHIGH COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 4A
W74-07649

DEFORMATION MODULI OF WATER-BEARING FORMATIONS AT ELEVATED TEMPERATURES,
California Univ., Berkeley. Coll. of Engineering.
For primary bibliographic entry see Field 4B
W74-07726

OPTIMUM DRILLING SITES FOR GROUNDWATER DEVELOPMENT ON THE EAST COAST OF LANAI ISLAND,
Hawaii Univ., Honolulu. Water Resources Research Center
For primary bibliographic entry see Field 4B.
W74-07734

PHREATOPHYTES, A BIBLIOGRAPHY, REVISED.
Office of Water Resources Research, Washington, D.C.
Available from the National Technical Information Service as PB-232 259, $6.75 in paper copy, $1.45 in microfiche. Water Resources Scientific Information Center Report WRSIC 74-201, April 1974, 277 p. Edited by Patricia Paylore, University of Arizona, Tucson.

Descriptors: *Phreatophytes, *Bibliographies, *Xerophytes, *Evapotranspiration, Arid lands, *Chaparral, *Sagebrush, Soil moisture, *Tamarisk, Vegetation effects, Water yield improvement.
Identifiers: Brush control.

This report, containing 183 abstracts, is another in a series of planned bibliographies in water resources to be produced from the information base comprising SELECTED WATER RESOURCES ABSTRACTS (SWRA). At the time of search for this bibliography, the data base had 68,063 abstracts covering SWRA through February 1974 (Volume 7, Number 4). Author and subject indexes are included.
W74-07829

WATER IN THE OKANOGAN RIVER BASIN, WASHINGTON,
Geological Survey, Tacoma, Wash.
K. L. Walters.
Washington State Department of Ecology, (Olympia), Water-supply Bulletin 34, 1974. 136 p, 35 fig, 1 plate, 8 tab.

Descriptors: *Water resources, *Washington, *Surface waters, *Groundwater, Water balance, Water utilization, Water yield, Water quality, Hydrologic data, Data collections.
Identifiers: *Okanogan River Basin(Wash).

Water information is presented for use in developing, protecting, and managing the water resources of the Okanogan River basin of Washington. Based on records compiled from 1930 through 1969, the estimated mean annual precipitation over the study area is 17.5 inches. About 2.1 million acre-feet of water enters the study area each year from Canada as streamflow. Alluvial and glacial sedimentary deposits ranging from a few feet to several hundred feet thick contain the main volume of groundwater in the basin, with sand and gravel layers constituting the principal water-bearing zones. Most of the sedimentary deposits are underlain by poorly permeable bedrock. In some places, the sedimentary deposits are thick and consist almost entirely of sand and gravel containing large quantities of groundwater. In other

aces, the deposits are thin or impermeable, and old little water. Streamflow accounts for most of ie water leaving the basin. The discharge veraged about 2.2 million acre-feet per year in ater years 1959-69. Evapotranspiration loss exeeds the average annual precipitation for most irgated crops. Water in the Okanogan and Similameen Rivers is of the calcium-magnesium bicarbonate type, and is suitable for most common sed. Some lakes contain water of about the same uality as the streams that feed them. However, ie closed-basin lakes contain saline water. roundwater generally is more mineralized and iore variable in chemical composition than the urface water, but in the Okanogan River basin it till is suitable for most common uses. Most of the ertile land of the basin that can be readily supplied from surface-water sources is being irrigated. Knapp-USGS)
W74-07907

ECLAMATION RESEARCH IN THE SEVENTIES--FIRST PROGRESS REPORT.
Bureau of Reclamation, Denver, Colo.
For primary bibliographic entry see Field 4A.
W74-07922

PROJECT SKYWATER 1972 ANNUAL REPORT.
Bureau of Reclamation, Denver, Colo. Office of Atmospheric Water Resources.
Available from NTIS, Springfield, Va. 22151, as REC-ERC-73-17, Price $6.00 printed copy, $1.45 microfiche. Bureau of Reclamation Engineering and Research Center Report 73-17, November 1973. 540 p.

Descriptors: *Weather modification, *Cloud seeding, Cloud physics, Model studies, Ecology, Instrumentation, Meteorology, Colorado River basin, Columbia River.
Identifiers: *Project Skywater.

The Bureau of Reclamation's precipitation management activities in fiscal year 1972 are summarized and advances made under the research program are discussed. The first part of the report outlines the project, its goals and depth. The second portion consists of reports prepared by the contractors who participated in Project Skywater during the fiscal year. The reports are preceded by descriptions which introduce the individual project, its objective, progress and funding. (Knapp-USGS)
W74-07928

SOME CLIMATOLOGICAL CHARACTERISTICS OF SEEDABLE UPSLOPE CLOUD SYSTEMS IN THE HIGH PLAINS,
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
C. D. Whiteman.
Technical Report 268-APCL 27, March 1973. 43 p, 32 fig, 3 tab, 6 ref, append.

Descriptors: *Meteorology, *Mathematical models, *Cloud seeding, Weather modification, Cloud physics, Winds, Climatology, Great Plains.

A model to describe seeding opportunity was developed for shallow wintertime cloud systems in the High Plains of the United States. The model uses rawinsonde network data for the High Plains to determine climatological characteristics of seedable upslope cloud systems. Included are annual, monthly, and diurnal frequencies of occurrence of seedable cloud systems as well as characteristics of the cloud systems themselves. Such characteristics include cloud thicknesses, heights of cloud tops and bases, lapse rates, cloud top temperatures, upslope wind components, and the relative frequencies of precipitating and non-precipitating cloud systems. (Knapp-USGS)
W74-07929

3C. Use Of Water Of Impaired Quality

THE SIGNIFICANCE OF RAINFALL ON SALT AND SODIUM ACCUMULATIONS UNDER IRRIGATION,
South Dakota State Univ., Brookings. Dept. of Plant Science.
L. O. Fine.
Available NTIS as PB-232 165, microfiche $1.45. South Dakota Water Resources Institute, Brookings, Completion Report, March 1974. 18 p, 1 fig, 6 tab. OWRR A-020-SDAK(1). 14-01-0001-1862.

Descriptors: *Irrigation effects, *Rainfall, Water quality standards, Salts, *Salinity, *Sodium, Sodium compounds, adsorption, Cations, Anions.
Identifiers: Residual sodium carbonate, *Sodium adsorption ratio.

Since irrigation water quality standards were established for use under arid conditions, it has been rationalized that they may be too stringent where natural precipitation may have a modifying effect on either or both of the sodium and salinity hazards. The rationalization was studied in a 17 inch rainfall belt using groundwaters with electrical conductivities of about 2000 micromhos per cm at 25C and having sodium adsorption ratio (SAR) values of about 10. The results determined from the field and plot experiments indicate that there is no justification for raising tolerable sodium adsorption ratio levels in irrigation water used in this rainfall belt; rather it showed that there may be reason for lowering them from three to four units. (Wiersma-South Dakota State)
W74-07743

LEACHING REQUIREMENT STUDIES: SENSITIVITY OF ALFALFA TO SALINITY OF IRRIGATION AND DRAINAGE WATERS,
Agricultural Research Service, Riverside. Salinity Lab.
L. Bernstein, and L. E. Francois.
Soil Science Society of America Proceedings, Vol 37, No 6, p 931-943, November-December, 1973. 4 fig, 10 tab, 17 ref.

Descriptors: *Alfalfa, *Lysimeters, *Leaching, *Water quality control, Irrigation operation and management, Irrigation effects, Salt balance, Drainage water, Investigations, *Salts, Chlorides, Soil profiles, Water requirements.

Alfalfa was grown in 0.6 by 1.5 meter greenhouse lysimeters and irrigated with two waters of EC 1 and 2 mmho/cm prepared by adding equivalent amounts of NaCl and CaCl2 to a 0.4 mmho/cm tap water. Yields showed relatively little effect of leaching fraction (LF) within the limits consistent with steady-state salt balance for suction-drained lysimeters but decreased 26 percent at the lowest LF for gravity-drained lysimeters. Cessation of leaching or reduction of LF to levels requiring drainage water salinities for salt balance at steady state to exceed 35 mmho/cm eventually reduced yields. Yield response appears to be related to the calculated mean salinity against which water was absorbed, which is influenced more by the salinity of the irrigation water than by the salinity of the drainage water. LF in the broad range that permitted nearly maximum growth had essentially no effect on water requirement or on Na and Cl contents of the harvested alfalfa. Increasing irrigation water salinity in the range 0.4 to 2 mmho/cm consistently increased plant Na and Cl contents, but had no effect on water requirement. Implications of the demonstrated lower leaching requirements for irrigation management and drainage and for water quality assessment are discussed. (Sandoski-Franklin)
W74-07774

EFFECTS OF COLORADO RIVER WATER QUALITY AND SUPPLY ON IRRIGATED AGRICULTURE,
Economic Research Service, Davis, Calif.
C. V. Moore, H. H. Snyder, and P. Sun.
Water Resources Research, Vol 10, No 2, p 137-144, April 1974. 7 fig, 2 tab, 4 equ, 8 ref.

Descriptors: *Irrigation water, *Water supply, *Saline water, *Water quality, Agriculture, Estimating, Linear programming, Regional analysis, Water demand, Irrigated land, Optimization, Colorado River, Farms, Size, Soils, Prices, Water rates, Mathematical models, Systems analysis, *California.
Identifiers: *Imperial Valley(Calif.), *Crop yield, Demand elasticity, Cost structure, Electroconductivity, Demand schedule.

Considered are salination effects upon irrigation water supplies in the Imperial Valley of California. A production function relating irrigated crop yield to the quality and supply of irrigation water is developed. The objective function is to maximize the return to land and water. Described is a linear programming, farm model constructed to estimate the probable effects of various levels of supply and quality. A regional programming model, an aggregation of three different size individual farms, reflects the distribution of soils and the cost structure representative of farm size. Given the production function, cropping pattern and irrigation management can be optimized using the linear programming models. Use of the regional model for estimating the demand schedule for irrigation water is discussed. Results show that the adverse effects of saline irrigation water can be offset by applying additional water over and above that required for plant transpiration. A degradation of the water supply in the Colorado River at Imperial Dam from the existing level of electroconductivity to the projected level for the year 2000 would cause a decline in the return to land and water of about 14%. Because of the relatively elastic demand for irrigation water at the current price, any attempt to ration water through a market price mechanism would have no effect, unless water rates were about double their current levels. (Bell-Cornell)
W74-08014

INFLUENCE OF TEMPERATURE AND MOISTURE STRESS FROM SODIUM CHLORIDE SALINIZATION ON OKRA EMERGENCE,
Florida Univ., Dover. Agricultural Research Center.
E. E. Albregts, and C. M. Howard.
Agronomy Journal, Vol 65, No 5, p 836-837, September-October, 1973. 1 tab, 7 ref.

Descriptors: *Soil moisture, *Stress, *Salinity, *Crop response, Crop production.
Identifiers: *Okra.

Okra seed were planted in a Scranton fine sand soil at 20, 25, and 30 C with six levels of moisture stress, 1.18, 1.75, 2.41, 4.33, 5.90, and 10.84 atm. Moisture stress was obtained by varying the moisture level in the soil and by NaCl salinization. The emergence rate and fresh plant weight decreased as the temperature decreased and soil moisture stress increased. The optimum temperature and soil moisture stress for total and earliness of emergence was 25 to 30 C and 1.18 atm. No emergence occurred at 10.84 atm of moisture stress and total emergence was reduced only at 5.90 atm and 20 C. (Skogerboe-Colorado State)
W74-08073

TOLERANCE OF RICE (ORYZA SATIVA L.) TO SALT DURING BOOT, FLOWERING, AND GRAIN-FILLING STAGES,
Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
M. T. Kaddah, W. F. Lehman, and F. E. Robinson.

Agronomy Journal, Vol 65, No 5, p 845-847, September-October, 1973. 1 fig, 14 ref.

Descriptors: *Salinity, *Crop response, *Rice, Soil moisture, Stress, *Crop production.

The effect of soil salinity on rice development at the boot, flowering, and grain-filling stages was tested for three varieties transplanted in a greenhouse. The irrigation waters used had electrical conductivities of 1.4, 3.0, and 6.0 mmho/cm at 25C. The last two irrigation waters were introduced at the three stages of development and used until harvest. Weights of grain and straw and lengths of plants and panicles did not differ significantly between the treatments, indicating that rice is not sensitive to salt after the boot stage. (Skogerboe-Colorado State)
W74-08080

EFFECTS OF DRAINAGE AND ORGANIC AMENDMENTS ON THE RECLAMATION OF A SODIC SOIL CROPPED WITH RICE,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
B. S. Puttaswamygowda, E. F. Wallihan, and P. F. Pratt.
Soil Science Society of America Proceedings, Vol 37, No 4, p 621-625, July-August, 1973. 6 fig, 3 tab, 22 ref.

Descriptors: *Salinity, *Sodium, *Alkaline soils, Soil chemistry, Organic matter, *Drainage, Soil physics, *Rice, Crop response.

In a greenhouse pot culture study, effects of drainage and organic amendments on the reclamation of a saline sodic soil material under submerged conditions were studied with and without the presence of a rice crip. In drained soils, application of dairy manure, sugar, straw or straw + CaC12 increased the rate of drainage and decreased the electric conductivity and exchangeable sodium percentage. Without drainage, treatments were less effective. Crop growth hastened the reclamation process by increasing the volume of water drained and the concentration of Ca + Mg in the drainage water. Drainage had a significant effect on the vegetative growth of rice, percentage of earbearing tillers, and straw and grain yield. In the undrained condition, organic soil amendments, except dairy manure, adversely affected the straw and grain yield. (Skogerboe-Colorado State)
W74-08087

RELATIONSHIP BETWEEN SOIL OXYGEN DIFFUSION RATE AND YIELD OF OATS IN A COASTAL ALLUVIAL SOIL AT CRITICAL SALINITY LEVEL,
Department of Agriculture, Frederiction (New Brunswick). Research Station.
G. R. Saini.
Agronomy Journal, Vol 65, No 5, p 841-842, September-October, 1973. 1 fig, 1 tab, 7 ref.

Descriptors: *Salinity, *Oxygenation, Root distribution, Root zone, Root development, *Oats, Crop production, Alluvium, Soil physical properties.
Identifiers: Oxygen diffusion rate.

The effect of improved soil physical conditions, as characterized by oxygen diffusion rate (ODR), on the growth of oats at the critical soil salinity level (ECe = 5.0 mmhos cm-1) is reported. In a coastal alluvial soil at critical salinity level, the yield of oats increased from 0.55 g/pot to 10.88 g/pot as ODR increased from 7.3 x 10 to the minus 8th power grams per cm squared per minute to 31.0 x 10 to the minus 8th power grams per cm squared per minute. The root elongation of the plant also appeared to be related to ODR. (Skogerboe-Colorado State)
W74-08094

3D. Conservation In Domestic and Municipal Use

PRECIPITATION CHARACTERISTICS OF THE NORTHERN NEW JERSEY, NEW YORK CITY METROPOLITAN AREA,
Rutgers-The State Univ., New Brunswick, N.J.
For primary bibliographic entry see Field 2B
W74-07607

INNOVATION: A CASE STUDY,
American Society of Civil Engineers, New York
For primary bibliographic entry see Field 6B
W74-07720

A STREAMFLOW MODEL FOR METROPOLITAN PLANNING AND DESIGN,
Metropolitan Sanitary District of Greater Chicago, Ill.
For primary bibliographic entry see Field 2A
W74-07721

WATER RESOURCES MANAGEMENT FOR METROPOLITAN WASHINGTON: ANALYSIS OF THE JOINT INTERACTIONS OF WATER AND SEWAGE SERVICE, PUBLIC POLICY AND LAND DEVELOPMENT PATTERNS IN AN EXPANDING METROPOLITAN AREA.
Metropolitan Washington Council of Governments, D.C.
For primary bibliographic entry see Field 6B.
W74-07723

APPENDICES TO WATER RESOURCES MANAGEMENT FOR METROPOLITAN WASHINGTON: ANALYSIS OF THE JOINT INTERACTIONS OF WATER AND SEWAGE SERVICE, PUBLIC POLICY, AND LAND DEVELOPMENT PATTERNS IN AN EXPANDING METROPOLITAN AREA.
Metropolitan Washington Council of Governments, D.C.
For primary bibliographic entry see Field 6B.
W74-07724

MUNICIPAL AND INDUSTRIAL WATER SUPPLY,
Kansas Univ., Lawrence. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6D.
W74-07968

REGIONAL ENERGY-WATER PROBLEMS, SOUTHERN PLAINS,
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 6D.
W74-07976

OPTIMAL TIMING AND SIZING OF A CONJUNCTIVE URBAN WATER SUPPLY AND WASTE WATER SYSTEM WITH NONLINEAR PROGRAMMING,
Loyola Univ., Los Angeles, Calif.
For primary bibliographic entry see Field 5D.
W74-08010

IMPROVING MUNICIPAL WATER SUPPLIES IN ARIZONA BY DESALTING,
Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 3A.
W74-08063

POTENTIAL CONTRIBUTION OF DESALTING SYSTEFS TO MUNICIPAL WATER QUALITY AND SUPPLY IN SOUTH DAKOTA.
Banner (J.T.) and Associates, Inc., Brookings, S. Dak.
For primary bibliographic entry see Field 3A
W74-08064

3E. Conservation In Industry

REVERSE OSMOSIS PROCESS AND ITS APPLICATION, (IN JAPANESE),
For primary bibliographic entry see Field 5D
W74-07750

TRITIUM DISTRIBUTION IN THE NUCLEAR INDUSTRY - THE REQUIREMENTS FOR CONTROL STRATEGIES,
Allied Chemical Corp., Idaho Falls, Idaho. Idaho Chemical Programs Operations Office
For primary bibliographic entry see Field 5B.
W74-07784

SOCIAL AND ECONOMIC FACTORS IN THE ADOPTION BY INDUSTRY OF WATER POLLUTION CONTROL MEASURES IN MINNESOTA,
Minnesota Univ., St Paul. Inst. of Agriculture
For primary bibliographic entry see Field 5G.
W74-07834

PREVENTION OF CALCIUM CARBONATE SCALE DEPOSITION IN MILL WATER SYSTEMS,
NL Industries, Inc., Houston, Tex. Baroid Div
For primary bibliographic entry see Field 8G.
W74-07848

SUN OIL DEVELOPS WATER REUSE PROGRAM,
Sun Oil Co., Toledo, Ohio.
For primary bibliographic entry see Field 5D.
W74-07882

CORROSION BY WATERS,
Union Carbide Corp., New York.
For primary bibliographic entry see Field 8G.
W74-07890

PROCESSES, PROCEDURES, AND METHODS TO CONTROL POLLUTION FROM MINING ACTIVITIES.
Skelly and Loy, Harrisburg, Pa.
For primary bibliographic entry see Field 5G.
W74-07927

THE HYDROGEOLOGY AND UTILIZATION OF BRINES IN EL SALADO, CHILE,
Birmingham Univ. (England). Dept. of Geology.
For primary bibliographic entry see Field 4A.
W74-07936

THE ROLE OF WATER IN THE ENERGY CRISIS.
Nebraska Univ., Lincoln. Water Resources Research Inst.
For primary bibliographic entry see Field 6D.
W74-07961

THE ROLE OF WATER IN THE ENERGY CRISIS,
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 6D.
W74-07962

MUNICIPAL AND INDUSTRIAL WATER SUPPLY,
Kansas Univ., Lawrence. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6D.
W74-07968

REGIONAL ENERGY-WATER PROBLEMS, MISSOURI RIVER,
North Dakota State Univ., Fargo. Water Resources Research Inst.
For primary bibliographic entry see Field 6D.
W74-07974

REGIONAL ENERGY-WATER PROBLEMS, SOUTHERN PLAINS,
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 6D.
W74-07976

REGIONAL ENERGY-WATER PROBLEMS--COLORADO RIVER-GREAT BASIN,
Colorado State Univ., Fort Collins. Environmental Resources Center.
For primary bibliographic entry see Field 6D.
W74-07977

INDUSTRIAL APPLICATION OF WHITFORD'S DEMAND FORECASTING PROCEDURE,
Southern Methodist Univ., Dallas, Tex. Inst. of Tech.
For primary bibliographic entry see Field 6D.
W74-08015

THE POTENTIAL OF DESALTING FOR INDUSTRIAL WATER SUPPLIES IN NORTHEASTERN WYOMING,
For primary bibliographic entry see Field 3A.
W74-08062

3F. Conservation In Agriculture

IRRIGATION OF CITRUS WITH CITRUS WASTE WATER,
Florida Univ., Lake Alfred. Inst. of Food and Agricultural Sciences.
For primary bibliographic entry see Field 5D.
W74-07603

ECONOMIC OPTIMIZATION AND SIMULATION TECHNIQUES FOR MANAGEMENT OF REGIONAL WATER RESOURCE SYSTEMS,
Texas Water Development Board, Austin.
For primary bibliographic entry see Field 6A.
W74-07714

ECONOMIC EVALUATION OF THE EFFECT OF SELECTED CROP PRACTICES ON NONAGRICULTURAL USES OF WATER,
Illinois Univ., Urbana. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5B.
W74-07828

AUTOMATIC PUMPING INSTALLATIONS FOR LIVESTOCK SECTIONS,
For primary bibliographic entry see Field 8C.
W74-07864

SOUTH DAKOTA STANDARDS FOR IRRIGATION PUMPS AND POWER UNITS,
South Dakota State Univ., Brookings. Inst. of Irrigation Technology.
For primary bibliographic entry see Field 8C.
W74-07895

SOUTH DAKOTA STANDARDS FOR CONSTRUCTION OF IRRIGATION WELLS IN SHALLOW UNCONSOLIDATED GLACIAL SEDIMENTS,
South Dakota State Univ., Brookings. Inst. of Irrigation Technology.
For primary bibliographic entry see Field 8A.
W74-07896

IRRIGATION WELL CONSTRUCTION.
South Dakota State Univ., Brookings. Inst. of Irrigation Technology.
For primary bibliographic entry see Field 8A.
W74-07897

METHODS AND PRACTICES FOR CONTROLLING WATER POLLUTION FROM AGRICULTURAL NONPOINT SOURCES.
For primary bibliographic entry see Field 5B.
W74-07941

ENVIRONMENTAL ASPECTS OF ENERGY-WATER RELATIONSHIPS,
Nebraska Univ., Lincoln. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6D.
W74-07965

AGRICULTURAL WATER SUPPLY,
Nebraska Univ., North Platte. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 6D.
W74-07969

A SYSTEMS APPROACH TO ASSESSMENT OF RURAL WATER SUPPLY PROGRAM EFFECTIVENESS,
Asian Inst. of Tech., Bangkok (Thailand). Dept. of Environmental Engineering.
For primary bibliographic entry see Field 6B.
W74-08012

PROBLEM OF ASSESSING EFFECTS OF HUMAN ACTIVITY ON SURFACE-WATER RESOURCES (K PROBLEME OTSENKI VLIYANIYA DEYATEL'NOSTI CHELOVEKA NA RESURSY POVERKHNOSTNYKH VOD),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 4A.
W74-08053

OPTIMAL CONJUNCTIVE USE MODEL FOR INDUS BASIN,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W74-08059

EFFECT OF TEMPERATURE AND PLANT WATER STRESS ON PHOTOSYNTHESIS DIFFUSION RESISTANCE, AND LEAF WATER POTENTIAL IN SPRING WHEAT,
Agricultural Research Service, Mandan, N.Dak. Northern Great Plains Research Center.
A. B. Frank, J. F. Power, and W. O. Willis.
Agronomy Journal, Vol 65, No 5, p 777-780, September-October, 1973. 4 fig, 3 tab, 19 ref.

Descriptors: *Soil moisture, *Crop response, *Wheat, Stress, Soil-water-plant relationships, Droughts, Salinity, *Photosynthesis, *Temperature.

A study was conducted in growth chambers to determine the combined effects of temperature and soil water supply on the development of plant water stress and subsequent recovery in spring wheat. Measurements were made of leaf water potential, photosynthesis, and stomatal diffusion resistance on the fifth leaf at tillering and the flag leaf at heading, flowering, and grain-filling growth stages for plants grown at 10, 18, and 27C. Stomatal closure of stressed plants was affected by both leaf position and age. Closure occurred at -13, -13, and -15 bars leaf water potential at tillering and at -18, -17, and -26 bars at heading for 10, 18, and 27C, respectively. As the flag leaf matured, stomata closed at progressively lower leaf water potential. In nonstressed check plants, temperature greatly influenced leaf water potentials. (Skogerboe-Colorado State)
W74-08075

EFFECT OF ESTABLISHMENT METHOD, VARIETY, AND SEEDING RATE ON THE PRODUCTION AND QUALITY OF ALFALFA UNDER DRYLAND AND IRRIGATION,
South Dakota State Univ., Brookings. Dept. of Plant Science.
L. H. Hansen, and C. R. Krueger.
Agronomy Journal, Vol 65, No 5, p 755-759, September-October, 1973. 1 fig, 3 tab, 10 ref.

Descriptors: *Alfalfa, *Planting management, *Crop response, Management, Irrigation, Dry farming, *Crop production.

This study was designed to compare alternative establishment methods and determine the influence of alfalfa varieties and seeding rates on dry matter and crude protein production and herbage quality. The relationship between alfalfa plant density and root+crown weight and their effect on forage yield were evaluated. Pure stands of alfalfa were established by four methods: (1) no herbicide or companion crop (check); (2) a pre-plant herbicide, S-ethyl dipropylthiocarbamate (EPTC); (3) a companion crop of oats harvested for forage; and (4) a companion crop of oats harvested for grain. Three alfalfa varieties were evaluated: T3X-8 hybrid, 'Saranac,' and 'Vernal.' Four alfalfa seeding rates were compared: 4.5, 9.0, 13.5, and 17.9 kg/ha of pure-live-seed. Studies were conducted at three locations in South Dakota. Experiments at Gayville and Norbeck were under dryland conditions and at Brookings under irrigation. (Skogerboe-Colorado State)
W74-08077

EFFECT OF NARROW TRENCHING IN HARLINGEN CLAY SOIL ON PLANT GROWTH, ROOTING DEPTH, AND SALINITY,
Agricultural Research Service, Weslaco, Tex. Soil and Water Conservation Research Div.
M. D. Heilman, and C. L. Gonzalez.
Agronomy Journal, Vol 65, No 5, p 816-819, September-October, 1973. 5 fig, 4 tab, 12 ref.

Descriptors: *Soil texture, *Salinity, *Crop response, Cultivation, *Cotton, Root zone, Root distribution, *Clays.

Narrow, backfilled trenches (61 and 102 cm deep) were tested in a Harlingen clay soil as a management technique to increase rooting depth and volume of soil available to roots. Cotton was planted directly over the trenches each year for 3 years. Cotton yields were significantly increased by trenching during 1971 and 1972. Yields of 815, 995, 1163, and 1018 kg/ha were obtained during 1972 for check, 61-cm trench soil-backfilled, 61-cm trench, soil-vermiculite backfilled, and 102-cm trench soil-backfilled, respectively. Root penetration and distribution was increased from 60 cm for conventional tillage to 122 cm for 102-cm deep trenches. An average of 83% of roots for conventional tillage were in surface 30 cm as compared with 43% of 102-cm trench. Trenching increased water infiltration rates, decreased soil bulk density in trenches, and increased soil root volume available to plants. (Skogerboe-Colorado State)
W74-08078

SUGARBEET RESPONSE TO IRRIGATION AS MEASURED WITH GROWTH SENSORS,
Southwestern Great Plains Research Center, Bushland, Tex.
W. C. Johnson, and R. G. Davis.
Agronomy Journal, Vol 65, No 5, p 789-794, September-October, 1973. 7 fig, 5 ref.

Descriptors: *Soil moisture, *Crop response, *Sugar beets, Irrigation, Irrigation practices, Growth rates.

The continuous growth records of two typical irrigated sugarbeet roots were compared at Bushland, Texas, during a 48-day period, June 25 to August 11, 1970, in a record dry season when there was little interference from rainfall on the effect of irrigation on root growth. The roots received 10 cm of irrigation water on staggered dates so that the growth record of a root not being irrigated at a particular time might be used to interpret the growth response to irrigation of the second root. The soil was slowly permeable, requiring an average of about 3 days for free water to disappear after an irrigation. A slow-growth period of about 3 days in length occurred after each irrigation during which time the irrigated root grew more slowly than the unirrigated root. When moisture stress was not extreme at the time of irrigation, a temporary decrease in growth rate actually occurred after irrigation. (Skogerboe-Colorado State)
W74-08079

RECOVERY, RESIDUAL EFFECTS, AND FATE OF NITROGEN FERTILIZER SOURCES IN A SEMIARID REGION,
Agricultural Research Service, Mandan, N. Dak. Northern Great Plains Research Center.
For primary bibliographic entry see Field 5B.
W74-08086

FLOOD AND SEEPAGE WATER SAMPLING TECHNIQUES IN RICE FIELDS UNDER DIFFERENT WATER MANAGEMENT PRACTICES,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 5B.
W74-08090

VARIATIONS IN POTASSIUM CONTENT OF ALFALFA GROWN ON PSEUDOGLEY SOIL DEPENDING ON MINERAL FERTILIZING, (IN SERBO-CREATION),
Zagreb Univ. (Yugoslavia). Zavod Opcu Proizvode Bilja.
A. Butorac.
Poljopr Znan Smotra. 27. p 59-68, 1971. (English summary).
Identifiers: *Alfalfa, Calcium, *Fertilization, *minerals, Nutrients, *Potassium, *Pseudogley soil, Soil moisture, Absorption.

The K content in alfalfa is primarily influenced by K fertilizing and by the quantities of K available in the soil. The uptake of K depends also on soil moisture, and accordingly, on climatic characteristics, hence the secondary occurrence of considerable aberrations in certain cuttings. K fertilizing, in view of its accumulation in alfalfa, should be applied in accordance with the plant needs and stability of production. An excessive concentration of K is possible which, due to its antagonism to Ca, may lower the nutritive value of alfalfa. The removal of K from the soil in alfalfa yields, especially in case of luxury consumption, is high.--Copyright 1973, Biological Abstracts, Inc.
W74-08097

WAYS OF INCREASING THE PRODUCTION OF TAKYR SOILS OF THE TEDZHEN DELTA, (IN RUSSIAN),
O. M. Dzhumaev, O. G. Eshchekov, and K. N. Skosyreva.
Probl Osvoeniya Pustyn'. 1. p 53-57, 1973. (English summary).
Identifiers: *Cotton, Delta, *Fertilizers, Nitrogen, Phosphorus, Potassium, Soils, *Takyr soils, *USSR(Tedyhen delta), Desalination, Crop production.

With the desalination of the aeration zone, selection of appropriate crops, are the application of the necessary nutrients under optimal water conditions, high yields of cotton can be obtained. Application of 150-200 kg/ha of N, 100 kg of P and 45 kg of K2O to takyr soils provides maximum yield of raw-cotton.--Copyright 1973, Biological Abstracts, Inc.
W74-08098

EFFECTIVENESS OF MINERAL FERTILIZERS DURING COTTON CULTIVATING DEPENDING ON SOIL HUMIDITY, (IN AZERBAIJANIAN),
R. K. Guseinov, and G. A. Mamedov.
Dokl Akad Nauk Az SSR. Vol 28, No 5, p 74-78, 1972. (English summary).

Descriptors: *Cotton, Cultivation, *Fertilizers, *Minerals, *Soil humidity, Crop production.

A positive effect of mineral fertilizers on the growth, development and accumulation of dry matter and productivity of cotton is marked by soil moisture 65-70% of field capacity.--Copyright 1973, Biological Abstracts, Inc.
W74-08099

AMELIORATIVE EFFECT OF FIELD SHELTERBELTS UNDER CONDITIONS IN THE URALS, (IN RUSSIAN),
For primary bibliographic entry see Field 4A.
W74-08100

CORRELATIONS BETWEEN P, FE AND MN AVAILABILITY IN WATER-LOGGED SOIL AT DIFFERENT FERTILITY LEVELS,
Uttar Pradesh Inst. of Agricultural Sciences, Kanpur (India). Div. of Soils and Agricultural Chemistry.
For primary bibliographic entry see Field 2G.
W74-08134

'HILL-TOP IRRIGATION,' A NEW SYSTEM FOR EARLY SWEETPOTATO PLANTING, (IN SPANISH),
Universidad Nacional de Tucuman (Argentina). Facultad de Agronomia y Zootecnica.
F. Folquer, L. R. Roncedo, and E. R. Rossi.
Rev Agron Noroeste Argent. Vol 9, No 1, p 145-164. 1972. Illus. English summary.
Identifiers: *Irrigation practices, Soils, *Sweetpotato, *Crop production, *Argentina(Tucuman).

Water distribution occurred along a small furrow made on top of the ridges, and it is called top irrigation. Low water requirement, (80,000 l/ha/irrigation) was observed. This system prevented soil compaction of the ridges, in contrast with usual irrigation methods. High yields (52,000 kg/ha) were obtained in both trials. Early planting was possible, even in lower rainfall periods. This top irrigation system was applicable during the first 2 mo. of plant growth. The limit in the top irrigation period under the conditions of Tucuman (Argentina) coincided with the initiation of the rainy season.--Copyright 1973, Biological Abstracts, Inc.
W74-08136

STUDIES ON THE INFLUENCE OF IRRIGATION AND DIFFERENT DOSES OF N, P AND K ON THE FLOWERING BEHAVIOUR AND ABSORPTION OF NUTRIENT ELEMENTS IN MUSKMELON (CUCUMIS MELO L.),
Punjab Agricultural Univ., Ludhiana (India). Dept. of Horticulture.
N. S. Jassal, K. S. Nandpuri, and K. S. Randhawa.
J Res Punjab Agric Univ. Vol 9, No 2, p 242-247. 1972.
Identifiers: Absorption, Cucumis-Melo, Doses, *Irrigation, *Muskmelon, *Nitrogen, Nutrients, *Phosphorus, *Potassium, *Fertilization.

The treatments consisted of 2 irrigation intervals, i.e., 1 wk (I1) and 2 wk (I2) and the levels of fertilizers were N at 0, 55, 110 and 165, P and K each a 0 and 55 kg/ha. The highest number of flowers wa obtained with I2 and with the maximum dose of I at 165 kg/ha and the lowest with I1, with no N Treatments of N 165 and 110 produced the max imum percentage of female flowers. The applica tion of N 165 and P 55 significantly increased th total number of flowers as well as the percentag of female flowers and was followed by the applica tion of N 110 K 55. The interaction effects of P an K were not significant. The percentage of N i plant tissue varied from 1.51 (where no fertilize was added) to 2.93 where N, P and K were adde at the rates of 165, 55 and 55 kg/ha, respectively. Copyright 1973, Biological Abstracts, Inc.
W74-08144

DROUGHT HARDENING IN ONIONS: I. IN FLUENCE OF PRESOWING TREATMENTS ON VEGETATIVE BEHAVIOR AND YIELD, (I SPANISH),
Universidad Nacional de Cuyo, Medoz (Argentina). Instituto de Biologia Vegetal.
B. R. De Lis, J. Vega, and J. B. Cavagnaro.
Phyton Rev Int Bot Exp. Vol 301 No 1/2, p 77-88 1972, Illus. (English summary).
Identifiers: Allium-Cepa, Ammonium, Chlorides Chloroethyltrimethyl, *Drought re sistance(Plants), Growth, Leaf, *Onions *Presowing treatment, Vegetation, *Crop produc tion.

The effect of presowing treatments on the onio plant (Allium cepa L., cv. Valenciana Sintetic No. 1) related to drought hardening at the critica period of water need was studied. Treatment were: distilled water; boric acid, 200 ppm; CCC 2 chloroethyl trimethylammonium chloride 200 ppm; control. There is a critical period of wate requirement at the beginning of bulb formation and the presowing treatment with water effective ly induced drought hardening at such period Drought applied on the control and boric acid treatment caused a significant decrease (35%) i yield, with the CCC and water treatments were no affected, as compared with the control withou drought. Moreover, presowing treatment with water, when submitted to drought, yielded 50% more than the control with drought. It was the only treatment that fulfilled the 2 requirements for hardening: it yielded as much as the contro without drought, and it yielded significantly more than the control with drought. Growth of the plants showed that the immediate effect of wate stress was to decrease the number of leaves (recovered later), while the bulb diameter and fresh weight decreased afterwards. At harvest time the bulbs from plants subjected to drought had a lower fresh weight. Since the leaves that ap pear after the drought period are responsible for bulb growth, it was inferred that their ability to furnish their assimilates to the bulb was impaired. The presowing treatment with water produces on the leaves of the onion plant a qualitative change which counteracts the detrimental effect of drought on bulb growth. (See also W74-08149)-- Copyright 1973, Biological Abstracts, Inc.
W74-08148

DROUGHT HARDENING IN ONIONS: II. ANALYSIS OF GROWTH, (IN SPANISH),
Universidad National de Cuyo, Mendoza (Argentia). Instituto de Biologia Vegetal.
J. Vega, B. R. De Lis, and J. B. Cavagnaro.
Phyton Rev Int Bot Exp. Vol 30, No 1/2, p 89-107. 1972, Illus. (English summary).
Identifiers: Allium-Cepa, Ammonium, Chloride, Chloroethyltrimethyl, *Drought re sistance(Plants), *Growth onion plants, Leaf, *Onions, Reduced, Stress, Water, Weight.

After water stress, the absolute dry weight of leaves and bulb of the onion plant (Allium cepa L.) decreased. During the drought period, RGR relative growth rate, RLwGR relative weight growth rate, NAR net assimilation rate and the number of

aves decreased significantly; but this effect dis-
ppeared later on. Leaf area was never affected by
rought; but the changes in SLA specific leaf area
owed, at the end of the drought period, that
aves contained less dry weight on a leaf area
asis. The increase in LAR leaf area ratio calcu-
ted for the same period indicated that the whole
ant had less dry weight on a leaf area basis. NAR
the bulb was reduced after the water stress. The
wer yield was accounted for by a decreased
owth of the photosynthetic system. Drought
oduced an irreversible damage on leaves which
evented them to finish their growth before the
lb's grand period of growth was initiated. The
ta of dry weight, leaf number, leaf area and
owth rate indices concerning the hardening
eatments showed that 8 wk after drought the
esowing treatment with CCC 2, chloroethyl
imethylammonium chloride showed the best
havior. At the preharvest period this was no
nger maintained. It was the presowing treatment
ith water which nullified the detrimental effects
drought on yield. (See also W74-08148)--Copy-
ght 1973, Biological Abstracts, Inc.
74-08149

WATER QUANTITY MANAGEMENT AND CONTROL

A. Control Of Water On The Surface

UMMARY REPORT FOR A METHODOLOGY TUDY TO DEVELOP EVALUATION RITERIA FOR WILD AND SCENIC RIVERS,
aho Univ., Moscow. Dept. of Agricultural conomics.
or primary bibliographic entry see Field 6B.
74-07608

N ANALYTICAL INTERDISCIPLINARY VALUATION OF THE UTILIZATION OF THE ATER RESOURCES OF THE RIO GRANDE NEW MEXICO: LOWER RIO GRANDE RE-ION,
ew Mexico State Univ., Las Cruces. Dept. of gricultural Economics.
or primary bibliographic entry see Field 6B.
74-07609

EOLOGY AND GROUNDWATER ESOURCES OF THE HANGMAN CREEK RAINAGE BASIN, IDAHO-WASHINGTON,
ashington State Univ., Pullman. Dept. of Geolo-
A. Ko.
orthwest Geology, Vol 3, p 16-21, 1974. 1 fig, 2
b, 9 ref.

escriptors: *Water resources, *Hydrogeology, daho, Groundwater, Surface waters, Water alance, Hydrologic budget.
entifiers: *Hangman Creek(Idaho).

rface water and groundwater resources of angman Basin, Idaho were estimated by using mpirical equations. The estimated average annual ater supply is about 76,500 acre-feet of surface ater and about 29,820 acre-feet of groundwater. bout 2.5% of the total available groundwater sources are presently applied to domestic, stock, nd irrigation uses in the basin. (KNapp-USGS)
74-07644

ISTORIC FLOOD INFORMATION FOR ORTHERN CALIFORNIA STREAMS FROM EOLOGICAL AND BOTANICAL EVIDENCE,
eological Survey, Washington, D.C.
or primary bibliographic entry see Field 2E.
74-07646

WATER RESOURCES OF LEHIGH COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
C. R. Wood, H. N. Flippo, Jr., J. B. Lescinsky, and J. L. Barker.
Pennsylvania Geological Survey, 4th Series, Water Resource Report 31, 1972. 263 p, 47 fig, 5 plate, 49 tab, 83 ref.

Descriptors: *Water resources, *Surface waters, *Groundwater, *Pennsylvania, Streamflow, Hydrogeology, Hydrologic data, Water yield, Water quality.
Identifiers: Lehigh County(Penn).

A study of Lehigh County, Pennsylvania, was made to determine how much water is available for man's use from streams and from the ground; the natural quality of this water and how man has affected its quality; how the relationships between streamflow and groundwater influence recreational use of the streams; and how flooding limits man's use of the land. Much of the county drains to the Lehigh River, both directly and by way of tributary streams. About 40% of the 58 million gallons of water used per day in Lehigh County in 1966 was surface water, and the remainder was groundwater. Pumpage of the Friedensville Mine and other activities of man have reduced the flow of Saucon Creek at Lanark. Most of the change in flow took place from 1955 through 1958. After 1958, the flow of Little Lehigh Creek near Allentown was 25% less than in the 1946-58 period. The frequent dryness above the confluence with Swabia Creek reflects an increase in channel seepage that was apparently caused by a change that took place within the aquifers of the Little Lehigh Creek basin in 1959. The cause of the change is unknown, but was probably due to increases in permeability in the carbonate rock aquifers underlying the basin resulting from the removal of debris from one or more major fractures. Most of the surface water used by industry in Lehigh County comes from the Lehigh River, and most of the surface water used for public supply comes from Little Lehigh Creek. With few exceptions, conventional treatment makes stream waters suitable for public supply and most industrial uses. Most groundwater occurs along joints, faults, and bedding planes. Most wells obtain water from several yielding zones. The number of yielding zones present in rocks decreases with depth. In the carbonate rocks, about 60 percent of the water-bearing zones in the upper 1,000 feet of rock occur within 350 feet of the land surface. Large quantities of ground water are available for industrial and public-supply use; at least 150 mgd could be pumped continuously from wells in Lehigh County. (Knapp-USGS)
W74-07649

ESTIMATING THE MAGNITUDE OF PEAK DISCHARGES FOR SELECTED FLOOD FREQUENCIES ON SMALL STREAMS IN EAST TEXAS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 2E.
W74-07664

GEOLOGY AND WATER RESOURCES OF THE WHARTON TRACT AND THE MULLICA RIVER BASIN IN SOUTHERN NEW JERSEY,
Geological Survey, Trenton, N. J. Water Resources Div.
For primary bibliographic entry see Field 4B.
W74-07668

DRAINAGE AREA AND RIVER MILEAGE OF NEBRASKA STREAMS: PART 1--SALT AND WEEPING WATER CREEKS, BIG AND LITTLE NEMAHA RIVERS, AND MINOR STREAMS IN SOUTHEASTERN NEBRASKA,
Geological Survey, Lincoln, Nebr.
For primary bibliographic entry see Field 2E.
W74-07669

WATER RESOURCES OF THE LITTLE RIVER BASIN, LOUISIANA,
Geological Survey, Washington, D.C.
M. W. Gaydos, J. E. Rogers, and R. P. Smith.
Available from GPO, Sup Doc, Washington, DC 20402 Price $3.15. Water -Supply Paper 1989, 1973. 74 p, 10 fig, 4 plate, 2 tab, 30 ref.

Descriptors: *Water resources, *Groundwater, *Surface waters, *Louisiana, Data collections, Hydrologic data, Water quality, Streamflow, Water supply.
Identifiers: *Little River basin(La).

The average flow of streams in the Little River basin of Louisiana is high, about 0.65 mgd per square mile, but many streams have little or no flow during parts of each year. Consequently, many streams are not dependable supply sources during the low-flow periods without storage. Streams in the southern part of the basin have sustained low flow and can be developed for municipal and small industrial supplies without storage. The Wilcox Group, the Sparta Sand, the Cockfield Formation, the Catahoula Sand, the Carnahan Bayou Member of the Fleming Formation, terrace deposits, and alluvial deposits contain freshwater in parts of the basin. Greatest development has been from the Sparta, which also has the greates potential for future development. Groundwater quality problems are local rather than basinwide. Flood damage in the basin is minor because the broad, flat flood plains are relatively undeveloped. (Knapp-USGS)
W74-07671

THE 7-DAY 10-YEAR LOW FLOWS OF ILLINOIS STREAMS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2E.
W74-07677

ECONOMIC OPTIMIZATION AND SIMULATION TECHNIQUES FOR MANAGEMENT OF REGIONAL WATER RESOURCE SYSTEMS,
Texas Water Development Board, Austin.
For primary bibliographic entry see Field 6A.
W74-07714

A STREAMFLOW MODEL FOR METROPOLITAN PLANNING AND DESIGN,
Metropolitan Sanitary District of Greater Chicago, Ill.
For primary bibliographic entry see Field 2A.
W74-07721

ANALYTICAL TECHNIQUES FOR PLANNING COMPLEX WATER RESOURCE SYSTEMS.
Texas Water Development Board, Austin. Systems Engineering Div.
For primary bibliographic entry see Field 6A.
W74-07722

OPTIMIZATION OF STOCHASTIC STORAGE MODELS FORMULATED BY P.A.P. MORAN, AND Z. KACZMAREK (OPTYMALIZAEJA STOCHASTYCZNYCH MODELI RETENCJONWANIA PODANYCH PRZES P.A.P. MORANA I Z. KACZMARKA),
H. T. Mitosek.
Archiwum Hydrotechniki, Vol 20, No 3, p 309-335, 1973. 3 fig, 66 ref. (English Summary).

Descriptors: Methodology, *Stochastic processes, *Markov processes, Reservoir storage, *Model studies, *Optimization, *Mathematical models, *Reservoir operation, Evaluation, Inflow.
Identifiers: Poland, Moran model, Kaczmarek model.

A methodology is presented concerning utilization of stochastic storage models for determination of release control rules under reservoir operation

plans securing optimization of economic effects. These models allow for evaluation of the reservoir operation in case the operation plan under the form of the so-called storage volume transition probabilities matrix is already known. Such evaluation depends on the assumptions concerning the random properties of the reservoir inflow process. Moran's model is based on the assumption of the nonstationary cyclic random process with independent variables, while Kaczmarek's model is based on the assumption of the nonstationary cyclic lag-one Markov process. Investigations based on the empirical material recorded for the Polish rivers indicate that the process of mean monthly flows (reservoir inflows) comply with the assumptions made in the Kaczmarek's model. (Sanduski-Franklin)
W74-07747

HYDROLOGICAL ASPECT OF SURFACE RUNOFF,
Jadavpur Univ., Calcutta (India).
For primary bibliographic entry see Field 2A.
W74-07756

HYDROLOGICAL FORECASTING AND WATER MANAGEMENT (IN RUSSIAN),
E. G. Popov, and V. D. Komarov.
Meteorologiya i Gidrologiya, No 10, p 37-44, 1973. 8 ref. English summary.

Descriptors: Application methods, Efficiencies, *Hydrologic aspects, *Forecasting, *Water management(Applied), Research and development, Surveys, *Methodology.
Identifiers: *USSR.

Problems involving the application and efficiency of hydrological forecasting to water management in the Soviet Union are described. A brief survey of forecasting methods and primary tasks and trends of research in the field of hydrological forecasting is given. (Sandoski-Franklin)
W74-07768

HYDROLOGIC MODELS OF THE GREAT LAKES,
State Univ. of New York, Buffalo. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2H.
W74-07826

THE COLUMBIA INTERSTATE COMPACT: POLITICS OF WATER RESOURCES IN THE PACIFIC NORTHWEST,
Washington State Univ., Pullman. Dept. of Political Science.
For primary bibliographic entry see Field 6E.
W74-07846

A SUMMARY OF QUANTITY, QUALITY AND ECONOMIC METHODOLOGY FOR ESTABLISHING MINIMUM FLOWS,
Washington Univ., Seattle.
For primary bibliographic entry see Field 6B.
W74-07847

WATER IN THE OKANOGAN RIVER BASIN, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 3B.
W74-07907

SELECTIVE WITHDRAWAL FROM BEECH FORK LAKE, BEECH FORK RIVER, WEST VIRGINIA,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 8B.
W74-07914

ESTIMATED USE OF WATER IN FLORIDA, 1970,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 6D.
W74-07917

HYDROLOGIC DATA FOR 1972, BROWARD COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W74-07918

RECLAMATION RESEARCH IN THE SEVENTIES--FIRST PROGRESS REPORT.
Bureau of Reclamation, Denver, Colo.
Available from Sup Doc, GPO, Washington, D.C. 20402 Price $1.80. Research Report No 26 (Water Resources Technical Publication), 1974. 95 p, 79 ref.

Descriptors: *Research and development, *Water resources development, Governments, Weather modification, Water conservation, Water supply, Hydraulics, Engineering structures.
Identifiers: *Bureau of Reclamation.

This report covers significant progress made on the full range of U.S. Bureau of Reclamation research programs. The work involves water resources development, conservation, and utilization. Some of the projects discussed are long-term studies of weather modification, physical properties and behavior of materials, basic physical problems facing all water resources development organizations, and new studies of social, economic, ecological, and environmental concepts. (Knapp-USGS)
W74-07922

TRANSIT LOSSES AND TRAVEL TIMES FOR RESERVOIR RELEASES, UPPER ARKANSAS RIVER BASIN, COLORADO,
Geological Survey, Denver, Colo.
R. K. Livingston.
Colorado Water Resources Circular No 20, 1973. 39 p, 11 fig, 6 tab, 11 ref.

Descriptors: *Water loss, *Diverson losses, *Reservoir releases, Bank storage, Depression storage, Hydrograph analysis, Hydrographs, Evapotranspiration, Evaporation, *Colorado.
Identifiers: Transportation loss, *Arkansas River(Colo).

Factors influencing reservoir releases were analyzed for the upper reach of the Arkansas River in Colorado. The time of travel of releases from Twin Lakes Reservoir to Colorado Canal, a distance of 175 miles, ranges from 29 to 69 hours depending on the antecedent flow of the Arkansas River; travel time from Turquoise Lake is 4 1/2 hours more and travel time of releases from Clear Creek Reservoir is 1 1/2 hours less. At the Colorado Canal, the streamflow hydrographs resulting from upstream reservoir releases are modified by channel and bank storage, inadvertent diversions, and evapotranspiration. During an average reservoir release of about 450 cubic feet per second for about 12 days, the released water arriving at the Colorado Canal is reduced by about 7% due to bank storage, by about 8% due to inadvertent diversions, and by about 1% due to evaporation. All release water in channel storage arrives at the Colorado Canal headgate during the release recession soon enough to be diverted and does not cause a loss. Transpiration losses are assumed to be negligible. Total average transportation loss is 16%; it can vary from about 6% to 28% due to the antecedent river conditions, the amount and duration of the reservoir release, and the time of year the release occurs. (Knapp-USGS)
W74-07931

THE HYDROGEOLOGY AND UTILIZATIO OF BRINES IN EL SALADO, CHILE,
Birmingham Univ. (England). Dept. of Geology.
J. W. Lloyd.
Ground water, Vol 12, No 2, p 72-77, March-Ap 1974. 4 fig, 2 tab, 7 ref.

Descriptors: *Brines, *Hydrogeology, *Desert Water supply, Water resources developmen Water yield, Mining.
Identifiers: *Chile(Rio Salado catchmen Atacama Desert.

The complex hydrogeology of brines from the origin in the andes to their emergence as springs the vicinity of El Salado, Chile, is described. T Rio Salado catchment is located in the southe Atacama Desert. The area is distinctly arid and groundwater reserves originating from loc recharge exist. To obtain water for a new copp ore processing plant, brines are being utilized. T long-term supply of brine will be adequate for t processing plant. A design for abstraction inco porating three filter drains with wooden pum housings was adopted to combat corrosion, incru tation and flood damage. (Knapp-USGS)
W74-07936

MUNICIPAL AND INDUSTRIAL WATE SUPPLY,
Kansas Univ., Lawrence. Dept. of Civil Enginee ing.
For primary bibliographic entry see Field 6D.
W74-07968

REGIONAL ENERGY-WATER PROBLEM NORTHEAST,
Delaware Univ., Newark. Water Resource Center.
For primary bibliographic entry see Field 6D.
W74-07971

REGIONAL ENERGY-WATER PROBLEMS PACIFIC NORTHWEST,
North Dakota State Univ., Fargo. Wate Resources Research Inst.
For primary bibliographic entry see Field 6D.
W74-07975

IMPROVED DYNAMIC PROGRAMIN PROCEDURES AND THEIR PRACTICAL A PLICATION TO WATER RESOURC SYSTEMS,
Water Research Association, Marlow (England).
For primary bibliographic entry see Field 6A.
W74-08013

EARTHQUAKE DAMAGE COSTS IN TH DESIGN OF WATER RESOURCE SYSTEMS,
California Univ., Los Angeles. Dept. of Enginee ing Systems.
S. E. Jacobsen, M. Torabi, and P. P. Bansal.
Water Resources Research, Vol 10, No 2, p 17 182, April 1974. 2 fig, 7 tab, 8 ref.

Descriptors: Water distribution(Applied) *Earthquakes, *Damages, Costs, Evaluation Probability, *Planning, *Design, Optimization Methodology, Networks, Construction costs Faults(Geologic), Equations, Systems analysis Mathematical models, *California.
Identifiers: *Seismic regions, Design intensity *Cost minimization, Los Angeles(Calif.), San Fer nando Valley(Calif.), Sensitivity, Earthquake oc currences, Random variables, Seismic data.

A renewal theoretic cost model is developed fo evaluating expected future damage costs due t earthquakes for a segment of a water distributio system located in a large seismic region. Thes costs depend upon the intensity that the structur is designed to withstand. A probabilistic model fo the occurrences of earthquakes during a plannin

period in a region with several faults is used to obtain expected future damage costs as a function of design intensity. Damage cost, it is pointed out, depends upon what action is taken at the time of the damage. A numerical example using data obtained for the Los Angeles region is included to demonstrate the usefulness of the methodology; shown is how the least-cost design intensity for a structure at a given location can be easily calculated. The difficulties that arise in network systems problems are discussed. The analysis applies to individual links or arcs of a network. If the system problem is to design an entire water distribution network, subject to an overall budget constraint, then the sensitivity of costs to seismic parameters may greatly affect the optimal distribution of the budget to the various links of the system. (Bell-Cornell)
W74-08018

QUANTITY AND QUALITY OF SURFACE WATER IN MARION COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W74-08044

PRESENT AND FUTURE OF LAKE SEVAN (SOVREMENNOYE SOSTOYANIYE I BUDUSHCHEYE OZERA SEVAN),
For primary bibliographic entry see Field 2H.
W74-08048

TRENDS AND PROBLEMS IN INVESTIGATION OF LONG-TERM FLUCTUATIONS OF RIVER RUNOFF (NAPRAVLENIYA I ZADACHI ISSLEDOVANIYA MNOGOLETNIKH KOLEBANIY RECHNOGO STOKA),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 2E.
W74-08051

PROBLEM OF ASSESSING EFFECTS OF HUMAN ACTIVITY ON SURFACE-WATER RESOURCES (K PROBLEME OTSENKI VLIYANIYA DEYATEL'NOSTI CHELOVEKA NA RESURSY POVERKHNOSTNYKH VOD),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
I. A. Shiklomanov.
Meteorologiya i Gidrologiya, No 10, p 27-36, October 1973. 19 ref.

Descriptors: *Surface waters, *Water resources, *Human population, *Human resources, *Evaluation, Water loss, Reservoir evaporation, Reservoirs, Water conservation, Irrigation, Water balance, Runoff, Economics, Conferences.
Identifiers: *USSR.

In the work program of the Fourth Hydrologic Congress of the USSR considerable attention was given to problems relating to the study and evaluation of changes in hydrologic regime and water resources under the influence of man's economic activity. According to the character of this influence on hydrologic processes, the economic factors can be tentatively divided into 3 groups: (1) factors that operate in the channel network and that redistribute river runoff in time and area (reservoir construction and operation, large water withdrawals, diversions of flow, etc.); (2) factors that alter relations among water-balance items in watersheds (agricultural measures, agricultural afforestation measures, urbanization, drainage of waterlogged lands, etc.); and (3) a combination of factors which are responsible for both direct removal of water from channels and for transformation of water-balance (irrigation of arid lands). To consider the effects of the first group of factors on the hydrologic regime, it is necessary to have reliable and complete data on the volume of water withdrawals for economic needs and of the discharges of used water into the river network. Consideration of the remaining economic factors is more complex and requires detailed studies of fluctuations in climatic factors and of changes in water-balance and water-exchange items in the zone of aeration under natural and transformed water regimes. Problems of assessing changes in river runoff under influence of human economic activity are discussed in connection with problems relating to evaluation of the effects of irrigated agriculture and reservoir facilities on the country's water resources. According to calculations by water management agencies, approximately 90% of irretrievable water consumption in the country is presently expended on irrigation and evaporation from reservoirs. (Josefson-USGS)
W74-08053

STATE RECORD KEEPING ON WATER AND ITS USAGE AND HYDROLOGIC CALCULATIONS AND FORECASTS (GOSUDARSTVENNYY UCHET VOD I IKH ISPOL'ZOVANIYA I GIDROLOGICHESKIYE RASCHETY I PROGNOZY),
Hydrometeorological Service of the USSR, Moscow.
For primary bibliographic entry see Field 7A.
W74-08054

PROBLEM OF RATIONAL USE AND CONSERVATION OF WATER RESOURCES AND GOALS OF HYDROLOGY (PROBLEMA RATSIONAL'NOGO ISPOL'ZOVANIYA I OKHRANY VODNYKH RESURSOV I ZADACHI GIDROLOGII),
Hydrometeorological Service of the USSR, Moscow.
For primary bibliographic entry see Field 6B.
W74-08055

NATIONAL WEATHER SERVICE RIVER FORECASTING SYSTEM,
National Oceanic and Atmospheric Administration, Silver Spring, Md. Office of Hydrology.
J. C. Monro, and E. A. Anderson.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY5, Paper 10549, p 621-630, May 1974. 12 ref.

Descriptors: *Streamflow forecasting, *Runoff forecasting, Rainfall-runoff relationships, Mathematical models, Precipitation(Atmospheric), *River forecasting, Data processing, *Computer programs, *Model studies.
Identifiers: National Weather Service.

The National Weather Service River Forecast System methods and computer programs for efficient operational river forecasting are described. A computer program performs all steps to convert the basic precipitation data to areal means. A procedure and computer programs needed for calibrating the basic conceptual model to a large number of basins in a reasonable time are described. The basic conceptual model has wide applicability. The inclusion of a snow-pack model and additions to the channel-routing procedure planned for the near future will make the model applicable over nearly all of the United States. (Knapp-USGS)
W74-08057

DAM COLLAPSE WAVE IN A RIVER,
Tippetts-Abbett-McCarthy-Stratton, New York.
For primary bibliographic entry see Field 2E.
W74-08060

AMELIORATIVE EFFECT OF FIELD SHELTERBELTS UNDER CONDITIONS IN THE URALS, (IN RUSSIAN),
L. S. Mochalkin.
Tr Ural Lesotekh Inst. 21. p 314-320, 1970.
Identifiers: *Cereal crops, Relative humidity, *Shelterbelts, Soil temperature, *USSR(Urals), Velocity, *Wind, Crop production.

The most effective protection proved to be the 2-5 fow field shelterbelts of open-permeable structure. The wind protective effect was manifest at a distance 25-30 times the height of the shelterbelt in the leeward side and 5 times the height in the windward side. Total reduction of wind velocity on the protected plot was 50-60%. On days with hot dry winds, air temperature in the inter-belt fields was lower than in open fields by 1-2 C. In fields with shelterbelts, the relative humidity of the air was higher by 4-5% on the average than in the open fields. The thickness of the snow cover in the Central Urals was 50-60 cm due to the protection by the shelterbelts; it was 12-30 cm in the open field. Soil humidity in inter-belt plots was, on the average, 3.5-4.1% higher than in the open fields. During the period of hot dry winds, soil temperature in fields with shelterbelt was lower by 1-1.5 deg., and during the days of cold winds it was higher by 1-5 deg. than in the open fields. In the southern part of the Urals in dry years, the additional yield of cereal crops in sheltered fields attains 710 kg/ha or 147.9%. Data are presented on the course of growth of the species in the shelterbelt. Recommendations are given for shelterbelt arrangement, taking into account the gradient of the plots, the soil types and other factors.--Copyright 1973, Biological Abstracts, Inc.
W74-08100

STUDIES OF RE-VEGETATION IN VEHICLE TRACKS IN SVALBARD. (IN NORWEGIAN),
O. Hjeljord.
Nor Polarinst Arbok. 1971. p 31-42, 1973. Illus. English summary.
Identifiers: Dryas, Erosion, *Grasses, Moss, *Norway(Svalbard), Soil, *Vegetation reestablishment, Vehicle tracks, *Soil moisture, Thawing.

A study was made of vegetation changes and erosion in vehicle tracks in Svalbard (Norway). Revegetation appeared to be particularly slow on dry soils. Fifty-yr-old tracks on Dryas heaths were still without significant plant growth. This is believed to be due to the delayed thawing and the increased soil moisture in the tracks. Tracks on wet land, however, appeared to regain their original vegetation rapidly, provided the tracks did not form deep trenches. Severe disturbance of the moss tundra of inland valleys caused the moss to be replaced by a pioneer community consisting of different species of grasses. Vehicle tracks on marine clay sediments are believed more likely to cause erosion than tracks on well-drained moraine ridges.--Copyright 1973, Biological Abstracts, Inc.
W74-08116

4B. Groundwater Management

ANALYSIS OF LIQUID-WASTE INJECTION WELLS IN ILLINOIS BY MATHEMATICAL MODELS,
Illinois Univ., Urbana. Water Resources Center.
For primary bibliographic entry see Field 5B.
W74-07604

WATER QUALITY AND TREATMENT OF DOMESTIC GROUNDWATER SUPPLIES,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 5F.
W74-07637

WELLS AND PUMPING SYSTEMS FOR DOMESTIC WATER SUPPLIES,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 8B.
W74-07638

PLANNING A DOMESTIC GROUNDWATER SUPPLY SYSTEM,
Illinois State Water Survey, Urbana.
J. P. Gibb.

Survey Circular 116, 1973. 13 p, 4 fig, 8 ref, 2 append.

Descriptors: *Water wells, *Domestic water, *Illinois, *Groundwater, Water supply, Planning, Water yield, Water quality, Water pollution control, Water treatment, Potable water.

Basic information needed to plan and develop a domestic groundwater supply is presented. A logical step-by-step planning summary is outlined. Accepted and recommended methods for a prospective owner of a domestic well to determine his water requirements and to gather meaningful information for planning his supply are presented. Groundwater is used as the source for almost all individual farm and domestic water supply systems in Illinois. Approximately 88% of the state's public water supplies also use groundwater as a source of supply. Altogether, groundwater supplies serve about 3,700,000 persons in the state, or approximately 34% of the total population. (Knapp-USGS)
W74-07639

GEOLOGY AND GROUNDWATER RESOURCES OF THE HANGMAN CREEK DRAINAGE BASIN, IDAHO-WASHINGTON,
Washington State Univ., Pullman. Dept. of Geology.
For primary bibliographic entry see Field 4A.
W74-07644

GROUND-WATER RESOURCES OF MONTGOMERY COUNTY, INDIANA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 2F.
W74-07645

GEOHYDROLOGY AND WATER RESOURCES OF THE TUCSON BASIN, ARIZONA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 2F.
W74-07648

WATER RESOURCES OF LEHIGH COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 4A.
W74-07649

GROUND-WATER LEVELS IN OBSERVATION WELLS IN KANSAS, 1966-70,
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 7C.
W74-07650

A GROUND-WATER MONITORING NETWORK FOR KOOTENAI FLATS, NORTHERN IDAHO,
Geological Survey, Boise, Idaho.
For primary bibliographic entry see Field 7A.
W74-07662

HYDROLOGIC RECONNAISSANCE OF THE NORTHERN GREAT SALT LAKE DESERT AND SUMMARY HYDROLOGIC RECONNAISSANCE OF NORTHWESTERN UTAH,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 2F.
W74-07665

GEOLOGY AND WATER RESOURCES OF THE WHARTON TRACT AND THE MULLICA RIVER BASIN IN SOUTHERN NEW JERSEY,
Geological Survey, Trenton, N. J. Water Resources Div.
E. C. Rhodehamel.
New Jersey Division of Water Resources Special Report No 36, 1973. 58 p, 15 fig, 8 tab, 65 ref.

Descriptors: *Water resources, *Groundwater, *Surface waters, *Conjunctive use, *New Jersey, Sands, Hydrogeology, Water balance, Surface groundwater relationships.
Identifiers: *Mullica River(NJ), *Wharton Tract(NJ).

In order for the water resources of the Wharton Tract of New Jersey to be developed, the hydrology of the tract and the encompassing Mullica River basin were evaluated. The Wharton Tract is an area of 150 square miles located in the Mullica River basin in southern New Jersey's Pine Barrens region. The tract is a relatively flat, low-lying, generally sandy area containing shallowly incised streams. The larger streams are commonly bordered by swamps. The tract was pruchased by the State primarily as a water-supply preserve, and also for conservation and recreational purposes. Principal aquifers in the Wharton Tract and Mullica River basin are in the Kirkwood Formation of middle Miocene age, Cohansey Sand of Miocene, and Pliocene age, and in overlying hydraulically connected deposits of Quaternary age. Groundwater and surface water in the Mullica River basin are low in dissolved solids, generally less than 50 mg/liter. Iron concentrations are generally high, up to 49 mg/liter in groundwater and up to 7.1 mg/liter in the streams. The water is acidic. The Wharton Tract is well situated to support the growing water needs of nearby New Jersey communities. Maximum development of water can be achieved by conjunctive use of ground and surface water. During most of the year, some water would be withdrawn either directly from streams or from adjacent wells. During periods of low flow during summer or fall water would be pumped from wells farther from the streams. From analysis of flow-duration curves it is estimated that 70 mgd of water could be developed with minimal effect upon low flows in the half of the tract above the gaging stations on the Mullica and Batsto Rivers. The quantity available in the entire tract is greater, possibly in the order of 150 mgd. With augmentation of streamflow by pumping from groundwater, it is likely that considerably more water could be safely used on a perennial basis. (Knapp-USGS)
W74-07668

WATER RESOURCES OF THE LITTLE RIVER BASIN, LOUISIANA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 4A.
W74-07671

DEFORMATION MODULI OF WATER-BEARING FORMATIONS AT ELEVATED TEMPERATURES,
California Univ., Berkeley. Coll. of Engineering.
W. H. Somerton.
Available from the National Technical Information Service as PB-232 152; $3.75 in paper copy, $1.45 in microf66 p, iche. California Water Resources Center, Davis, Contribution No 146, January, 1974. Completion Report, January 1974. 21 fig, 8 tab, 26 ref. OWRR A-042-CAL(2). UCAL-WRC-W-348.

Descriptors: *Compressibility, *Thermal conductivity, *Sandstones, *California, Measurement, Underground storage.
Identifiers: *Imperial Valley(Calif), Siltstone, *Sonic velocity tests.

Measurements of sonic velocities, bulk and matrix compressibilities and thermal conductivities have been made on a group of outcrop sandstones and a group of siltstone cores obtained from wells drilled in the Imperial Valley, California. Results of these measurements, which were made at temperatures as high as 200 deg C and pressures to 16,000 psi, are presented and discussed relative to their application in high temperture underground reservoir studies. (Snyder-California, Davis)
W74-07726

HYDROGEOLOGIC INVESTIGATION OF SANITARY LANDFILL IN STRATIFIED GLACIAL DRIFT,
Connecticut Univ., Storrs. Inst of Water Resources.
For primary bibliographic entry see Field 5B
W74-07728

OPTIMUM DRILLING SITES FOR GROUNDWATER DEVELOPMENT ON THE EAST COAST OF LANAI ISLAND,
Hawaii Univ., Honolulu. Water Resources Research Center.
W. M. Adams, and R. D. Huber
Available from the National Technical Information Service as PB-232 155, $3.25 in paper copy, $1.45 in microfiche. Completion report, Technical report No 68, July 1973. 43 p, 9 fig, 3 tab, 11 ref. OWRR B-015-HI(7). 14-31-0001-3073.

Descriptors: *Sites, *Groundwater, Rainfall, Salinity, Temperature, Resistivity, Conductivity, Permeability, *Hawaii, *Drilling
Identifiers: Optimum sites, *Lanai Island(H.I.).

For a proposed reforestation of the canyon country of east Lanai, seedlings will be required. The seedlings could be grown in east Lanai preventing the stress of transplantation from a different environment, if an adequate source of high quality water were available. This study was designed to locate such a source; more specifically, to find optimal sites at which to drill for fresh water. Reconnaissance work in the field took place in July 1970. At 176 places along the eastern coastline, shallow observation wells were dug to the high-tide level during low tide. The temperature and salinity of the ground water there were measured. In most of the canyon gulches, electrical resistivity soundings of the Schlumberger configuration were made. Through analysis of the field data two sectors were identified on the eastern coast: the northern sector, from Federation Village to Lopa, and the southern sector, from Lopa to Naha. Evidence points to the southern sector as being the most promising region for drilling, and specific sites are suggested. However, while the southern sector is superior for the accumulation of ground water, its beach rock is more impermeable than that of the northern sector, hence the southern sector provides less favorable conditions for recharge of the water table. Thus the southern sector should be developed if a relatively small amount of high-quality ground water is desired from many holes closely spaced along a line--as for the irrigation of seedlings. Should a relatively larger amount of lower-quality ground water be preferred, exploitation of the northern sector would be appropriate.
W74-07734

THREE-DIMENSIONAL ZONE MODEL LOG INTERPRETATION,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 8G.
W74-07735

RADIOACTIVITY OF NEVADA HOT-SPRING SYSTEMS,
California Univ., Berkeley. Lawrence Berkeley Lab.
For primary bibliographic entry see Field 5A.
W74-07786

PROJECT RIO BLANCO SPALL MEASUREMENTS DATA REPORT,
California Univ., Livermore. Lawrence Livermore Lab.
C. Sisemore, and J. Toman.
Available from NTIS, Springfield, Va., as Rept No. UCRL-51484; $4.00 per copy, $1.45 microfiche. Report No. UCRL-51484, November 1973. 38 p, 29 fig, 2 tab, 3 ref.

Descriptors: *Natural gas, *Secondary recovery(Oil), *Nuclear explosions, *Well data, *Data collections, Geology, Strength, Yield strength, Properties, Measurement, Dispersion, Ground movement, Mass transfer, Seismic waves, Instrumentation.
Identifiers: *Spall data.

Project Rio Blanco was a joint government-industry experiment to stimulate a natural gas reservoir using nuclear explosives in a well bore. A major instrumentation program was undertaken for the Rio Blanco experiment using accelerometers and velocity gages buried at various depths below the ground surface and at various horizontal ranges from the emplacement well. The objective was to physically measure the depth and aerial extent of spall (tensile failure of the earth material). Data from each of the instrument stations are given, along with the appropriate integrated data for particle velocity and displacement, or just displacement. (Houser-ORNL)
W74-07797

THE ELECTRICAL RESISTIVITY METHOD (PART I),
Keck Consulting Services, Inc., East Lansing, Mich.
For primary bibliographic entry see Field 7B.
W74-07852

GROUNDWATER ISSUE MERITS MORE FEDERAL PROTECTION, GROUNDWATER POLLUTION AND CONSERVATION,
For primary bibliographic entry see Field 5G.
W74-07854

LOCATION AND CHARACTERISTICS OF THE INTERFACE BETWEEN BRINE AND FRESH WATER FROM GEOPHYSICAL LOGS OF BOREHOLES IN THE UPPER BRAZOS RIVER BASIN, TEXAS,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 8B.
W74-07859

MICROPOROSITY IN CARBONATE ROCKS,
Amoco Research Center, Tulsa, Okla.
E. D. Pittman.
American Association of Petroleum Geologists Bulletin, Vol 55, No 10, p 1873-1878, October 1971. 3 fig, 12 ref.

Descriptors: *Carbonate rocks, *Porosity, Pores, Pore water, Permeability.
Identifiers: *Micrite, *Microporosity, Aragonite, Calcite, Neomorphism.

Large pores in carbonate rocks hold and transmit fluids, whereas associated micropores may hold irreducible water; i.e., water not available for flow. Analysis of borehole logs of microporous carbonate rocks can result in misleadingly high calculated water saturations and possible bypassing of a potential oil or gas reservoir. Microporosity occurs in carbonate rocks that range from friable to well indurated. Intercrystalline micropores may be present in micrite and within ooids, pisolites, micrite intraclasts, pellets, and cryptocrystalline grains. Micropores in ancient rocks appear to result from (1) formation of micrite envelopes, (2) void space present after transition of aragonite to calcite, or (3) incipient weathering and dissolution. Aggrading neomorphism of micrite to microspar tends to destroy microporosity. (Staplin-NWWA)
W74-07861

VARIATIONS IN THE DESIGN OF DEPTH SAMPLERS FOR USE IN GROUNDWATER STUDIES,
Institute of Geological Sciences, London (England). Dept. of Hydrogeology.
For primary bibliographic entry see Field 8G.
W74-07865

ELECTRIC AND THERMAL PROPERTIES OF ROCKS,
For primary bibliographic entry see Field 8E.
W74-07906

WATER IN THE OKANOGAN RIVER BASIN, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 3B.
W74-07907

HYDROLOGY OF LIMESTONE KARST IN GREENBRIER COUNTY, WEST VIRGINIA,
Geological Survey, Morgantown, W. Va.
For primary bibliographic entry see Field 2F.
W74-07908

RECONNAISSANCE OF THE WATER RESOURCES IN THE VICINITY OF PROPOSED DEEP-WELL INJECTION SITES IN SOUTHEAST DADE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5B.
W74-07915

ESTIMATED USE OF WATER IN FLORIDA, 1970,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 6D.
W74-07917

HYDROLOGIC DATA FOR 1972, BROWARD COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W74-07918

HYDROLOGY AND CHLORIDE CONTAMINATION OF THE PRINCIPAL ARTESIAN AQUIFER IN GLYNN COUNTY, GEORGIA,
Geological Survey, Atlanta, Ga.
For primary bibliographic entry see Field 2F.
W74-07919

GEOHYDROLOGY OF THE BURIED TRIASSIC BASIN AT THE SAVANNAH RIVER PLANT,
DuPont de Nemours(E.I) and Co., Aiken, S.C. Savannah River Lab.
For primary bibliographic entry see Field 5B.
W74-07934

EXPLORATION FOR A BURIED VALLEY BY RESISTIVITY AND THERMAL PROBE SURVEYS,
Harshbarger and Associates, Tucson, Ariz.
For primary bibliographic entry see Field 2F.
W74-07935

ICELANDIC GEOTHERMAL ACTIVITY AND THE MERCURY OF THE GREENLAND ICECAP,
Hawaii Univ., Honolulu. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W74-07944

THE ROLE OF WATER IN THE ENERGY CRISIS,
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 6D.
W74-07962

REGIONAL ENERGY-WATER PROBLEMS--COLORADO RIVER-GREAT BASIN,
Colorado State Univ., Fort Collins. Environmental Resources Center.
For primary bibliographic entry see Field 6D.
W74-07977

OPTIMAL TIMING AND SIZING OF A CONJUNCTIVE URBAN WATER SUPPLY AND WASTE WATER SYSTEM WITH NONLINEAR PROGRAMMING,
Loyola Univ., Los Angeles, Calif.
For primary bibliographic entry see Field 5D.
W74-08010

OPTIMAL CONJUNCTIVE USE MODEL FOR INDUS BASIN,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
M. T. Chaudhry, J. W. Labadie, W. A. Hall, and M. L. Albertson.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY5, Paper 10550, p 667-687, May 1974. 3 fig, 1 tab, 16 ref, append. USAID Contract AID/csd-2162.

Descriptors: *Conjunctive use, *Mathematical models, Dynamic programming, *Irrigation water, Groundwater, *Optimization, Water resources development, Reservoir operation, Costs, Canals.
Identifiers: *Pakistan(Indus River).

A mathematical model is presented as a tool for analysis and optimization of conjunctive use of surface water and groundwater resources of the Indus Basin in Pakistan. The size of the canal system, the surface reservoir, and the groundwater pumping facilities are calculated such that when the system is operated optimally, the capital, operation, and maintenance costs of meeting given irrigation water requirements are minimized. A mathematical model of the Marala Ravi link canal subsystem, which is uncoupled from other areas of the large, complex Indus Basin irrigation system, was developed. The mathematical programming problems is large scale and must be decomposed into subproblems and solved by dynamic programming. (Knapp-USGS)
W74-08059

PRELIMINARY STUDY TO INVESTIGATE FEASIBILITY OF DESALTING GROUND WATER IN NORTH DAKOTA,
North Dakota State Water Commission, Bismarck.
For primary bibliographic entry see Field 3A.
W74-08066

GROUNDWATER POLLUTION AND CONSERVATION.
For primary bibliographic entry see Field 5B.
W74-08071

INJECTION WELLS POSE A POTENTIAL THREAT.
For primary bibliographic entry see Field 5B.
W74-08072

4C. Effects On Water Of Man'S Non-Water Activities

EFFECT OF DEICING CHEMICALS ON GROUND AND SURFACE WATER--(MODUS OPERANDI),
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 5B.
W74-07617

ESTIMATION OF IMPERVIOUSNESS AND SPECIFIC CURB LENGTH FOR FORECASTING STORMWATER QUALITY AND QUANTITY,
Metropolitan Washington Council of Governments, Washington, D.C. Dept. of Health and Environmental Protection.
For primary bibliographic entry see Field 5B.
W74-07640

ALTERATIONS IN THE HYDROLOGIC CYCLE INDUCED BY URBANIZATION IN NORTHERN NEW CASTLE COUNTY, DELAWARE: MAGNITUDES AND PROJECTIONS,
Delaware Univ., Newark.
J. C. Albrecht.
Available from the National Technical Information Service as PB-232 153, $3.25 in paper copy, $1.45 in microfiche. Completion Report, April 1974. 22 p, 1 fig, 5 tab, 7 ref. OWRR A-017 DEL(2).

Descriptors: *Surface runoff, *Urban runoff, *Urban hydrology, *Groundwater, *Runoff, *Evapotranspiration, Hydrologic budget, Hydrologic cycle, Hydrologic models, Computer models, Energy budget, Soil water, Water resources, Model studies, Watersheds(Basins), Small watersheds, Land use, Surface waters, On-site data collections, *Delaware.
Identifiers: New Castle County(Delaware), Wilmington(Delaware), Shellpot Creek(Delaware), Land use changes.

A model of surface runoff as a function of land surface characteristics in an urban residential area was developed from measured land surface characteristics, precipitation, and runoff data. Surface runoff from impervious surfaces feeding directly into drainage ways began after an initial extraction for wetting the surface of .03 inches (.08 inches after hot, sunny summer weather). Surface runoff from impervious surfaces draining onto lawns and gardens was counted as additional precipitation spread evenly over the vegetated surfaces. Surface runoff from vegetated surfaces was then estimated by the Soil Conservation Service's method for estimating storm runoff. The combined estimates for the different surface types corresponded closely with measured runoff (r=.996, s=.06 in., a=.01, b=1.04). The model was used to evaluated the effects of urbanization on other components of the hydrologic cycle by incorporation into a standard daily water budget run for Shellpot Creek Watershed, Wilmington, Delaware for 1954 to 1968. The application revealed a tripling of surface runoff, a one-half increase in total runoff, and a halving of both percolate to ground water and actual evapotranspiration as urbanized surface (residential use, 54 percent impervious surface) increased from 20 to 100 percent of the watershed area.
W74-07729

CONTRIBUTION TO WATER POLLUTION FROM AGRICULTURAL AND URBAN SOURCES IN THE COACHELLA VALLEY,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W74-07757

PROCESSES, PROCEDURES, AND METHODS TO CONTROL POLLUTION RESULTING FROM ALL CONSTRUCTION ACTIVITY.
Hittman Associates, Inc., Columbia, Md.
For primary bibliographic entry see Field 5B.
W74-07942

PROBLEM OF ASSESSING EFFECTS OF HUMAN ACTIVITY ON SURFACE-WATER RESOURCES (K PROBLEME OTSENKI VLIYANIYA DEYATEL'NOSTI CHELOVEKA NA RESURSY POVERKHNOSTNYKH VOD),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 4A.
W74-08053

HYDROLOGICAL INVESTIGATIONS IN FOREST.
Akademiya Nauk SSSR, Moscow. Laboratoriya Lesovedeniya.
Nauka, Moscow. 1970. 155 p, Illus.

Identifiers: *Forests, *Hydrological studies, Minerals, Precipitation(Atmospheric), *Runoff, Publications.

Problems of variations of surface runoff in different forest growing zones on water-catchment basins are examined. The variations of the runoff depth as influenced by the forest cover percentage of water catchment basins, as well as the significance of clearcuttings for the runoff of atmospheric precipitation and the loss of mineral substances, are shown.--Copyright 1973, Biological Abstracts, Inc.
W74-08140

4D. Watershed Protection

SEDIMENT DISTRIBUTION IN A BEACH RIDGE COMPLEX AND ITS APPLICATION TO ARTIFICIAL BEACH REPLENISHMENT,
Geological Survey, Urbana, Ill.
For primary bibliographic entry see Field 2J.
W74-07666

ANNUAL PEAK DISCHARGES FROM SMALL DRAINAGE AREAS IN MONTANA, THROUGH SEPTEMBER 1972,
Geological Survey, Helena, Mont.
For primary bibliographic entry see Field 2E.
W74-07667

APPLICATION OF REMOTE SENSING TO HYDROLOGY--FINAL TECHNICAL REPORT,
IBM Electronics Systems Center, Huntsville, Ala.
For primary bibliographic entry see Field 2A.
W74-07940

EFFECT OF THE STAND DENSITY OF WALNUT FORESTS ON SURFACE RUNOFF AND SOIL EROSION ON THE SPURS OF THE SOUTHWESTERN SLOPE OF THE DARVAZA RANGE, (IN RUSSIAN),
I. Dzhabarov.
Tr Tadzh Nauchno-Issled Inst Pochvoved. Vol 13, No 2, p 136-143. 1970.
Identifiers: *Erosion, *Forests(Stand density), Juglans-Regia, Range, Runoff, Slopes, Soils, USSR(Darvaza Range), *Walnut.

Ground soil conditions (soil texture and chemical composition), gradients, and degree of vegetation cover are described. In 1963, the surface runoff under stands of Juglans regia of 0.3 density was 30.4 m3/ha and the erosion of solid matter was 139 kg/ha. In walnut stands with a 0.6 density, there was almost no surface runoff (0.8 m3/ha), and no erosion was observed. On plots of natural herbaceous stands with a projection cover of 30%, surface runoff was 116.6m3/ha, erosion-121.5 kg/ha. In 1965 under stands with a 0.3 density, surface runoff was 16 m3/ha, erosion-34.1 kg/ha, and at a stand density of 0.6, surface runoff was 0.6 m3/ha and there was no erosion. Soil erosion on forestless areas is related to topographical features: grandients of 15-30 deg predominate on 71% of the territory investigated.--Copyright 1973, Biological Abstracts, Inc.
W74-08137

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

CARBON MEASUREMENTS IN WATER QUALITY MONITORING,
Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering.
W. J. Maier, and H. L. McConnell.
Journal Water Pollution Control Federation, V 46, No 4, p 623-633, April 1974. 3 fig, 5 tab, 25 re

Descriptors: *Organic matter, *Carbo *Biochemical oxygen demand, *Water quali Sampling, *Minnesota, Lakes, Rivers, Alkalini Instrumentation, *Monitoring.
Identifiers: Organic carbon

A commercially available instrument for the det mination of organic and inorganic carbon was u in a 1-year test program of water quality sampl in Minnesota. All natural waters contained s stantial concentrations of organic carbon, rang from 5 mg/liter in Lake Superior to 15 to 30 mg/ in the larger rivers. These concentrations creased in the downstream direction. Total orga carbon and biochemical oxygen demand were o weakly correlated, but total inorganic carbon w closely correlated with alkalinity. While presence of organic carbon may not in itself detrimental, it suggests the need for continuo surveillance and adequate treatment of water s plies. (Knapp-USGS)
W74-07641

TRACE METALS INVESTIGATIONS,
Westinghouse Electric Corp., Pittsburgh, Pa.
For primary bibliographic entry see Field 5B.
W74-07655

QUALITY OF SURFACE WATER IN ILLINO 1966-1971,
Illinois State Water Survey, Urbana.
R. H. Harmeson, T. E. Larson, L. M. Henley, R A. Sinclair, and J. C. Neill.
Bulletin 56, 1973. 100 p, 2 fig, 8 tab.

Descriptors: *Water quality, *Surface wate *Illinois, Statistics, Water temperature, Turbidi Dissolved solids, Hardness(Water), Alkalini Nitrates, Manganese, Phosphates.

Surface water quality in 25 streams at 30 sampl locations in Illinois is summarized for a 5-y period from 1966 through 1971. Results of statis cal analyses are given with graphic summaries temperature, turbidity, total dissolved minera hardness, alkalinity, nitrate, and mangane Available data on phosphates are included in statistical analyses. Summaries of these data each sampling location, arranged alphabetically stream name, are accompanied by the tabulatio of mineral quality for the streams sampled, w available physical data. The analyses of wa quality present a representative picture of stre conditions during a particular sampling peri These data can serve as a base for comparison a evaluation of existing quality with manmade st dards that are often established arbitrarily or m be based on more or less ideal conditions. (Knap USGS)
W74-07678

METHODS OF ANALYSIS,
Arbetsmedicinska Institutet, Stockholm (Swede Dept. of Chemistry.
G. Lindstedt, and S. Skerfving.
In: Mercury in the Environment, (Chemi Rubber Co. Press), p 3-13, 1972, 1 fig, 3 tab.

Descriptors: *Pollutant identification, *Mercu *Analytical techniques, *Measurement, Wa pollution, Air pollution, Colorimetry, Neutron tivation analysis, Spectrophotometry, Instrume tation, Evaluation, Toxicity, Organic compound Inorganic compounds.

An evaluation of some important methods used the analysis of mercury in air and in biologi material is presented. Air sampling methods a direct reading methods are used in determining t mercury vapor in the air of industrial facilit where it presents a potential health hazard. The sampling method using dithizone requires a 20 li

sample with a detection limit of 1 micro g/sample. Direct reading methods can detect about 2 micrograms/m3 if there is no interference from other vapors. Colorimetric analysis, atomic absorption analysis, neutron activation and the micrometric method are described and compared in their ability to detect total mercury in biological material. In a comparison, neutron activation, flameless atomic absorption and flame atomic absorption gave overall average detection levels close together but the flame atomic absorption method had much lower precision than the other two. From a toxicological point of view, most of the modern methods of analysis of total mercury meet the demand for a reasonable degree of reliability. For analysis of total mercury in blood, activation analysis and flameless atomic absorption are the methods of choice. Methods for separating organic from inorganic mercury in biological material are thin layer chromatography, isotope exchange and stannous chloride reduction. Specific methods for organic mercury analysis are presented. (See also W74-07680) (Jerome-Vanderbilt)
W74-07681

THE DISTRIBUTION OF LEAD IN HUMAN DECIDUOUS TEETH,
Harvard Medical School, Boston, Mass.
For primary bibliographic entry see Field 5C.
W74-07691

SOLVENT EXTRACTION OF SELENIUM (IV) WITH 2-THENOYLTRI-FLUOROACETONE,
Indian Inst. of Tech., Bombay. Dept. of Chemistry.
S. B. Akki, and S. M. Khopkar.
Separation Science, Vol 6, No 3, p 455-460, June 1971. 2 fig, 2 tab, 3 ref.

Descriptors: *Spectrophotometry, *Selenium, *Ions, *Separation techniques, *Solvent extractions, Analytical techniques, Metals, Chemical analysis, Evaluation, Measurements, Laboratory tests, Solvents, *Pollutant identification.

A simple, rapid method is presented of solvent extraction of selenium (IV) at trace concentrations, with 2-thenoyltrifluoroacetone-xylene (0.03M) at pH from 1.0 to 4.5. Selenium has been determined in the organic phase photometrically by complexation with 3, 3 -diaminobenzidine. The system conforms to Beer's law in the concentration range of 2.2-13.2 micrograms/ml of selenium, and is a stable complex. The chlorides of lithium, ammonium, and calcium (0.5-3.0M) were used as the salting-out agents and had no effect on the extraction. Selenium can be extracted and determined in one operation in the presence of several other elements with this method. (Jerome-Vanderbilt)
W74-07692

PAPER CHROMATOGRAPHIC AND ELECTROCHROMATOGRAPHIC SEPARATION OF EDTA COMPLEXES OF METAL IONS,
Z. H. Coll. of Engineering and Technology, Aligarh (India).
M. Qureshi, and J. P. Rawat.
Separation Science, Vol 6, No 3, p 451-454, June 1971. 2 tab, 6 ref.

Descriptors: *Chromatography, *Aqueous solutions, *Metals, *Ions, Analytical techniques, Chemical analysis, Inorganic compounds, Aluminum, Beryllium, Iron, Cobalt, Copper, Manganese, Zinc, Chelation, Laboratory tests, Testing procedures, Separation techniques, *Pollutant identification.
Identifiers: *EDTA complexes.

A study is described of the chromatographic separation of EDTA complexes of metal ions and of the effect of EDTA concentration on R(f) values. Complexes were prepared by reported methods and dissolved in deionized water. Various solvent systems were tried in order to study the separation of Al, Be, Fe, Co, Cu, Mn, and Zn in ways which would not break the complexes; results are presented. Also presented are results of paper electrophoresis which was also performed in four solvent systems. EDTA complexes were very stable and therefore difficult to detect. Neutral or alkaline media were used because EDTA complexes are not stable in acidic media. EDTA complexes are only soluble in water-like systems, hence nonpolar solvents can be used only in combination with water. From electrophoresis studies, it appears that Mn and Be can be separated from Al, Zn, Co, Cu, and Fe. (Jerome-Vanderbilt)
W74-07693

METHODS OF MERCUROMETRIC INVESTIGATIONS,
E. A. Sergeev.
International Geology Review, Vol 3, p 93-99, 1961, 7 fig, 2 ref. Translated from Geokhimicheskiye Poiski Rudnykh Mestorozhdenii v SSSR, 1957.

Descriptors: *Mercury, *Rocks, *Geochemistry, *Analytical techniques, Geological surveys, *Spectroscopy, Metals, Heavy metals, Instrumentation, Lead, Mining.
Identifiers: Ores, USSR.

A spectroscopic method of analysis of rocks for the presence of mercury in minute concentration is described. Sensitivities to 0.02 ppm are possible. Its usefulness in geochemical exploration is illustrated by application of the technique to the Khaidarkanskoe ore field. Variants of the method and examples of other successful field applications are given. (Oleszkiewicz-Vanderbilt)
W74-07695

USGS COMPLETES NATIONWIDE RECONNAISSANCE OF METALS IN STREAMS.
Water and Sewage Works, Vol 118, No 6, p 174-175, June 1971, 2 tab.

Descriptors: *Heavy metals, *Surface waters, *Data collections, *Sampling, Lakes, Rivers, Streams, Surveys, Evaluation, Investigations, Measurement, Metals, Arsenic compounds, Cadmium, Chromium, Cobalt, Lead, Mercury, Zinc, Public health, Water pollution, Potable water.

A summary is presented of a U.S. Geological Survey report on the concentrations of arsenic, cadmium, chromium, cobalt, lead, mercury, and zinc in the nation's surface waters. More than 720 water samples were taken from urban and rural locations in all 50 states, Puerto Rico and the District of Columbia. The samples were collected during low streamflows, which would result in accentuated concentrations of the metals. Although small amounts of the metals were found to be widely distributed in streams and lakes, there was no widespread occurrence of amounts exceeding the current Public Health Service drinking water standards. A listing of 44 sites in 10 states where one or more of the metals exceeded the PHS drinking water standards is presented. Concentrations of dissolved mercury ranged up to 4 micrograms/liter. Only 2% of the samples exceeded the limit for arsenic; while 4% had levels above the limit for cadmium. Concentrations of lead were generally low, less than 2% of the samples contained detectable chromium, cobalt was found in 37% of the samples, and zinc was detected most commonly in ranges from 10 to 50 micrograms/liter. This study will be used along with further investigation to establish baseline data for these metals. (Jerome-Vanderbilt)
W74-07698

MERCURY ANALYSIS BY ATOMIC ABSORPTION SPECTROPHOTOMETRY,
Duval Corp., Tucson, Ariz.
F. M. Tindall.
Atomic Absorption Newsletter, Vol 6, No 5, p 104-105, September-October 1967. 2 tab, 2 ref.

Descriptors: *Mercury, *Analysis, *Analytical techniques, *Spectrophotometry, Absorption, Extraction, Sampling, Laboratory tests, Geochemistry, Heavy metals, *Pollutant identification.
Identifiers: *Atomic absorption spectrophotometry.

Samples of various types found in the mining industry are assayed for mercury. The element is extracted as the tetra-iodo-mercurate into ketone from an ammoniacal solution. The analysis was performed on an atomic absorption spectrophotometer using a wide slot burner and a low fuel flow rate. Reproducibility is quite good over a range common to mercury ores. With slight changes the method can be made to cover the geochemical range as well. (Oleskiewicz-Vanderbilt)
W74-07704

TRACE METALS IN ATMOSPHERIC PARTICULATES AND ATOMIC ABSORPTION SPECTROSCOPY,
Instrumentation Lab., Inc., Lexington, Mass.
J. Y. Hwang.
Analytical Chemistry, Vol 44, No 14, p 20A-27A, December 1972. 6 tab, 46 ref.

Descriptors: *Spectroscopy, *Trace elements, *Measurement, Evaluation, Chemistry, Analytical techniques, Atmosphere, *Air pollution, Sampling, Filters, Filtration, Laboratory tests, Digestion, *Pollutant identification.
Identifiers: *Atomic absorption spectroscopy.

Trace metal particulate matter in the atmosphere and the application of atomic absorption spectroscopy to detect its presence and concentration are discussed. Means of circumventing the difficulties encountered in this method of analysis are suggested. In obtaining samples, the organic membranes are the purest, but glass fiber filters are adequate, if the sample is gathered over about 24 hours. A low temperature ashing technique is recommended to avoid elemental loss. The sensitivities of various atomic absorption techniques are discussed and tables of their sensitivities are presented. Flameless techniques have excellent sensitivities at nano- and picogram levels, but may require pretreatment and pre-concentration. Methods of dealing with interferences are discussed. Atomic absorption speciroscopy is a useful tool which provides sensitivity, selectivity, simplicity and excellent reproducibility in comparison with other analytical techniques. (Jerome-Vanderbilt)
W74-07705

ANALYSIS OF TRACE METAL PARTICULATES IN ATMOSPHERIC SAMPLES USING X-RAY FLUORESCENCE,
Dayton Univ., Ohio.
T. R. Dittrich, and C. R. Cothern.
Journal of the Air Pollution Control Association, Vol 21, No 11, p 716-719, November 1971. 6 fig, 2 tab, 25 ref.

Descriptors: *Trace elements, *Metals, *Air pollution, Analysis, Sampling, Iron, Copper, Zinc, Lead, Cadmium, Titanium, Instrumentation, Absorption, Neutron activation analysis, *Pollutant identification.
Identifiers: *X-ray fluorescence, Atomic absorption spectroscopy, Selenium, Sensitivity, Accuracy, Air samples.

Trace metals collected on filter paper by a hi-volume air sampler for 24 hours were analyzed using the X-ray fluorescence method. A gamma ray exciting source (241Am) and a bremsstrahlung exciting source (147Pm) were both used to produce the X-rays, the latter being more efficient. For the samples collected in Dayton, several metals were detected, viz.: Ti, Fe, Cu, Zn, Pb, Cd, and Sn. Elements in the periodic table between Ti and Cs were seen to have a sensitivity limit of 0.5

micrograms/cu.m of air. (Oleszkiewicz-Vanderbilt)
W74-07709

THE DETERMINATION OF MERCURY IN AIR SAMPLES AND BIOLOGICAL MATERIALS,
Ottawa Occupational Health Div. (Ontario).
J. L. Monkman, P. A. Maffett, and T. F. Doherty.
Industrial Hygiene Quarterly, Vol 17, No 4, p 418-420, 1956. 4 fig, 5 ref.

Descriptors: *Mercury, *Analytical techniques, *Chemical analysis, *Sampling, *Organic matter, *Air pollution, Separation techniques, Instrumentation, Analysis, *Pollutant identification.
Identifiers: Biological samples, Sensitivity, Vapor detector.

A method is described for the cold digestion of urine with potassium permanganate and sulfuric acid, which eliminates many hours of work. The mercury is isolated by filtering the treated sample through a glass filter pad impregnated with cadmium sulfide. The pad, containing the mercury as the sulfide, is placed in a micro gas chamber connected to a G.E. Instantaneous Vapor Detector equipped with a recorder. The gas chamber is heated and compressed air passed through the system to carry the liberated vapor into the detector. The area under the curve traced by the recorder is proportional to the amount of mercury in the sample. The method as outlined allows the determination of 0.1 to 10 plus or minus 0.1 micrograms of mercury. Greater sensitivity may be achieved if desired. (Oleszkiewicz-Vanderbilt)
W74-07710

LEAD DETECTION IN LIVING PLANT TISSUE USING A NEW HISTOCHEMICAL METHOD,
California Univ., Los Angeles. School of Engineering and Applied Science.
R. A. B. Glater, and L. Hernandez, Jr.
Journal of the Air Pollution Control Association, Vol 22, No 6, p 463-467, June, 1972. 5 fig, 21 ref.

Descriptors: *Lead, *Plant tissues, Chemical analysis, Trees, Air pollution, Path of pollutants, Trace elements, Analytical techniques, Sampling, Separation techniques, Analysis, Cytological studies, Vegetation, *Pollutant identification.
Identifiers: *Histochemical methods, Automobile exhausts, Sensitivity.

A quick, simple method for identifying and distinguishing lead from other heavy metals in living plants has been developed using sodium rhodizonate (C6O6Na2) which forms a scarlet precipitate with lead at approximately pH 2.8. Hand sections of plant tissues are treated with rhodizonate reagent, buffered, and examined microscopically. Very little time and/or effort is required for this method. Those cells and tissues contaminated with lead turn scarlet--color intensity being directly related to concentration. Lead may be detected in quite low concentrations and, most importantly, may be observed in situ; its entry and movement through the plant can thus be followed. In an area of moderate traffic of Downey, California (Southeast Los Angeles), lead was found abundantly on leaves as well as on and in roots of garden-grown lettuce; origin of this lead is presumed to be car exhausts. (Oleszkiewicz-Vanderbilt)
W74-07711

DETERMINATION OF COPPER AND ZINC IN BIOLOGICAL MATERIAL,
Veterans Administration Hospital, Omaha, Nebr.
M. M. Parker, F. L. Humoller, and D. J. Mahler.
Clinical Chemistry, Vol 13, No 1, p 40-48, January 1967. 5 tab, 7 ref.

Descriptors: *Copper, *Zinc, *Spectrophotometry, Urine, Milk, Analytical techniques, Separation techniques, Analysis, Metals, Heavy metals, Chelation, Laboratory tests, Instrumentation, *Pollutant identification.
Identifiers: *Atomic absorption spectroscopy, *Biological samples.

Copper and zinc are readily determined in biological material by atomic absorption spectrophotometry. Two procedures are presented for the quantitative estimation of these metals in serum. One of these involves simple dilution and aspiration into the burner of the instrument. Suitably prepared standards must be used. The other method involves trichloroacetic acid preparation of the proteins prior to aspiration. With both methods satisfactory results in precision and recovery of added metals are obtained. Urinary copper determinations require chelation of the metal with ammonium pyrrolidino dithiocarbamate or some similar sequestering agent and concentration by extraction of the chelate into a suitable organic solvent. A similar procedure must be used in analyzing cow's milk for copper. Tissue analysis requires heating with boiling nitric acid and removal of the acid under reduced pressure prior to aspiration into the burner. It has been shown that procedural errors in such determinations are very much smaller than biological variation. (Oleszkiewicz-Vanderbilt)
W74-07712

AN INVESTIGATION OF THE WATER QUALITY AND PRODUCTIVITY OF POLSON BAY, FLATHEAD LAKE, MONTANA,
Montana Univ., Missoula. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W74-07717

TESTACEA (PROTOZOA: SARCODINA) AS INDICATORS OF WATER QUALITY IN WESTERN MONTANA,
Montana Univ., Missoula. Dept. of Zoology.
J. F. Tibbs.
Available from the National Technical Information Service as PB-232 118; $3.00 in paper copy, $1.45 in microfiche. Montana Water Resources Research Center, Bozeman, Completion Report No 49, January 1974. 7 p, 5 ref. OWRR A-038(1)MONT.

Descriptors: *Protozoa, Water quality, Water analysis, *Nutrients, *Montana, Lakes, Ponds, Sampling, Sediments, *Periphyton, *Pollutant identification.
Identifiers: *Testacea.

Water, sediment and periphyton samples were collected in a variety of aquatic habitats in western Montana, especially from a chain of 13 confluent lakes and ponds in the South Cold Creek Drainage of the Mission Mountains. Chemical and physical data were obtained at the site with the use of a portable test kit; associated dominant faunal and floral elements were noted; some water samples were returned for laboratory analysis, including sediment and periphyton samples. Nearly 40 species of testacea were identified. The study was successful in establishing equivalent and meaningful sampling procedures, but the data did not yield very meaningful information on the characteristics of the habitats represented. Future studies should involve more comprehensive and revised sampling techniques. Testacea do not appear to be very useful indicators for momentary water quality. Frustules of plants may be better indicators over many years, for the arenaceous shells of some of the Testacean species decompose in sediments. (Williams-Montana State)
W74-07718

THE SIGNIFICANCE OF RAINFALL ON SALT AND SODIUM ACCUMULATIONS UNDER IRRIGATION,
South Dakota State Univ., Brookings. Dept. of Plant Science.
For primary bibliographic entry see Field 3C.
W74-07743

THE DETERMINATION OF HEAVY METAL IN DOMESTIC SEWAGE TREATMENT PLAN WASTES,
Toronto Univ. (Ontario). Dept. of Geology.
J. C. Van Loon, J. Lichwa, D. Ruttan, and J. Kinrade.
Water, Air, and Soil Pollution, Vol 2, No 4, p 47 482, December 1973. 9 tab, 10 ref.

Descriptors: *Pollutant identificatio *Spectroscopy, *Heavy metals, Analyti techniques, *Sewage treatment, Treatment facil ties, Solid wastes, Liquid wastes, Waste wat treatment, *Sampling, Laboratory tests, Contr systems
Identifiers: *Atomic absorption spectroscopy.

Atomic absorption spectroscopy procedures ar outlined for the determination of some importar heavy metals in sewage treatment plant solids an liquids. Problems associated with sample prepar tion and sample solution interferences ar described. It is recommended that reference sta dards and internal laboratory control samples b used to allow some assessment of the validity o results. Sewage treatment plant products, bot liquid and solid, were analyzed and results ar given for samples representing a wide range o sewage input patterns. (Sandoski-Franklin)
W74-07763

INTERDISCIPLINARY MONITORING OF TH NEW YORK BIGHT,
Grumman Aerospace Corp., Bethpage, N.Y.
W. G. Egan, J. M. Cassin, and M. E. Hair.
Environmental Letters, Vol 2, No 4, p 205-215 1972. 5 fig, 7 ref.

Descriptors: *Measurement, *On-site investiga tions, Feasibility studies, *Instrumentation *Monitoring, Performance, Hydrogen ion concen tration, Dissolved oxygen, Chlorophyll, Mineralo gy, Thermocline, Salinity, *Water pollution, New York, Bioluminescence.
Identifiers: *New York Bight.

Measurements were made in the New York Bigh during 1969-1970 using in situ instrumentation together with monitoring devices for performance verification. Feasibility studies indicated that in situ instrumentation can measure chlorophyll bioluminescence, Gellbstoff, hydrogen ion con centration, dissolved oxygen, salinity and the loca tion of the thermocline. It is maintained that in situ instrumentation may be adapted to continuous synoptic monitoring of the estuarine and oceano graphic parameters necessary for mathematical modeling. (Sandoski-Franklin)
W74-07764

A STUDY OF POLLUTANT DISCHARGES FROM REACTOR OPERATIONS UTILIZING ULTRACENTRIFUGATION TECHNIQUES,
Oak Ridge Gaseous Diffusion Plant, Tenn.
J. W. Amburgey, Jr.
Available from NTIS, Springfield, Va., as Rept No. K-1754; $4.00 per copy, $1.45 microfiche. Report No K-1754, August 1968. 36 p, 3 fig, 18 tab, 1 append.

Descriptors: *Nuclear powerplants, *Nuclear reactors, *Nuclear wastes, *Cooling water, Effluents, *Columbia River, Analytical techniques, Centrifugation, Radiochemical analysis, Radioisotopes, Limnology, Elements(Chemical), Suspended load, Chromium, Sulphur, Zinc, *Washington.
Identifiers: Hanford site(Wash), Elemental analysis.

Reactor cooling water samples from the Hanford Operation at Richland, Washington, have undergone particulate separations and study utilizing recently developed ultracentrifugation techniques. The suspended particles contained in these samples were separated into classified groups and then

subjected to a variety of analytical investigations including elemental and radiochemical analyses. The samples selected for study were taken in sets ranging from one to four samples per set. Six sets or a total of sixteen samples were collected and shipped to the Biophysical Limnology Laboratory at Oak Ridge for study. The analytical results from these investigations are summarized in a series of tables. The content of selected elements and the radioactivity for the more prominent radionuclides are shown as associated with either the particulate or the dissolved fractions contained in the original sample volume. A few of the radionuclide parent elements such as chromium, sulphur, and zinc were found almost entirely associated with the dissolved materials fraction. These results along with the other data showed that the suspended materials isolated from the various samples of reactor cooling water did not add significantly to the production of radionuclides and the radioactive pollution of the Columbia River at Hanford. (Houser-ORNL)
W74-07782

FRACTIONATION OF SUSPENDED AND COLLOIDAL PARTICLES IN NATURAL WATER,
Oak Ridge Gaseous Diffusion Plant, Tenn.
W. T. Lammers.
Available from NTIS, Springfield, Va., as Rept. No. K-1749; $4.00 per copy, $1.45 microfiche. Report No. K-1749, October 1968. 42 p, 9 fig, 90 ref.

Descriptors: *Analytical techniques, *Centrifugation, *Laboratories, *Research facilities, *Suspended load, Natural streams, Water pollution, Water pollution control, Chemical properties, Physical properties, Biological properties, Instrumentation, Mathematics.
Identifiers: *Natural waters.

Feasibility studies were conducted on the use of centrifugal techniques for isolating insoluble materials from samples of natural water. The isolated particulate fractions were then used in studies encompassing several areas of water pollution with particular emphasis on the characterization of different groups of isolated particles. These characterizations were confined to the physical, chemical, and biological properties of suspended and colloidal particles which influence their separation, concentration, and analysis. Systems and techniques were developed for separating these materials into relatively pure particulate groups and for making reliable analytical determinations. Particle characterization methods and the instruments, techniques, and calculations used in isolating the different particulate groups for study are described. (Houser-ORNL)
W74-07783

RADIOACTIVITY OF NEVADA HOT-SPRING SYSTEMS,
California Univ., Berkeley. Lawrence Berkeley Lab.
H. A. Wollenberg.
Available from NTIS, Springfield, Va., as Rept. No. LBL-2482; $4.00 per copy, $1.45 microfiche. Report No. LBL-2482, January 1974. 15 p, 5 fig, 3 tab, 12 ref.

Descriptors: *Radioactivity, *Measurement, *Assay, *Hot springs, *Nevada, Water pollution, Water pollution sources, Radium, Calcium, Calcium carbonate, Uranium, Flow.

Field gamma radiometry and laboratory gamma-ray spectrometry of waters and spring deposits were accomplished for some hot-spring systems in northern Nevada. Gamma-ray dose rates measured on-site range from 2 to 500 microrem/hr, and depend mainly on the amounts of the natural radioelements in the spring deposits. At several locations Rn-222, emanating from the water causes recognizable gamma-ray anomalies. High radioactivities, primarily from Ra-226, are associated with hot-spring systems dominated by CaCO3, while silica-dominated systems are relatively low in radioactivity. Gamma spectrometry disclosed the enrichment of Ra-226 with respect to its parent U in CaCO3-dominated systems. Ra-226 preferentially associates with Ca; therefore, where tufa and siliceous sinter are present in a deposit, the calcareous material is highest in radioactivity. Spring deposits at fast-flowing CaCO3-dominated systems are generally less radioactive than calcareous deposits at slower flowing springs. (Houser-ORNL)
W74-07786

URANIUM-234,
Atomizdat, Moscow (USSR).
For primary bibliographic entry see Field 5B.
W74-07790

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE PROPOSED PERRY NUCLEAR POWER PLANT, UNITS 1 AND 2.
Directorate of Licensing (AEC), Washington, D.C.
Available from NTIS, Springfield, Va., as Rept. No. Docket 50440-61; $10.60 per copy, $1.45 microfiche. Report No Docket 50440-61 and 50441-61, April 1974. 394 p, 35 fig, 60 tab, 138 ref, 6 append.

Descriptors: *Lake Erie, *Nuclear powerplants, Effluents, Environment, Administrative agencies, *Comprehensive planning, *Sites, Geology, Investigations, Hydrology, Seismology, Climatology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis, *Ohio.
Identifiers: *Environmental impact statements, *Boiling water reactors.

This final environmental statement was prepared in compliance with the National Environmental Policy Act and relates to the proposed construction of the Perry Nuclear Power Plant, Units 1 and 2. Environmental impacts are assessed and after consideration of alternatives an environmental benefit-cost summary was compiled. Environmental factors considered include climate, hydrology (surface water and ground water), ecology including aquatic life, cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in effluent water. The conclusion is to issue construction permits for the facility subject to the following conditions: (1) Determine the importance of the site as a spawning and nursery ground for fish; (2) adequate control of iodine-131; (3) if necessary, make changes in the cooling systems to meet the needs of items 1 and 2; (4) correct any adverse environmental impacts resulting from construction. (Houser-ORNL)
W74-07793

IRON-55 AND RUTHENIUM-103 AND -106 IN THE BRACKISH-WATER CLAM RANGIA CUNEATA,
National Marine Fisheries Service, Beaufort, N.C.
D. A. Wolfe, and C. D. Jennings.
In: Conf-710501-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee. p 783-790, (1971) 4 fig, 3 tab, 25 ref.

Descriptors: *Aquatic environment, *Radioactivity, *Radioisotopes, *Water pollution, *Clams, Water pollution sources, Nuclear explosions, Testing, Fallout, *North Carolina, Brackish water, Saline water, Iron, Ruthenium.
Identifiers: Trent River(N.C.), Neuse River(N.C.).

Rangia cuneata, an estuarine clam, was collected at 4- to 6-week intervals during 1965-1967 from several stations over a 40-mile length of the Trent and Neuse Rivers in eastern North Carolina. The soft tissues were dried, ashed, and analyzed for gamma-emitting radioisotopes, Fe-55, stable Fe, and other elements. Both Ru-103 and Ru-106 were more concentrated in clams collected from downstream stations at higher salinities than in clams from low-salinity water. A similar distribution was observed for Fe-55. Ruthenium-103 appeared in Rangia withing two weeks after the third and fifth Chinese nuclear tests, and its retention was resolved into two rate functions, with apparent effective half-lives of 40 days and 7 days. (See also W74-07799) (Houser-ORNL)
W74-07804

DETERMINATION OF THE FATE OF POLYNUCLEAR AROMATIC HYDROCARBONS IN NATURAL WATER SYSTEMS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
P. R. McGinnes, and V. L. Snoeyink.
Available from the National Technical Information Service as PB-232 168, $3.75 in paper copy, $1.45 in microfiche. Illinois Water Resources Center, Urbana, Research Report No 80, March 1974. 60 p, 19 fig, 26 ref. OWRR A-045-ILL(1). 14-31-0001-3513.

Descriptors: *Pollutant identification, *Aromatic compounds, Gas chromatography, Trace elements, *Analytical techniques.
Identifiers: *Fate of pollutants, *Polynuclear aromatic hydrocarbons, *Photodecomposition, Trace organics, Carcinogens, Ultraviolet light, Benzpyrene, Benzanthracene.

The polynuclear aromatic hydrocarbons, or PAH, are of current concern as water pollutants and potential health hazards. The presence of PAH in natural water systems was evaluated and an analytical technique for specific PAH was developed. It was found that the PAH are not soluble in water but they either are present as particulate material or as material absorbed on solid surfaces in natural water systems. The photodecomposition of two PAH, 1,2 benzanthracene, or BA, and 3,4 benzpyrene, or BP, was examined. Both compounds decompose under ultraviolet light to form their quinones, which then further decompose. Both BP and BA decompose following first order kinetics in true solution in 20 percent acetone in water. Particulate BA also decompose following first order reaction kinetics, although particulate BP will decompose only to a depth of 0.2 micrometers before decomposition stops. This decomposition is relatively unaffected by water chemistry and will occur under solar radiation and in turbid waters.
W74-07827

THE FATE AND EFFECTS OF PESTICIDES IN THE AQUATIC ENVIRONMENT OF THE FLATHEAD LAKE DRAINAGE AREA,
Montana Univ., Missoula. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W74-07835

DETERMINING A RECREATIONAL LAKE'S TOLERANCE FOR DEVELOPMENT AND USAGE,
New Hampshire Univ., Durham. Water Resources Research Center.
R. H. Frey, and R. V. Fabian, Jr.
Available from the National Technical Information Service as PB-232 246, $3.25 in paper copy, $1.45 in microfiche. Completion Report, January 1974. 22 p, 3 tab, 12 ref. OWRR A-032-NH(1). 14-31-0001-3829.

Descriptors: *Water quality, *Water pollution, *Lakes, *Limnology, Sampling, Surface waters, Aquatic algae, Light penetration, Deep-water habitats, Plankton, Anabaena, *New Hampshire, Cyanophyta, Recreational facilities, Management, Natural resources.
Identifiers: *Squam Lake(N.H.).

Information is needed with respect to the tolerable levels of development, chemical inputs, bacteria and organic materials that a lake basin can withstand before water quality is impaired, to provide the basis for regulations that will foster the maintenance of high lake water quality and natural surrounding. The current level of pollutants, or the water quality, must be determined and monitored. In 1972, a three-year project was undertaken to help solve the problems of Squam Lake, New Hampshire and provide an approach for coping with similar pressures on other recreational waters. During the first phase of this project (summer, 1972), data on the water quality of the lake were obtained with respect to light penetration, temperature, dissolved oxygen, total phosphates, nitrates and total coliform. The status of the lake was examined in terms of species diversity of plankton, using the Shannon-Weiner diversity index. During the second phase of this project (summer, 1973), sources of pollution and contamination were located by a systematic method of water analysis. As sources were located, this information was given to the respective town health officers who in turn continued the investigation to eliminate the sources of pollution. (Wakefield-New Hampshire)
W74-07836

SURVIVAL OF ENTERIC PATHOGENS AND INDICATOR ORGANISMS IN NATURAL WATERS,
Tennessee Univ., Knoxville. Dept. of Civil Engineering.
J. D. Womack, P. B. O'Connor, and P. Williams.
Available from the National Technical Information Service as PB-232 242, $3.75 in paper copy, $1.45 in microfiche. Tennessee Water Resources Research Center, Knoxville, Research Report No 25, November 1973. 46 p, 7 fig, 28 ref. OWRR A-014-TENN(2). 14-31-0001-3243.

Descriptors: *Salmonella, Bacteria, Microorganisms, Enteric bacteria, Pathogenic bacteria, *Tennessee, Pollutant identification, Coliforms, Cytological studies, Cultures, Bioindicators, Microbiology.
Identifiers: Ft. Loudoun Reservoir(Tenn).

This report deals with (1) various microbiological methods to positively quantify Salmonella, fecal coliforms and standard coliforms (2) confirmation studies of bacteria growing on Bismuth Sulfite Agar and (3) diffusion cell studies of the survival characteristics of Salmonella bacteria in Fort Loudoun Reservoir. The difficulties encountered in confirming the presence of pathogenic Salmonella in mixed cultures prevented accurate quantification. This was due to similar cultural characteristics of other enteric organisms. Alternative procedure employing diffusion cells excluded the interfering organisms and permitted useful measurements of environmental effects on pure cultures of pathogenic Salmonella.
W74-07840

COLIFORMS ARE AN INADEQUATE INDEX OF WATER QUALITY,
Canada Centre for Inland Waters, Burlington (Ontario).
B. J. Dutka.
Journal of Environmental Health, Vol 36, No 1, p 39-46, July/August, 1973. 2 fig, 6 tab, 31 ref.

Descriptors: Groundwater, *Water quality, *Coliforms, Aquatic life, Aquatic microorganisms, *Bacteria, *Enteric bacteria, Microbiology, *Pathogenic bacteria, Salmonella.
Identifiers: Shigella, Vibrio, Mycobacterium, Pasteurella, Leptospira.

Coliforms have been used as indicators of water quality for over 50 years. The presence of these organisms in water was assumed to indicate a potential health hazard because of their association in the intestine with a variety of pathogenic microorganisms: Salmonella, Shigella, Vibrio, Mycobacterium, Pasteurella, Leptospira and enteric viruses. However, research in the last ten years has shown that coliforms do not fulfill any of the following criteria for indicator organisms: be present and occur in much greater numbers than the pathogens concerned; not be able to proliferate to any greater extent than enteric pathogens in the aqueous environment; be more resistant to disinfectants and to the aqueous environment than the pathogens; yield characteristic and simple reactions enabling as far as possible an unambiguous identification of the group. Coliforms are reviewed with respect to the above criteria, and more practical indicators of water quality are suggested for use in the future. (Campbell-NWWA)
W74-07885

COLLECTION, DETECTION, IDENTIFICATION, AND QUANTITATION OF HUMAN EFFLUENTS,
Edgewood Arsenal, Aberdeen Proving Ground, Md.
R. I. Ellin, R. L. Farrand, F. W. Crouse, and N. B. Billups.
Available from NTIS, Springfield, Va., 22151, as AD-768 762. Price $3.00 printed copy; $1.45 microfiche. Biomedical Laboratory Technical Report EB-TR-73007 (EATER 4799), October 1973. 25 p, 8 fig, 3 tab, 8 ref.

Descriptors: *Pollutant identification, *Chemical analysis, *Chromatography, Gas chromatography, Mass spectrometry, *Domestic wastes.
Identifiers: Human wastes.

Over 135 compounds were identified in human wastes. Two to three times this number of compounds were observed in the sensitive gas chromatograph-mass spectrometer (GC-MS) analytical system, but could not be identified. A variety of organic structures are included among these effluents. In addition to alcohols and ketones, unsaturated, branched, cyclic and aromatic hydrocarbons, sulfhydryl and cyano and a variety of heterocyclic compounds were found. Porous polymer collectors can be used to collect effluents at room temperature, to absorb more effluents in a shorter time, can be connected in parallel, and can be cleaned and desorbed without using vacuum. (Knapp-USGS)
W74-07912

FOAM FRACTIONATION OF MERCURY(II) NITRO COMPLEXES,
National Lead Co., Hightstown, N.J.
M. W. Miller, and G. L. Sullivan.
Separation Science, Vol 6, No 4, p 553-558, August, 1971. 1 tab, 1 fig, 7 ref.

Descriptors: *Foam fractionation, *Ion exchange, *Distribution patterns, *Mercury, Analytical techniques, Separation techniques, Foam separation, Nitrogen compounds, Acids, Chemical reactions, Surfactants, Laboratory tests, Measurements, Evaluation, Cations.
Identifiers: Nitric acid.

The cationic surfactant hexadecyltrimethyl ammonium bromide (HDT) was used to determine the distribution factor for mercury(II) as a function of the normality of nitric acid. The application of ion exchange data to the removal of mercury(II) nitro complexes by foam fractionation is also reported. Results of tests indicated that the distribution factor of mercury(II) nitro complexes is strongly dependent on the HNO3 acid concentration, with the maximum occurring at approximately 0.1M nitric acid; HDT forms an ion pair with the Hg(NO3)3(-) complex and at 0.1M the fraction of mercury(II) ion in the Hg (NO3)3(-) form is presumably at a maximum. The magnitude of the stability constant has a greater effect on the value of the anion exchange volume distribution coefficient than on the foam fractionation distribution factor. The correct nitric acid concentration for removal of one or more metal ions in nitro complex form can be determined from the ion exchange volume distribution factor maxima reported by Ichikawa et a (1961). Foam fractionation is an effective method for removal of trace amounts of complexes which form soluble ion pairs with a surfactant. (Jerome-Vanderbilt)
W74-07945

SOME NOVEL COMPLEXES OF CHROMIUM(I),
Leeds, Univ (England). Dept. of Inorganic and Structural Chemistry.
P. Gans, and S. M. E. Hague.
Chemistry and Industry, No 24, p 978, December 16, 1972. 1 tab, 3 ref.

Descriptors: *Chromium, *Metals, *Pollutant identification, *Heavy metals, Laboratory tests, Analytical techniques, Infrared radiation, Oxidation
Identifiers: *Infrared spectroscopy.

It has been reported previously that the hexaarylisocyanide complexes of chromium(O) exhibit three infrared-active C-N stretching bands rather than the single band expected of an octahedral complex (Cotton, F.A. and Zingales, F., 1961). Now, it has been found that the band at highest frequency, ca 2 065/cm, is not present in the spectra of carefully purified samples, but bands at the appropriate frequencies appear when the solutions of the pure compounds are exposed to air. Compounds in which the band at ca 2065 cm is the most intense infrared band have subsequently been prepared by controlled oxidation of the chromium(O) compounds, and the preparation and properties of the phenyl isocyanide derivatives are described. Symmetry and activity of the C-N stretching vibrations are described, together with similar magnetic, conductivity and spectroscopic results obtained with other isocyanide compounds (Oleszkiewicz-Vanderbilt)
W74-07946

URANIUM, THORIUM, AND LEAD CONCENTRATIONS IN THREE SILICATE STANDARDS AND A METHOD OF LEAD ISOTOPIC ANALYSIS,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 2K.
W74-07947

AN INSTRUMENTAL TECHNIQUE FOR THE DETERMINATION OF SUB-MICROGRAM CONCENTRATIONS OF MERCURY IN SOILS, ROCKS, AND GAS,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 2K.
W74-07948

DETERMINATION OF MERCURY IN VEGETATION WITH DITHIZONE - A SINGLE EXTRACTION PROCEDURE,
Geological Survey, Denver, Colo.
F. N. Ward, and J. B. McHugh.
Professional Paper 501-D, Geological Survey Research, p D128-D130, 1964, 2 tab, 7 ref.

Descriptors: *Spectrophotometry, *Mercury, *Extraction, *Vegetation, Analysis, Chemical analysis, Analytical techniques, Instrumentation, Sampling, Testing, Methodology, Pollutant identification, Plants.

A spectrophotometric method for determining small amounts of mercury in vegetation is based on the reaction of mercury with dithizone after sample dissolution by wet ignition under reflex. Treatment of the sample solution with sulfur dioxide provides a reducing environment during the formation and extraction of the mercury dithizonate into n-hexane. Thus, a single extraction suffices to obviate side reactions, and double

extractions or reversion steps are unnecessary. The method is useful for determining as little as 0.4 ppm of mercury in dry vegetation, and this range is enough to evaluate the usefulness of the mercury content of vegetation is prospecting. (Oleszkiewicz-Vanderbilt)
W74-07949

ODORS EMITTED FROM RAW AND DIGESTED SEWAGE SLUDGE,
Saint Louis Metropolitan Sewer District, Mo.
For primary bibliographic entry see Field 5D.
W74-07960

GRADIENT ANALYSIS OF CARBON MONOXIDE AND METHANE IN POLLUTED AND OTHER NEARSHORE HABITATS,
Naval Postgraduate School, Monterey, Calif.
J. T. Welch.
Available from the National Technical Information Service as AD-76-4482, $6.25 in paper copy, $1.45 in microfiche. Thesis, March 1973. 84 p. 19 fig, 11 tab, 17 ref, 3 append.

Descriptors: *Analytical techniques, *Gases, *Methane, *Sea water, Gas chromatography, California, Tracers, Sewage effluents, Air-water interfaces, Computer programs.
Identifiers: *Carbon monoxide, Monterey Bay(Calif.).

Two concepts were tested in Monterey Bay, California. (1) That carbon monoxide production might be related to primary productivity and (2) since methane gas, reported as present in surface waters, is a product of anaerobic decomposition of organic matter, it might be useful as a pollution tracer from sewage outfalls. The highly sensitive methods of gas chromatography were used and are described. Results from an open ocean station and several nearshore stations show a possible correlation between carbon monoxide and primary productivity. Methane was shown to be present in the upper 100 m, with a maximum at about 50 m. At nearshore stations, concentrations of methane and carbon monoxide were both far above equilibrium and open ocean values. Methane concentrations were highest in the vicinity of sewage outfalls and the source of this gas may be the city water supply. Carbon monoxide concentrations may be dependent on the type of plant life in the surrounding waters. Transects showed that methane was an effective tracer for sewage disposal plant effluent and that kelp seemed to slow pollutant diffusion and mixing. Results indicate that, at least locally, the ocean is a source of carbon monoxide and methane in the atmosphere. (Jones-Wisconsin)
W74-07984

THEORY AND APPLICATION OF CONTINUOUS MONITORING FOR CHEMICAL RESEARCH IN NATURAL WATER SYSTEMS,
G. K. Rice, and L. P. Varga.
Available from the National Technical Information Service as ORD-4254-8, $3.25 in paper copy, $1.45 in microfiche. Atomic Energy Commission ORD-4254-8, October 1972. 24 p. 2 tab, 56 ref.

Descriptors: *Measurement, *Data collections, *Chemical properties, *Water quality, Mathematical studies, Biological properties, Kinetics, Aqueous solutions, Analytical techniques, Equipment, Automation, Monitoring.
Identifiers: Inorganic mass balance.

Natural water monitoring can be divided into two categories: pollution detection and basic research. Pollution monitoring measures parameters that can determine water quality while monitoring for basic research collects data useful for determining the composition and nature of a water system. Continuous monitoring requires that methods for measuring be instrumented and then automated to produce continuous data accurately for extended periods of time. Pollution monitors typically emphasize physical parameters because these are easiest to monitor. Some physical measurements are required for chemical research including water temperature and consideration that biological and chemical systems are non-separable. Biological processes are difficult to represent mathematically, and significant progress in this area has been made only recently. Regarding kinetic factors, whether or not an equilibrium model will adequately describe chemistry of natural waters depends on how closely steady state conditions are approached. Of all analytical methods, colorimetry and potentiometry are most commonly adapted for continuous monitoring in natural waters. In selecting methods for a specific analysis, their suitability for continuous monitoring under field conditions has to be evaluated. Methods, recording, data processing, and display are discussed. (Jones-Wisconsin)
W74-07985

INVESTIGATION OF RIVER WATER FOR THE PRESENCE OF ESCHERICHIA COLI AND ENTEROCOCCUS, (IN RUSSIAN),
Municipal Sanitary-Epidemiological Station, Leningrad (USSR).
A. G. Kapkova, L. I. Karaseva, and V. A. Avdeeva.
Gig Sanit. Vol 37, No 3, p 100-101. 1972.
Identifiers: *Enterococcus, *E. coli, *Alkalinity, *Polymyxin, *River waters, Antibiotics, Pollutant identification.

Determination of the presence of E. coli and enterococci in river water was carried out on an enrichment alkaline polymyxin medium. This medium has selectivity due to alkalinity (pH 9.6-10.2) and ability of the antibiotic polymyxin to suppress gram-negative flora, particularly E. coli. The confirming medium was 1 with methyl violet for final suppression of gram-negative microflora, except enterococci.--Copyright 1973, Biological Abstracts, Inc.
W74-08004

POLLUTION MONITORING IN LAKE CHAMPLAIN USING ERTS-1 IMAGERY,
Vermont Univ., Burlington. Remote Sensing Lab.
A. O. Lind, and E. B. Henson.
Available from the National Technical Information Service as N73-26347 $3.00 in paper copy, $1.45 in microfiche. Report June 1973. 7 p, 4 fig. NAS 5-21753.

Descriptors: *Pulp wastes, *Water pollution sources, *Monitoring, *Satellites(Artificial), Vermont, New York, Surveys, Spectrophotometry, Sedimentation, Judicial decisions.
Identifiers: *Lake Champlain(Vt.-N.Y.), ERTS-1 imagery, Pollution plume, Fort Ticonderoga(N.Y.).

The detection of a major pollution plume emanating from the International Paper Company's Fort Ticonderoga operation is described. A major plume was seen in the Earth Resources Technology Satellite (ERTS) coverage of October 10, and it was observed that the plume configuration agreed with earlier lake surveys. Position of the plume in the lake may be determined by superimposing MSS bands 4 and 6 or 7. The near-infrared band provides excellent shoreline definition and makes it possible to note the extent of the plume area. The usual high level of general turbidity in the water shows as a light tone in the image compared to the darker tone of the plume area which results from the suspended paper mill wastes producing an overall brownish coloration. The cumulative effect of these images will be to provide data to construct a model depicting the plume configuration in differing seasons and limnological conditions. This information can be combined with aircraft data taken under different circumstances. The documented plume data will be made available to the Vermont Attorney's Office for possible application in the ongoing resources action now in progress at U.S. Supreme Court level. (Jones-Wisconsin)
W74-08009

SANITARY-HYGIENIC EVALUATION OF THE WATER QUALITY OF THE NURA WATER CONDUIT OF THE TSELINOGRAD DISTRICT (IN RUSSIAN),
Meditsinskii Institut, Tselinograd (USSR).
N. M. Anan'ev, and N. A. Demin.
Gig Sanit, Vol 37, No 10, p 92-94, 1972.
Identifiers: Conduits, *Fluorine, Hygienic conditions, *Iron, Sanitary conditions, *USSR(Nura River), *Water quality standards, Alluvial deposits.

The water quality of the alluvial deposits of the Nura River (USSR) meets the requirements of the State standard, except for the high content of Fe (0.3-2 mg/l) and low content of F1 (0.08-0.4 mg/l). Fluoridation plants should be installed at the intakes of the Nura water conduit and the metal pipes should be replaced by polyethylene, asbestos-cement, or other materials which would not affect water quality.--Copyright 1973, Biological Abstracts, Inc.
W74-08052

A SCANNING ELECTRON MICROSCOPIC STUDY OF SECONDARY LAMELLAE AND CHLORIDE CELLS OF RAINBOW TROUT (SALMO GAIRDNERI),
Michigan State Univ., East Lansing. Dept. of Physiology.
For primary bibliographic entry see Field 5C.
W74-08096

INVESTIGATIONS ON THE PROBLEM OF SOLUBILITY AND STABILITY OF STEROID OVULATION INHIBITORS IN WATER, WASTE WATER AND ACTIVATED SLUDGE, (IN GERMAN),
K. Norpoth, A. Nehrkorn, M. Kirchner, H. Holsen, and H. Teipel.
Zentralbl Bakteriol Parasitenkd Infektionskr Hyg Erste B Hyg Praev Med. Vol 156, No 6, p 500-511. 1973. Illus. English summary.
Identifiers: *Activated sludge, *Inhibitors, Oral contraceptives, *Solubility, Stability, *Steroid ovulation, Waste water, Chromatography, Pollutant identification.

The solubility steroid ovulation inhibitors was determined in double distilled water and in various waste water samples using quantitative fluorospectroscopic steroid identification by thin layer chromatography. Further experiments were carried out to determine how long the individual synthetic progestagens and estrogens persist in activated sludge. Of oral contracepatives commercially available, ethinylestradiol had a water solubility of 4.75 mg/l; for the other steroids, the values were between 0.2 and 2.0 mg/l. In the waste water tests the steroid solubility was sometimes insignificantly and sometimes markedly reduced. In no case was the difference more than 50%. In activated sludge, the estrogens (ethinylestradiol, mestranol) persisted intact over 5 days, while the progestagens were more than 50% disintegrated after 48 hr. Stable decomposition products of megestrol acetate, medroxyprogesterone acetate, norethisterone, chlormadinone acetate and norgestrel were still found after 5 days, but it was not possible to determine their biological activity. Ethinylestradiol, which is included as the estrogen component of almost all commercial preparations for oral contraception, is far more soluble in water than the other components of oral contraceptives and is probably excreted in greater quantities. The compound also persists in activated sludge for more than 1 week. Possible future dangers from the accumulation of synthetic steroid compounds in waste water are unpredictable.--Copyright 1973, Biological Abstracts, Inc.
W74-08133

DETERMINATION OF COUNTING EFFICIENCY BY 14C BY LIQUID SCINTILLATION IN PRIMARY PRODUCTION MEASUREMENTS IN A LAGOON ENVIRONMENT, (IN FRENCH),
Tunis Univ. (Tunisia). Laboratoire d'Oceanographie.
P. Crouzet.
Rev Int Oceanogr Med. 26, p 27-41. 1972, Illus. (English summary).
Identifiers: *Carbon-14 method, Environment, Lagoons, Measurements, *Primary production, *Scintillation method, *Cytological studies, Solubility, Pollutant identification.

Liquid scintillation is known to be the easiest way of counting 14C in primary productivity measurements. Direct application of this technique to lagoons poses the problem of counting efficiency determination for non-homogeneous samples. The experiments presented suggest a partial solubilization of cells by organic solvent. The channel ratio method should be used for the correct determination of counting efficiency.--Copyright 1973, Biological Abstract, Inc.
W74-08143

5B. Sources Of Pollution

IRRIGATION OF CITRUS WITH CITRUS WASTE WATER,
Florida Univ., Lake Alfred. Inst. of Food and Agricultural Sciences.
For primary bibliographic entry see Field 5D.
W74-07603

ANALYSIS OF LIQUID-WASTE INJECTION WELLS IN ILLINOIS BY MATHEMATICAL MODELS,
Illinois Univ., Urbana. Water Resources Center.
M. Heidari, K. Cartwright, and P. Saylor.
Available from the National Technical Information Service as PB-232 004, $4.75 in paper copy, $1.45 in microfiche. Research Report No 77, January 1974. 124 p, 34 fig, 4 tab, 48 ref. OWRR A-058-ILL(1). 14-31-0001-3813.

Descriptors: *Illinois, *Finite element analysis, *Equations, *Mathematical models, Flow, Dispersion, *Injection wells, Liquid wastes, Industrial wastes, Diffusion, Path of pollutants.
Identifiers: *Mass-transport equation, *Flow equation, Multi-layered systems, Adaptive-Chebyshev-factorization method.

Results are presented of a preliminary theoretical study of the fate of liquid industrial wastes injected into deep geologic formations. The Jones and Laughlin Corporation well was used as a model and the geology of the area was idealized into a 15-layered homogeneous and anisotropic mathematical model. The finite element method was tested and proved to be an effective mathematical tool in the solution of the equation of flow. The flow and pressure build-up show that the rocks are capable of receiving greater volumes of waste than are now being injected without endangering the integrity of the aquifer or the confining layer. The mass-transport equation for large and complex ground-water reservoir systems was investigated, and it was concluded that the dispersion and diffusion parts of the equation are relatively insignificant, and under extreme conditions the dispersed zone will not be more than a few feet wide. Therefore, it was concluded that a more practical approach to the problem would be the solution of a system with a moving interface boundary in which mass transport results mainly from convection. To overcome difficulties encountered with computer time and memory in the solution of the mass-transport equation for large complex systems, an iterative method is proposed for the solution of the equations, which substantially reduces these difficulties.
W74-07604

POLLUTED GROUNDWATER: SOME CAUSES, EFFECTS, CONTROLS, AND MONITORING.
General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.
Available from the National Technical Information Service as PB-232 117, $6.75 in paper copy, $1.45 in microfiche. Environmental Protection Agency, Monitoring Series, Report EPA-600/4-73-001b, July 1973. Edited by Charles F. Meyer. 282 p, 32 fig, 29 tab. EPA Contract 68-01-0759.

Descriptors: *Water pollution sources, *Water pollution effects, *Water pollution control, *Monitoring, *Underground waste disposal, Aquifer management, Federal Water Pollution Control Act, *Groundwater, Management, Water pollution.

Consultants Harvey O. Banks, James J. Geraghty, P.H. McGauhey, Nathaniel M. Perlmutter, David Keith Todd, and Don L. Warner, and TEMPO staff members Charles F. Meyer and Edward J. Tschupp, formed a team which prepared information for EPA's use in developing guidelines and reports in compliance with the Federal Water Pollution Control Act Amendments of 1972. Groundwater pollution aspects of the following topics are discussed: institutional and legal constraints; injection wells into saline and freshwater aquifers; lagoons, basins, and pits; septic systems; sewer leakage; spraying; land fills; surface-groundwater relationships; saltwater intrusion; land subsidence and collapse; effects of urbanization and of flow diversion, including wells and surface structures; spills of liquid pollutants; tank and pipeline leakage; and groundwater basin management, including related surface activities. (See also W74-07614) (EPA)
W74-07615

EFFECT OF DEICING CHEMICALS ON GROUND AND SURFACE WATER--(MODUS OPERANDI),
Geological Survey, Boston, Mass.
L. Toler.
Available from the National Technical Information Service, Springfield, Va 22151, PB-222 290, Price $3.00 printed copy; $1.45 microfiche. Research Project R-18-1, Interim Progress Report for Massachusetts Department of Public Works, December 1972. 31 p, 20 fig, 3 tab.

Descriptors: *Path of pollutants, *Deicers, *Massachusetts, Chlorides, Sodium, Salinity, Water pollution sources, Water pollution effects, Snow removal, Highways, Monitoring.

Transport of highway deicing chemicals by surface water and groundwater is related to a variety of geologic, hydrologic and highway maintenance conditions. A number of study sites in Massachusetts were selected for collection of data. Eight steamflow sites were instrumented to measure the surface runoff of deicing salt. At each of three groundwater sites, 14 or more wells were installed to monitor the movement of salt in the ground. Criteria, besides small drainage area, for selecting a site to monitor included that there be little interference from sources of salt other than highway deicing chemicals, that highways are located in the basin and that the amount of salt applied could be obtained and measured. (Knapp-USGS)
W74-07617

NITROGEN TRANSFORMATIONS IN SOIL DURING LEACHING: I. THEORETICAL CONSIDERATIONS,
California Univ., Davis. Dept. of Water Science and Engineering.
C. Misra, D. R. Nielsen, and J. W. Biggar.
Soil Science Society of America Proceedings, Vol 38, No 2, p 289-293, March-April 1974. 12 ref.

Descriptors: *Nitrification, *Denitrification, *Leaching, *Unsaturated flow, Ammonia, Oxidation, Soil water movement, Diffusion, Path of pollutants, Equations, Reduction(Chemical).

Transport equations describing the movement and simultaneous oxidation of NH4 to NO3 and reduction of NO3 and N2 by microbial and chemical means were set up and solved both for leaching of a pulse and for a continuous application at the soil surface. Both ionic adsorption owing to cation exchange and microbiological transformations were considered and distinguished as reversible and irreversible processes, respectively. The possibilities of the model extended to a sequential transformation during transport of more than two nitrogen species have been examined. (See also W74-07620 and W74-07621) (Knapp-USGS)
W74-07619

NITROGEN TRANSFORMATION IN SOIL DURING LEACHING: II. STEADY STATE NITRIFICATION AND NITRATE REDUCTION,
California Univ., Davis. Dept. of Water Science and Engineering.
C. Misra, D. R. Nielsen, and J. W. Biggar.
Soil Science Society of America Proceedings, Vol 38, No 2, p 294-299, March-April 1974. 5 fig, 1 tab, 19 ref.

Descriptors: *Nitrification, *Denitrification, *Leaching, *Unsaturated flow, Ammonia, Oxidation, Soil water movement, Diffusion, Path of pollutants, Equations, Reduction(Chemical).

Nitrogen transformations were examined by means of a miscible displacement technique that permitted passage of air with different levels of oxygen through the soil. With the use of steady-state solutions of equations describing the convective transport of NH4 and NO3 ions in Columbia silt loam, first-order reaction rate constants k1 and k2 were ascertained for NH4-oxidation and NO3-reduction, respectively. Values of k1 were 10-fold greater than those of k2. At an oxygen level of 0.5% in the gaseous phase, nitrification was apparently inhibited. (See also W74-07619) (Knapp-USGS)
W74-07620

NITROGEN TRANSFORMATIONS IN SOIL DURING LEACHING: III. NITRATE REDUCTION IN SOIL COLUMNS,
California Univ., Davis. Dept. of Water Science and Engineering.
C. Misra, D. R. Nielsen, and J. W. Biggar.
Soil Science Society of America Proceedings, Vol 38, No 2, p 300-304, March-April 1974. 7 fig, 1 tab, 11 ref.

Descriptors: *Nitrification, *Denitrification, *Leaching, *Unsaturated flow, Ammonia, Oxidation, Soil water movement, Diffusion, Path of pollutants, Equations, Reduction(Chemical).

Nitrate reduction in water-unsaturated Columbia silt loam columns was examined at 19.5C and 34.5C with three levels of oxygen (0.5%, 5%, and 20%) in an aerating gas passing through the soil. Following a continuous application of NH4 solution, a pulse of a NO3 solution was leached through the columns. After the decay of the pulse, a continuous application of NO3 solution allowed mathematical analysis leading to ascertaining NO3 reduction rate coefficients. The temperature dependence of these constants as a function of oxygen composition and the need for microbial population and activity analysis are discussed. (See also W74-07619) (Knapp-USGS)
W74-07621

DISTRIBUTION OF FREE IRON AND ORGANIC CARBON AS RELATED TO AVAILABLE WATER IN SOME FORESTED SANDY SOILS,
Michigan Technological Univ., L'Anse. Ford Forestry Center.
For primary bibliographic entry see Field 2G.

W74-07622

NITROGEN TRANSFORMATIONS DURING CONTINUOUS LEACHING,
California Univ., Davis. Dept. of Soils and Plant Nutrition.
J. L. Starr, F. E. Broadbent, and D. R. Nielsen.
Soil Science Society of America Proceedings, Vol 38, No 2, p 283-289, March-April 1974. 9 fig, 17 ref.

Descriptors: *Nitrification, *Denitrification, *Leaching, *Unsaturated flow, Ammonia, Oxidation, Soil water movement, Diffusion, Path of pollutants, Equations, Reduction(Chemical).

Simultaneous nitrification, denitrification, and N movement were investigated in a soil column during continuous unsaturated leaching. During a continuous application of NH4Cl solution, analyses were made of the soil solution with soil depth and time for N as NH4, NO2 and NO3; and of the soil atmosphere for O2, CO2, N2O, and N2. The use of N-15 permitted direct measurement and quantification of nitrification and denitrification, as well as the transport of N in the liquid and gaseous phases. Solutions to the appropriate equations using measured reaction rate coefficients, pore-water velocities, and diffusion coefficients adequately described the steady state NH4 and NO3 concentration distribution in the soil profile. Equations were also used to stoichiometrically account for the various interacting species in the N transformations. (Knapp-USGS)
W74-07623

BIODEGRADATION OF NITRILOTRIACETATE (NTA) IN SOILS,
Michigan State Univ., East Lansing. Dept. of Crop and Soil Sciences.
J. M. Tiedje, and B. B. Mason.
Soil Science Society of America Proceedings, Vol 38, No 2, p 278-283, March-April 1974. 3 fig, 5 tab, 17 ref.

Descriptors: *Nitrilotriacetic acid, *Biodegradation, *Path of pollutants, Chelation, Carbon radioisotopes, Detergents, Sewage disposal, Sludge, Activated sludge, Sewage treatment, Soil disposal fields, Tracers.
Identifiers: *Land disposal(Wastes).

Nitrilotriacetate (NTA) was biodegraded in a variety of soils; the process was measured by total CO2 and CO2 production from C-14-carboxyl-NTA. Production of CO2 and C-14 followed similar patterns and suggested complete degradation of NTA; C-14 production was used routinely to assay NTA dissimilation. At 40 ppm of NTA in soils receiving sewage effluent and in muck soils, maximum rates of degradation were 8 to 10 ppm/day while in mineral surface soils, they ranged from 0.5 to 6 ppm/day; the rates in subsoils were always less than for the surface soils from the same site. Degradation rates did not correlate with pH, drainage, texture, or plant cover. Rates of degradation increased from 2 to 64 ppm/day as NTA concentration was increased from 10 to 600 ppm. C-14 production from NTA did not occur anaerobically and was severely limited under microaerophilic conditions. NTA was degraded at 24 and 12.5C; it was also degraded at 2C if previously acclimatized at 12.5C. Iminodiacetate was a possible intermediate in NTA degradation while N-methyliminodiacetate was not. (Knapp-USGS)
W74-07624

A KINETIC STUDY OF AMMONIUM AND NITRITE OXIDATION IN A SOIL FIELD PLOT,
California Univ., Berkeley. Dept. of Soils and Plant Nutrition.
M. S. Ardakani, R. K. Schulz, and A. D. McLaren.
Soil Science Society of America Proceedings, Vol 38, No 2, p 273-277, March-April 1974. 6 fig, 1 tab, 13 ref. NSF RANN GI-34733XI.

Descriptors: *Oxidation, *Ammonia, *Nitrates, Soils, Nitrification, Denitrification, Soil microorganisms, Adsorption, Biodegradation.
Identifiers: Nitrobacter, Nitrosomonas.

Disappearance of NH4 from percolating solution in a field test was attributed to both oxidation and to adsorption by the soil. Once a steady state was established and exchangeable NH4 was equilibrated with NH4 in soil solution, oxidation alone accounted for disappearance of NH4 in the top 2.5 cm of the soil. Concentration profiles of NO2 and NO3 may be described by a modified Michaelis-Menten equation. Rate constants for oxidation of NO2 and NH4 are 0.0006 and 0.0025, respectively. These rates are in good agreement with the values found under controlled laboratory conditions. Growth and distribution in soil of Nitrobacter and Nitrosomonas were followed by weekly estimates of their numbers at different depths. Nitrobacter reached a maximum population of about 1 million per cc of soil but declined to a stable density of about 100,000 organisms per cc. Nitrobacter approached a steady level of about 10,000 organisms per cc. Both organisms showed higher densities near the soil surface where the concentrations of substrates were always highest. (Knapp-USGS)
W74-07625

EFFECT OF MONOSILICIC ACID ON HYDROLYTIC REACTIONS OF ALUMINUM,
Saskatchewan Univ., Saskatoon. Inst. of Pedology.
For primary bibliographic entry see Field 2G.
W74-07626

ADSORPTION OF FENURON AND MONURON (SUBSTITUTED UREAS) BY TWO MONTMORILLONITE CLAYS,
Louvain Univ. (Belgium). Dept. of Soil Science.
R. Van Bladel, and A. Moreale.
Soil Science Society of America Proceedings, Vol 38, No 2, p 244-249, March-April 1974. 5 fig, 4 tab, 27 ref.

Descriptors: *Adsorption, *Herbicides, *Clay minerals, Bentonite, *Montmorillonite, Urea pesticides, Thermodynamics, Monuron, *Path of pollutants, Chemical degradation.
Identifiers: *Fenuron.

The effect of the type of clay mineral, exchangeable cation, temperature, and electrolyte concentration on the adsorption of two substituted ureas was investigated. Adsorption was greater on a bentonite than on a Camp Berteau montmorillonite because the lattice charge in the bentonite originates from tetrahedral and octahedral layers, whereas in the montmorillonite the charge originates only from octahedral layers. The adsorption increased with the polarizing power of the exchangeable cation. Normal adsorption isotherms were exothermic but when the temperature effect on solubility was accounted for, the adsorption reaction tended to be more and more temperature independent as the electronegativity of the exchangeable cation increased. Thermodynamic data suggest that the favorable contribution to the adsorption energy arises mainly from enthalpy changes. The effect of salt concentration was almost negligible up to 1.0N and for a given electrolyte good agreement was obtained between the heat of solution of the herbicide and its adsorption. (Knapp-USGS)
W74-07627

THE SURFACE CATALYZED HYDROLYSIS OF PARATHION ON KAOLINITE,
Agricultural Research Organization, Bet-Dagan(Israel). Inst. of Soils and Water.
S. Saltzman, B. Yaron, and U. Mingelgrin.
Soil Science Society of America Proceedings, Vol 38, No 2, p 231-234, March-April 1974. 5 fig, 13 ref.

Descriptors: *Kaolinite, *Catalysts, *Hydrolysis, *Organophosphorus pesticides, Pesticide residues, Pesticide kinetics, Chemical degradation.
Identifiers: *Parathion.

The decomposition of parathion on various monoionic kaolinites proceeds via the hydrolysis of the phosphate ester to p-nitrophenol and diethyl thiophosphate. The kaolinites catalyze the hydrolysis. The nature of the exchangeable cation greatly affects the rate of hydrolysis. Ca-kaolinite is the most active in inducing the degradation of parathion, the hydrolysis being twice as fast as in a water solution at pH 8.5 at the same temperature. The presence of a large excess of water decreases the catalytic effect of the kaolinite. The mechanism of the hydrolysis is via adsorption of the parathion upon the exchangeable cation or its hydration shell. The temperature dependence of the process is consistent with this proposed mechanism. The significant catalytic activity of kaolinites and its dependence on the exchangeable cation is important to the degradation of parathion in soil and may be utilized in the formulation of parathion for various purposes. (Knapp-USGS)
W74-07628

FIXATION OF ZINC BY CLAY MINERALS,
Georgia Agricultural Experiment Station, Athens.
For primary bibliographic entry see Field 2G.
W74-07629

PACKING-INDUCED RADIAL PARTICLE-SIZE SEGREGATION: INFLUENCE ON HYDRODYNAMIC DISPERSION AND WATER TRANSFER MEASUREMENTS,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2G.
W74-07630

ANION EXCLUSION AND COUPLING EFFECTS IN NONSTEADY TRANSPORT THROUGH UNSATURATED SOILS: II. LABORATORY AND NUMERICAL EXPERIMENTS,
Agricultural Research Organization, Bet-Dagan (Israel). Dept. of Soil Physics.
For primary bibliographic entry see Field 2G.
W74-07631

ANION ADSORPTION BY ALLOPHANIC TROPICAL SOILS: I. CHLORIDE ADSORPTION,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W74-07634

ANION ADSORPTION BY ALLOPHANIC TROPICAL SOILS: II. SULFATE ADSORPTION,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W74-07635

ANION ADSORPTION BY ALLOPHANIC TROPICAL SOILS: III. PHOSPHATE ADSORPTION,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W74-07636

WELLS AND PUMPING SYSTEMS FOR DOMESTIC WATER SUPPLIES,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 8B.
W74-07638

ESTIMATION OF IMPERVIOUSNESS AND SPECIFIC CURB LENGTH FOR FORECASTING STORMWATER QUALITY AND QUANTITY,
Metropolitan Washington Council of Governments, Washington, D.C. Dept. of Health and Environmental Protection.
P. H. Graham, L. S. Costello, and H. J. Mallon.
Water Pollution Control Federation, Vol 46, No 4, p 717-725, April 1974. 5 fig, 4 tab, 14 ref.

Descriptors: *Mathematical models, *Urban hydrology, *Storm runoff, *Permeability, *Water quality, Infiltration, Storm water, Urban runoff, Biochemical oxygen demand, Cities, Water pollution sources, Urban drainage.
Identifiers: Imperviousness.

A method is given for estimating the imperviousness and specific curb length (curb length per unit area) of a watershed for input into a stormwater model. A sensitivity analysis was used to establish the importance of these parameters on the quantity and quality of stormwater runoff. Methods are presented to obtain specific curb length and imperviousness values from color infrared imagery. The functional relationships with household, population, and employment densities are reported. With the ability to infer imperviousness and specific curb length from demographic data commonly projected by planners, it is now convenient for the environmental engineer to make estimates of future urban runoff volume per storm and BOD washoff per storm in expanding urban areas. (Knapp-USGS)
W74-07640

USE OF FLUORESCENT DYE TRACERS IN MOBILE BAY,
Food and Drug Administration, Dauphin Island, Ala. Gulf Coast Technical Services Unit.
A. H. Story, R. M. McPhearson, Jr., and J. L. Gaines.
Journal Water Pollution Control Federation, Vol 46, No 4, p 657-665, April 1974. 4 fig, 1 tab, 19 ref.

Descriptors: *Path of pollutants, *Bays, *Estuaries, Tracers, *Dye releases, Tides, Currents(Water), *Alabama, Fluorescent dye, Tracking techniques.
Identifiers: *Mobile Bay(Ala).

Surveys of shellfish growing areas in Mobile Bay included a study of the effects of tides and streamflows on pollutants. Fluorescent dyes were used to trace movement of water masses. The approximate minimum time for pollutants to travel from the Mobile River (Source of pollutants) to the south end of the bay where the oyster reefs are situated was determined. Dye was introduced at high tide and at flood stage in the river and was followed until it reached the oyster reefs. The minimum time for water to pass through the bay was calculated to be 56 hr. (Knapp-USGS)
W74-07642

CHESTER RIVER STUDY, VOLUMES I, II, AND III.
Chester River Study Joint Investigation by State of Maryland Department of Natural Resources and Westinghouse Electric Corporation, November 1972 (Vols 1, 38p, and II, 251p) and July 1973 (Vol III, 107p).

Descriptors: *Polychlorinated biphenyls, *Water pollution sources, *Water pollution effects, *Path of pollutants, *Maryland, Rivers, Erosion, Chesapeake Bay, Estuaries, Pesticides, Sedimentation, Trace elements, Shellfish.
Identifiers: *Chester River(Md).

Shellfish and finfish from the Chester River, Maryland, are presently safe for human consumption with respect to concentrations of hard chlorinated hydrocarbon type insecticides and polychlorinated biphenyls (PCB's). The insecticides, DDT, DDD, DDE, chlordane, and PCB's (primarily Aroclor 1242) were found routinely in biological samples and sediment samples from the Chester River, but at levels far below those considered hazardous to humans. Most of the measured chlorinated hydrocarbon pollutants are entering the Chester River from the upper Bay rather than from the river drainage area itself. Both trace metals and the insecticides and PCB's are carried on the surfaces of sediments, there being an inverse relationship between the amount of these materials and the mean grain-size of the sediments. Shoreline erosion is extensive in the lower Chester River. Significant amounts of shore erosion are caused by water seepage and runoff from the landward side. Volume I is an overview of the entire study, presenting in a condensed form the scope and major findings. Volume II contains the discipline-oriented reports upon which the contents of Volume I are based. Volume II is organized into eight sections. Section 1 gives a description of the Chester River region; section 2 covers the investigations of pesticides and PCB's; section 3 takes up the trace metals investigated during the Chester River Study; section 4 discusses the biological investigations; section 5 covers the geological investigations; section 6 presents the findings of the meteorological and hydrological investigations; and section 7 covers the data management techniques. Section 8 discusses instrumentation and equipment. Volume III contains the data for the discipline-oriented reports. (See W74-07654 thru W74-07660) (Knapp-USGS)
W74-07653

BIOCHEMICAL INVESTIGATIONS,
T. O. Munson.
In: Chester River Study, Volume II; Joint Investigation by State of Maryland Department of Natural Resources and Westinghouse Electric Corporation, p 15-45, November 1972. 19 fig, 10 tab, 12 ref.

Descriptors: *Polychlorinated biphenyls, *Water pollution sources, *Water pollution effects, *Path of pollutants, *Maryland, Rivers, Erosion, Chesapeake Bay, Estuaries, Pesticides, Sedimentation, Trace elements, Shellfish.
Identifiers: *Chester River(Md).

The sediments and biota of the Chester River, Maryland, were analyzed for chlorinated hydrocarbons on a seasonal basis and found to contain DDT (DDD and DDE), chlordane and PCB's (mostly of the Aroclor 1242 variety). None of the compounds found in the biota occurred at levels high enough to be considered potentially hazardous to human health. The chlorinated hydrocarbons appeared to be entering the Chester River from the Bay rather than coming from sources within the Chester River watershed. Toxicity experiments indicated that the shellfish readily accumulated chlordane to high levels from very low concentrations in the water. Even though the observed levels in Chester River shellfish presented no hazard to human health, the levels may be high enough to adversely affect the animals themselves. In addition, the toxicity data provided an understanding of the chlordane uptake mechanisms for soft-shelled clams and oysters which may yield useful resource management tools. (See also W74-07653) (Knapp-USGS)
W74-07654

TRACE METALS INVESTIGATIONS,
Westinghouse Electric Corp., Pittsburgh, Pa.
H. D. Palmer.
In: Chester River Study, Volume II; Joint Investigation by State of Maryland Department of Natural Resources and Westinghouse Electric Corporation, p 47-59, November 1972. 2 fig, 6 tab, 23 ref.

Descriptors: *Trace elements, *Estuaries, *Maryland, Bottom sediments, Zinc, Lead, Cadmium, Copper, Chromium, Iron, Heavy metals, Path of pollutants, Water pollution sources, Chesapeake Bay.
Identifiers: *Chester River(Md).

Bottom sediment samples from the Chester River Estuary, Maryland, were analyzed to determine concentration levels of six metallic ions (Zn, Pb, Cd, Cu, Cr, and Fe). High concentrations of these metals were found at the mouth of the river and in the upper tributary portions of the Chester River. Low values for these metals were found in the middle reaches of the river upstream from the mouth but downstream from the major tributary net. A strong negative correlation exists between trace metal concentrations and the mean grain size of sediments, but only weak correlations are found between trace metals and the clay mineralogy of sediments. Concentrations of zinc are higher than those reported for other similar estuaries in the Chesapeake Bay region, but all trace metal concentrations are below levels of environmental concern. Dredging of the fine-grained materials in the main channel of the river, however, could be hazardous to the environment, since it would place large amounts of these materials back in suspension. (See also W74-07653) (Knapp-USGS)
W74-07655

BIOLOGICAL INVESTIGATIONS,
J. M. Forns.
In: Chester River Study, Volume II; Joint Investigation by State of Maryland Department of Natural Resources and Westinghouse Electric Corporation, p 61-73, November 1972. 5 fig, 6 tab, 10 ref.

Descriptors: *Plankton, *Estuaries, *Maryland, Chesapeake Bay, Sampling, Water pollution effects, Chlorinated hydrocarbon pesticides.
Identifiers: *Chester River(Md).

A preliminary investigation of the zooplanktonic community was undertaken as part of the study of the distribution and movements of chlorinated hydrocarbons through the aquatic environment of the Chester River System, Maryland. The chlorinated hydrocarbon concentrations in any one of the plankton samples could not have exceeded 0.286 ppm. Four planktonic groups were present plus a great deal of organic detrital matter. The overwhelmingly dominant organism in the planktonic community during the time of year investigated (October 1972) was the copepod Acartia tonsa. Comparisons of all tows at the three stations did not indicate any significant differences in the vertical distribution of plankters from surface to bottom or changes in community structure from the mouth of the river to the farthest station upstream. However, a slight increase in the numbers of Acartia copedodite stages was observed at the station closest to the Bay while nauplii seemed more abundant at the upstream station. Generally, the relative percent composition of the different organisms in the 20 collections examined were quite similar to those observed in other northeastern estuaries such as Long Island Sound, Raritan Bay and Delaware Bay. (See also W74-07653) (Knapp-USGS)
W74-07656

GEOLOGICAL INVESTIGATIONS,
Westinghouse Electric Corp., Pittsburgh, Pa.
H. D. Palmer.
In: Chester River Study, Volume II; Joint Investigation by State of Maryland Department of Natural Resources and Westinghouse Electric Corporation, p 75-137, November 1972. 47 fig, 5 tab, 99 ref.

Descriptors: *Estuaries, *Sedimentation, *Maryland, Sediment transport, Provenance, Geology, Mineralogy, Stratified flow, Sediment load, Suspended load, Bed load, Erosion, Bank erosion, Stream erosion.
Identifiers: *Chester River(Md).

The Chester River, Maryland, is similar to many rivers entering Chesapeake Bay in that extensive portions of its lower reaches are now drowned by the geologically recent rise in sea level. It is, therefore, capable of receiving sediments from the Bay as well as furnishing them. Sediments accumulating in the Chester River estuary are derived from shoreline erosion, from the adjacent Bay, and from the tributary net of the drainage basin. In the lower reaches of the river, Bay and shoreline sediment sources predominate, but in upstream areas, the primary sources are shoreline erosion and from the tributaries. Sedimentation is occurring in two clastic wedges prograding to the south. The upstream wedge is accumulating materials reworked from the extensive blanket deposits formed by the Upland terrace sands, silts and clays, while the downstream wedge, lying at the mouth of the river, is being built by an influx of Bay sediments supplemented by local shoreline erosion. A series of thalweg basins lie between the two wedges, and low sedimentation rates in them indicate a bypassing mechanism is partially responsible for maintaining these features. Two- and occassionally three-layer flows were measured. Net transport into the river from the Bay prevails in the lower layer, and clay mineralogy of both bottom and suspended sediment indicates that the fine fractions originating outside the river are being deposited at least 22 miles upstream from the mouth. (See also W74-07653) (Knapp-USGS)
W74-07657

METEOROLOGICAL AND HYDROLOGICAL INVESTIGATIONS,
K. T. S. Tzou.
In: Chester River Study, Volume II: Joint Investigation by State of Maryland Department of Natural Resources and Westinghouse Electric Corporation, p 139-211, November 1972. 45 fig, 11 tab, 24 ref.

Descriptors: *Meteorology, *Hydrology, *Estuaries, *Maryland, Currents(Water), Winds, Sediment transport, Path of pollutants, Chlorinated hydrocarbon pesticides, Streamflow, Discharge(Water), Precipitation(Atmospheric), Hydrographs.
Identifiers: *Chester River(Md).

Meteorological and hydrological investigations were undertaken to gain an understanding of possible transport mechanisms for chlorinated hydrocarbons (pesticides and PCB's) in the Chester River system of Maryland. Field measurements included air temperature, precipitation, wind speed and direction, streamflow, tides, current speed and direction, water temperature, salinity (conductivity), dissolved oxygen and pH. Water movements in the upper Bay are largely responsible for the transport of these materials. The coupling of meteorological and hydrological processes are also important in the final distribution of sediments carrying the chlorinated hydrocarbons. Prevailing winds in the Chester River area are from west to northwest in the spring, fall and winter and from the southwest during the summer. Hence, pesticide residues from the western shore of the Bay can be carried directly by winds and reach the study area through aerial fallout. Attachment of chlorinated hydrocarbons to particulate matter is the most important transport mechanism, particularly in the movement of fine sediments carrying the chlorinated hydrocarbons from the Bay to the River. About 28 grams of PCB's, 3 grams of total DDT and 1 gram of chlordane were moving into the Chester River from the Bay each day during the early spring freshet period, and only a small fraction of these compounds were returned to the Bay in late spring. Most of the chlorinated hydrocarbons found in the Chester River sediments originate in Chesapeake Bay. Meteorological conditions and their strong coupling with the hydrological regime have contributed to serious shore erosion in various portions of the River. Tropical storm 'Agnes' demonstrated in a dramatic fashion how strongly these factors are interlocked. Extreme low salinities as a result of this storm caused losses of shellfish, particularly the soft-shelled clam, while record annual high water levels were recorded at several points in the river. (See also W74-07653) (Knapp-USGS)
W74-07658

DATA MANAGEMENT,
R. W. Onstenk.
In: Chester River Study, Volume II; Joint Investigation by State of Maryland Department of Natural Resources and Westinghouse Electric Corporation, p 213-235, November 1972. 14 fig, 6 tab, 2 ref.

Descriptors: *Data processing, *Data storage and retrieval, Meteorological data, Hydrologic data, Estuaries, Maryland, Water pollution, Water quality.
Identifiers: *Chester River(Md).

The nature of the Chester River study required the collection, storage and analysis of more than 30 million data. Wind speed and direction, tide, currents, and various physical and chemical observations regarding temperature, conductivity, dissolved oxygen and pH were fundamental measurements which required analysis. Field data from a variety of sensors employing magnetic tape, paper tape, hand entries on log sheets, and card decks and tapes from participating agencies all required registration to a common time base prior to their storage in a master data file. Details of data handling and problems encountered in the management of large quantities of diverse information are presented. (See also W74-07653) (Knapp-USGS)
W74-07659

EQUIPMENT AND INSTRUMENTATION,
A. G. Haury.
In: Chester River Study, Volume II; Joint Investigation by State of Maryland Department of Natural Resources and Westinghouse Electric Corporation, p 237-251, November 1972. 15 fig, 12 tab.

Descriptors: *Estuaries, *Maryland, *Data collections, *Instrumentation, Streamflow, Currents(Water), Rain gages, Meteorological data, Hydrologic data, Sampling, Sediments.

Instrumentation and complementary equipment required in support of the 12-month study of the Chester River, Maryland, are described. Performance of the various devices is discussed, with a description of problems, calibration techniques, and installation schemes employed for hydrological and meteorological sensors. Major problems encountered during the study included vandalism and severe biological fouling during summer months when the rise in water temperature prompted growth of algae and slime on submerged instruments. (See also W74-07653) (Knapp-USGS)
W74-07660

THE CHEMICAL/PHYSICAL AND MICROBIOLOGICAL CHARACTERISTICS OF TYPICAL BATH AND LAUNDRY WASTE WATERS,
National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center.
W. D. Hypes, C. E. Batten, and J. R. Wilkins.
Available from NTIS, Springfield, Va 22151 NASA TN D-7566 Price $3.00 printed copy; $1.45 microfiche. Technical Note D-7566, March 1974. 29 p, 4 fig, 8 tab, 6 ref.

Descriptors: *Water reuse, *Domestic water, Water quality, Coliforms, Turbidity, Water chemistry, Waste water(Pollution), Water pollution effects.
Identifiers: Bath water, Laundry water.

The chemical, physical, and microbiological characteristics of typical bath and laundry waste waters were studied. Data are presented for bath waste water and laundry waste water collected separately and for bath and laundry waste water collected together during a 12-day test in which the untreated waste waters were reused for toilet flush water. The characteristics of combined bath and laundry waste waters showing the most significant changes from a tap water were ammonia, color, methylene blue active substance (MBAS), phosphates, sodium, sulfates, total organic carbon, total solids, and turbidity. The mean total number of microorganisms detected from the combined bath and laundry waste waters ranged from 1 to 10 million cells/ml and the mean number of possible coliforms ranged from 100,000 to 1 million cells/ml. Total microorganism and coliform counts stabilized at levels of 1 million and 100,000 cells/ml, respectively. An accumulation of particulates and an objectionable odor were detected in the tankage use during the 12-day reuse of the untreated waste waters. The combined bath and laundry waste waters from a family of four provided enough water for 91 percent of the toilet flushing of the same family. (Knapp-USGS)
W74-07663

QUALITY OF SURFACE WATERS IN THE COLORADO RIVER BASIN, TEXAS, 1966-72 WATER YEARS,
Geological Survey, Austin, Tex.
J. Rawson, M. L. Maderak, and L. S. Hughes.
Open-file report, February 1974. 81 p, 8 fig, 7 tab, 11 ref.

Descriptors: *Water quality, *Texas, *Rivers, Path of pollutants, Salinity, Saline water, Water pollution sources.
Identifiers: *Colorado River basin(Tex).

The discharge-weighted average concentrations of dissolved solids in flow from the San Saba, Llano, and Pedernales Rivers of Texas during the 1966-72 water years were less that 250 mg/liter dissolved solids, 50 mg/liter chloride, and 50 mg/liter sulfate. Saline-water inflow seriously degraded the quality of water in the Colorado River upstream from Colorado City and in most of the principal tributaries upstream from San Saba. The discharge-weighted average concentration of dissolved solids was about 1,110 mg/liter in flow of the Colorado River at Colorado City. Inflow of water from Pecan Bayou, San Saba River, Llano River, Pedernales River, and several smaller tributaries caused a progressive reduction in the concentrations of dissolved constituents in the Colorado River downstream from the areas of saline inflow. The discharge-weighted average concentrations for flow in the lower reach of the Colorado River between Austin and Wharton were less than 300 mg/liter dissolved solids. Diversion of saltwater upstream from Colorado City has reduced the salinity of the water available for storage in E. V. Spence Reservoir. Inflow of organic wastes caused some localized degradation in the quality of water in tributaries but caused no serious impairment in the quality of water in the main stem between San Saba and Wharton. The discharge of wastes containing minor elements or the use of pesticides in the areas studied has not resulted in serious impairment of the quality of the water. (Knapp-USGS)
W74-07670

HETEROGENEITIES IN SALINITY IN A RIVER PLUME,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 2L.
W74-07672

A SIMPLE, SEGMENTED PRISM MODEL OF TIDAL MIXING IN WELL-MIXED ESTUARIES,
Institute of Oceanographic Sciences, Taunton (England).
For primary bibliographic entry see Field 2L.

W74-07673

CHEMICAL EVIDENCE FOR THE DISPERSAL OF RIVER MERSEY RUN-OFF IN LIVERPOOL BAY,
Liverpool Univ. (England). Dept. of Oceanography.
M. I. Abdullah, and L. G. Royle.
Estuarine and Coastal Marine Science, Vol 1, No 4, p 401-409, October 1973. 3 fig, 2 tab, 20 ref.

Descriptors: *Water circulation, *Path of pollutants, Tracers, Bays, Estuaries, Currents(Water), Trace elements, Water chemistry, Tides.
Identifiers: *United Kingdom(Liverpool Bay).

River Mersey water was traced in Liverpool Bay by analysis of chemical data (nutrients and some trace metals) for surface water obtained in December 1970 and March 1971. The extent of the area and the rate of dispersal of Mersey effluent is mainly controlled by the turbulent mixing caused by meteorological conditions as well as tidal effects. (Knapp-USGS)
W74-07674

A SIMILARITY SOLUTION FOR STEADY-STATE GRAVITATIONAL CIRCULATION IN FJORDS,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W74-07675

THE 7-DAY 10-YEAR LOW FLOWS OF ILLINOIS STREAMS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2E.
W74-07677

MERCURY IN THE ENVIRONMENT, AN EPIDEMIOLOGICAL AND TOXICOLOGICAL APPRAISAL.
For primary bibliographic entry see Field 5C.
W74-07680

TRANSPORT AND TRANSFORMATION OF MERCURY IN NATURE AND POSSIBLE ROUTES OF EXPOSURE,
Rochester Univ., N.Y. Dept. of Pharmacology and Toxicology.
J. Vostal.
In: Mercury in the Environment, (Chemical Rubber Co. Press), p 15-27, 1972, 1 tab.

Descriptors: *Path of pollutants, *Mercury, *Transfer, *Inorganic compounds, *Organic compounds, Water pollution, Air pollution, Geology, Industrial wastes, Chemical reactions, Biochemistry, Evaporation, Solubility, Food chains.

The sources of mercury and its transport in the air and aquatic environments and through food chains are discussed. Mercury occurs in nature to the extent of 50 to 80 ppb of the earth's content. It enters the geochemical cycle in the form of metallic mercury vapors and volatile or soluble mercury compounds. The physicochemical properties of newly formed compounds may contribute considerably to the release of mercury into the biosphere, since their high volatility and solubility make the transport of mercury into the environment easy. The natural content of mercury in surface waters depends of the accessibility of mercury, time of contact, and conditions of the water. Most of the mercury produced annually is eventually released to the environment through industrial and agricultural routes. All components of the biosphere contain at least minimal traces of mercury and constitute potential sources of exposure for all living organisms. Levels of mercury in the atmosphere and hydrosphere and routes of mercury passage through aquatic and terrestrial food chains are considered. Fish have been found to be the most important source of methylmercury in human food, however relatively high levels may occur in foods other than fish. (See also W74-07680) (Jerome-Vanderbilt)
W74-07682

METABOLISM,
Karolinska Institutet, Stockholm (Sweden). Dept. of Environmental Hygiene.
G. F. Nordberg, and S. Skerfving.
In: Mercury in the Environment, (Chemical Rubber Co. Press), p 29-91, 1972, 2 fig, 8 tab.

Descriptors: *Mercury, *Metabolism, *Absorption, *Transfer, Water pollution, Air pollution, *Path of pollutants, Environmental effects, Human physiology, Human pathology, Animal physiology, Animal pathology, Biochemistry, Organic compounds, Inorganic compounds, Respiration, Laboratory tests, Evaluation, Reviews.

Mercury and its organic and inorganic compounds are considered in regard to their absorption into the human or animal body, their biotransformation and transport, their distribution in body tissue, their retention and excretion, and the indices of exposure to and retention of them. Absorption of mercury into the body is discussed in regard to respiratory intake, gastrointestinal uptake, skin absorption, and placental transfer, for elemental mercury, inorganic mercury in general and alkylmercury, aryl mercury, alkoxylkalkyl mercury and other organic mercury compounds. Oxidation of mercury is its major biotransformation. Elemental mercury is generally transported by the erythrocytes and penetrates biological membranes easily. Mercury compounds are concentrated mainly in the kidney, liver and brain tissue. The biological half-life of inorganic mercury in humans is 30 to 60 days, and for alkylmercury compounds it appears to be longer. The rate of elimination of organic mercury compounds depends upon the rate of degradation into inorganic mercury. The most reliable index of exposure to and retention of mercury in the nervous system is the level of mercury in the blood. (See also W74-07680) (Jerome-Vanderbilt)
W74-07683

'NORMAL' CONCENTRATIONS OF MERCURY IN HUMAN TISSUE AND URINE,
National Swedish Food Administration, Stockholm. Dept. of Nutrition and Food Hygiene.
For primary bibliographic entry see Field 5C.
W74-07685

GENERAL DISCUSSION AND CONCLUSIONS-NEED FOR FURTHER RESEARCH,
Karolinska Institute, Stockholm (Sweden). Dept. of Environmental Hygiene.
For primary bibliographic entry see Field 5C.
W74-07689

METALS FOCUS SHIFTS TO CADMIUM,
H. M. Miller.
Environmental Science and Technology, Vol 5, No 9, p 754-755, Sept. 1971. 1 fig, 1 tab.

Descriptors: *Metals, *Cadmium, *Human disease, *Research priorities, Pollutants, Air pollution, Water pollution, Environmental effects, Toxicity, Investigations, Path of pollutants, Absorption, Distribution, Water pollution sources.

A link between cadmium and osteomalacia has led to concern over the amount of this metal in the environment. Cadmium has an extermely long biological half-life and, although rare in the earth's crust, it does not degrade in the environment. This metal has been linked to serious liver and kidney damage, pulmonary disease and death, in addition to brittleness of bones. The Environmental Protection Agency commissioned several studies to determine the cadmium threat to health, and results seem to show that it is not as great as w
mercury contamination. Although nearly 4.6 m
lion pounds were emitted into the atmosphere
1969 alone, the levels in ambient air are not seen
significant. Only about 5% of ingested cadmium
retained by the body while up to 40% of inhal
cadmium is retained. Most cadmium in the e
vironment results from metallurgical processing
incineration of plastic products. (Jerome-Va
derbilt)
W74-07697

AERIAL POLLUTION AND THE RAP EVOLUTION OF COPPER TOLERANCE,
Liverpool Univ. (England). Dept. of Botany.
L. Wu, and A. D. Bradshaw.
Nature, Vol 238, No 5360, p 167-169, July 21, 197
3 fig, 1 tab, 10 ref.

Descriptors: *Industrial wastes, *Soil contamin
tion, *Copper, *Plant growth, Biology, Biochemi
try, Metabolism, Growth rates, Pollution, Fallou
Toxins, Soil analysis, Heavy metals, Zinc, Lea
Inhibitors, Plant physiology.

Although airborne metals have been shown to
toxic to plants when they contaminate soil, it w
noted that Agrostis stolonifera and Agrostis tenu
growth covered contaminated soil after ten yea
or more. This study investigated the rapid evol
tion of copper tolerance in these species. Seed
from plants in areas of copper contamination we
taken and their growth was compared with that
seeds from uncontaminated soil, and seeds fro
soil which was contaminated with zinc and lea
when they were all grown in soil from a copp
refining area which contained 10,260 ppm coppe
The seeds from plants in areas of no copper co
tamination grew very poorly, and most of th
seedlings died, while seeds from copper co
taminated areas grew normally. Metal toleranc
seems to be selective, but, selection for coppe
tolerance appears to occur easily. (Jerome-Va
derbilt)
W74-07713

HYDROGEOLOGIC INVESTIGATION OF A SANITARY LANDFILL IN STRATIFIED GLA CIAL DRIFT,
Connecticut Univ., Storrs. Inst. of Wate
Resources.
T. L. Holzer.
Available from the National Technical Informa
tion Service as PB-232 154, $3.00 in paper copy
$1.45 in microfiche. Completion Report, 1973. 1
p, 7 fig, 1 tab. OWRR A-038-CONN(1). 14-31
0001-3207.

Descriptors: *Landfills, *Glacial drift
*Groundwater movement, *Water pollutio
sources, Hydrogeology, *Connecticut, Path o
pollutants, Water table, Ions, *Chlorides, Dis
solved solids.

The impact on quality of ground water beneath
municipal sanitary landfill in fine-grained
rhythmically-bedded glacial drift in eastern Con
necticut was investigated over a sixteen-month
period. Two wells drilled through the landfill
yielded water samples of natural quality. Chemical
analyses of ground water for selected dissolved in
organic constituents (total Fe, Ca++, Mg++
Na+, K+, HCO3-, SO4=, and Cl-) indicate sig
nificant contamination of shallow ground wate
only in the immediate vicinity of the landfill. The
distribution of these constituents is in general
agreement with predictions based on the map of
the water table. Anomalous, but low, concentra
tions of Cl- were detected, approximately 2,100
feet from the landfill in the direction of ground
water flow. This distance agrees with estimated
rates of horizontal migration, 70-100 feet per year,
and the age of the landfill, 30 years. However, pol
lution by road salting or septic tanks also may be
the source of the Cl-. Concentrations of leachate
in shallow ground water beneath the landfill corre-

te with seasonal fluctuations of the water table, ith high concentrations corresponding to periods hen the water table is above the base of the land- ll.
774-07728

HE TRANSPORT OF RADIOISOTOPES BY INE PARTICULATE MATTER IN AQUIFERS,
eorgia Inst. of Tech., Atlanta. Environmental esources Center.
B. F. Champlin.
vailable from the National Technical Informa- on Service as PB-232 179, $5.50 in paper copy, 1.45 in microfiche. Report No WRC-1169, ecember 1969, 187 p, 27 fig, 8 tab, 97 ref. OWRR -002-GA(5). 14-01-0001-1629.

escriptors: *Radioisotopes, *Water pollution ources, *Aquifers, Fallout, *Radioactive wastes, oil physical properties, Soil chemistry, Bound ater, Adsorption, Clay minerals, *Path of pollu- nts.
dentifiers: Particle retention, *Van der Waals rces.

nformation on the long-term movement of adioactive fission products and other pollutants om waste pits, fallout, and underground nuclear xplosions is persued through theoretical and ex- erimental investigations of the various henomena that pertain to ion transport or reten- on by soils. The theoretical section explores the nteractions between solids in water that result rom thermal forces, electrostatic charges, and an der Waals forces. The particle range con- idered is that of the large colloid to the finest silt. pecial attention is given to sources of energy suf- icient to cause breakage of adsorption bonds, ad- itive bonding, and the relationshp between uspended particles and the granules making up he aquifer. The experimental section explores actors which influence either retention of adioactivity by the sand bed or transport of the ctivity through such a bed by micro-particles. Correlation between the phenomena observed ex- erimentally and those predicted in the theoretical ection shows Casimir's correction to the theoreti- al van der Waals interactions to account for najor changes in the particle retention ability of a and bed. Control of the movement of radioactivi- y through porous soils lies first with the nature of he particles, second with the cation and anion concentrations of the suspending solutions, and hird with pore size distribution of the aquifer. (See also W72-06571) (James-Georgia Tech)
W74-07730

CHARACTERIZATION OF SUSPENDED SEDIMENTS IN WATER FROM SELECTED WATERSHEDS AS RELATED TO CONTROL PROCESSES, NUTRIENT CONTENTS, AND LAKE EUTROPHICATION,
Washington State Univ., Pullman. Dept. of Agronomy and Soils.
B. L. Carlile, B. L. McNeal, J. A. Kittrick, L. C. Johnson, and H. H. Cheng.
Available from the National Technical Information Service as PB-232 176, $4.00 in paper copy, $1.45 in microfiche. Completion Report, March 1974. 92 p, 30 tab, 52 ref. OWRR A-052-WASH(1). 14-31-0001-3548.

Descriptors: *Suspended solids, *Sediments, *Nitrogen, Phosphorus, Flocculents, Adsorption, Creek Muds, *Return flows, Erosion, Turbidity, Settling ponds, *Nutrients, Eutrophication, Water pollution control, *Washington, Irrigation, *Path of pollutants.

Laboratory and field investigations characterized suspended sediments from watersheds of varied hydrologic, soil and land use characteristics. Agricultural activities in the dryland wheat region of eastern Washington contributed large amounts of sediments and dissolved nitrogen during heavy runoff periods, whereas urban activities provided substantial nitrogen and phosphorus during the remaining months. Chemical 'fingerprints' suggested that most suspended solids originated from actively-eroding agricultural fields, rather than from channel erosion. In excess of 90 per cent of the orthophosphate exposed to sediments was adsorbed, with adsorption following the Freundlich isotherm and being essentially non temperature-dependent. Chemical analyses of creek muds above and below two sewage treatment plants substantiated the existence of interactions between muds and effluents. In irrigated portions of the Yakima Valley, furrow irrigation management had a significant effect on sediment and nutrient contents or irrigation return flows, with sediment concentrations substantially higher than permitted by proposed water quality standards. Preliminary field assessment was provided of sediment removal by settling ponds, and preliminary laboratory studies demonstrated the superiority of cationic flocculents. Nutrient contents of sediments from better-managed fields were higher in several cases, due to higher soil fertility levels. Correlation between suspended solids and turbidity were acceptable at loads between 20 and 300 mg/l, providing that data were grouped by location and season. Re-analysis of stored water samples demonstrated that equilibrium had existed initially between adsorbed and dissolved orthophosphate and ammonium nitrogen.
W74-07736

SURVIVAL OF INTESTINAL BACTERIA IN OLIGOTROPHIC WATERS,
Washington State Univ., Pullman. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5C.
W74-07737

ACCUMULATION PHENOMENON WHICH TAKES PLACE IN A MUSSEL (MYTILUS GALLOPROVINCIALIS LMK) GROWN IN AN ARTIFICIALLY POLLUTED ENVIRONMENT, VERIFICATION OF A SIMPLIFIED MODEL OF THE DYNAMIC EQUILIBRIUM OF METAL RIPARTITION BETWEEN MUSSELS AND SEA-WATER, NOTE II-POLLUTION FROM COPPER, (FENOMENO DI ACCUMULO NEL MITILO (MYTILUS GALLOPROVINCIA-LIS LMK) STABULATO IN AMBIENTE ARTIFICIALMENTE INQUINATO. VERIFICA DI UN MODELLO SEMPLIFICATO PER L'EQUILIBRIO DINAMICO DI RIPARTIZIONE DEL METALLI FRA MITILO E ACQUA MARINA, NOTA II: INQUINAMENTO DA RAME),
For primary bibliographic entry see Field 5C.
W74-07746

HYDRAULICS OF CULVERT OUTLETS,
Auckland Univ., (New Zealand). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W74-07749

CONTRIBUTION TO WATER POLLUTION FROM AGRICULTURAL AND URBAN SOURCES IN THE COACHELLA VALLEY,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
J. J. Oertli, and G. R. Bradford.
California Agriculture, Vol 27, No 7, p 4-6, July, 1973.

Descriptors: *California, *On-site data collections, Water pollution sources, *Urban runoff, *Agricultural runoff, Chemical properties, Effluents, Nutrients, Nitrogen, Investigations, Phosphorus, Salinity, *Surface runoff, Subsurface waters, Drainage water, *Water quality control.
Identifiers: *Coachella Valley(Calif).

To obtain quantitative data on the contributions of agricultural and urban sources to water pollution, an investigation was initiated in the Coachella Valley on the chemical composition of drainage water from cropped fields under various agricultural managements and the effluents from the Indio sewage treatment plant. Research emphasis was on those nutrients suspected of playing a major role in eutrophication. Of the ten sampling station study fields, three were in citrus, two in grapes, one in dates, one in carrots, one in asparagus, and two in corn. Surface runoff and subsurface drainage of a large feedyard were also sampled. Results indicate that the drainage water from corn, carrots, and asparagus fields contains the largest amounts of nitrates and that the most significant contributor to phosphates in the White Water River is the Indio sewage treatment plant. With respect to total salinity, the water quality was best from the sewage effluent and surface runoff from the feedyard. (Sandoski-Franklin)
W74-07757

INTERDISCIPLINARY MONITORING OF THE NEW YORK BIGHT,
Grumman Aerospace Corp., Bethpage, N.Y.
For primary bibliographic entry see Field 5A.
W74-07764

TEST RESULTS ON BUOYANT JETS INJECTED HORIZONTALLY IN A CROSS FLOWING STREAM,
American Univ., Beirut (Lebanon). Faculty of Engineering and Architecture.
For primary bibliographic entry see Field 8B.
W74-07766

A NOTE CONCERNING THE ENVIRONMENTAL ACCEPTABILITY OF NITRILOTRIACETIC ACID (NTA): THE EFFECT OF NTA ON THE GROWTH OF GYMNODINIUM BREVE,
University of South Florida, Tampa. Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W74-07775

SOIL MOISTURE TRANSPORT IN ARID SITE VADOSE ZONES,
Atlantic Richfield Hanford Co., Richland, Wash.
For primary bibliographic entry see Field 2G.
W74-07780

FRACTIONATION OF SUSPENDED AND COLLOIDAL PARTICLES IN NATURAL WATER,
Oak Ridge Gaseous Diffusion Plant, Tenn.
For primary bibliographic entry see Field 5A.
W74-07783

TRITIUM DISTRIBUTION IN THE NUCLEAR INDUSTRY - THE REQUIREMENTS FOR CONTROL STRATEGIES,
Allied Chemical Corp., Idaho Falls, Idaho. Idaho Chemical Programs Operations Office.
B. C. Musgrave.
Available from NTIS, Springfield, Va., as Rept. No. ICP-1041; $4.00 per copy, $1.45 microfiche. Report No ICP-1041, January 1974. 23 p, 4 fig, 3 tab, 8 ref. AEC AT(10-1)-13755-22-1.

Descriptors: *Tritium, *Hydrogen, *Nuclear powerplants, *Air pollution, *Water pollution, *Water pollution sources, Radioisotopes, Control, Regulation, Safety, Evaluation, Assessment, Effluents, Waste storage, Waste disposal.
Identifiers: *Fuel reprocessing.

Tritium which is produced from ternary fission in nuclear reactors will be diluted and dispersed throughout the aqueous streams in the fuel reprocessing plants. The ranges of tritium concentrations expected in the reprocessing plant streams for different reactor types are examined. The requirements for tritium control through recycle and isotope separation are described. An

economic study of these methods of control shows the costs are quite high. (Houser-ORNL)
W74-07784

RADIOACTIVITY OF NEVADA HOT-SPRING SYSTEMS,
California Univ., Berkeley. Lawrence Berkeley Lab.
For primary bibliographic entry see Field 5A.
W74-07786

THE TECHNOLOGY OF TRITIUM FIXATION AND STORAGE,
Battelle-Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 5D.
W74-07789

URANIUM-234,
Atomizdat, Moscow (USSR).
V. V. Cherdyntsev.
John Wiley and Sons, Inc., New York, N.Y., 1971; 239 p, 43 fig, 77 tab, 1 biblio. $19.50. Translation of URAN-234, Atomizdat, Moskva, 1969, by Israel Program for Scientific Translations, Ltd. 1971.

Descriptors: *Uranium, *Radioisotopes, *Natural resources, *Data collections, *Geochemistry, Nuclear energy, Radiation, Nuclear powerplants, Nuclear wastes, Water pollution, Oceans, Soils geology, Archeology, Radioactive dating, History, Quaternary period.

This book is a logical and systematic account of the experimental data available on uranium-234 in nature. The intention is not merely to review the experimental data in a systematic manner, but also to draw the attention of the experts in the various disciplines to the wide scope of application of U-234, which is an important and useful radioactive indicator, the atoms of which have been tagged by nature itself. Even now, U-234 is becoming one of the tools of modern nuclear geochemistry. Consideration is given to both the needs of specialists who will find that the experimental data contained in the tables are as complete and as up-to-date as feasible, and those readers interested in science in general and of workers in various historical and exact sciences: geologists, physicists, oceanologists, vulcanologists, archeologists, soil scientists, etc. For the sake of the less specialized readers, technical terms with which they may not be familiar are avoided, and to deal with physical problems in elementary physical terms, with geological problems in elementary geological terms, etc. Nevertheless, it is the purpose not merely to present facts but the totality of the ideas comprised in the subject of this book, without any simplification. (Houser-ORNL)
W74-07790

ENVIRONMENTAL RADIOACTIVITY,
New York Univ. Medical Center, N.Y. Inst. of Environmental Medicine.
M. Eisenbud.
Academic Press, New York, Environmental Sciences Interdisciplinary Monograph Series, 542 p, Second edition, 1973. 126 fig, 97 tab, 1 appendix, 1 bibliography. $29.50.

Descriptors: *Environment, *Radioactivity, *Effluents, *Air pollution, *Water pollution, *Soil contamination, Regulation, Administrative agencies, Standards, Safety, Nuclear powerplants, Radioactive waste disposal, Transport, Transfer, Food chains, Biology, Public health, Fallout, Uranium, Training.
Identifiers: *Textbook.

A technical summary is presented of the relevant biological and physical information that has been accumulated in the 30 years since control over the fission process was first achieved. The text is concerned primarily with the behavior of radioactive substances when they enter the environment. Many of the diverse aspects of this behavior are reported. (Houser-ORNL)
W74-07791

ENVIRONMENTAL STATEMENT RELATED TO CONSTRUCTION AND OPERATION OF BARNWELL NUCLEAR FUEL PLANT.
Directorate of Licensing, Fuels and Materials (AEC), Washington, D.C.
Available from NTIS, Springfield, Va., as Rept. No. Docket 50332-37; $7.60 per copy, $1.45 microfiche. Report No Docket 50332-37, January 1974. 279 p, 12 fig, 29 tab, 3 append.

Descriptors: Fuels, *Nuclear powerplants, Effluents, Environment, Administrative agencies, *Comprehensive planning, *Sites, Geology, Investigations, Hydrology, Seismology, Climatology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis, Krypton, Tritium, Iodine, *South Carolina.
Identifiers: *Fuel reprocessing plant, *Environmental impact statements.

This environmental statement was prepared in compliance with the National Environmental Policy Act and relates to the proposed continuation of construction permit of the Barnwell Nuclear Fuel Plant. The plant is located in Barnwell County, South Carolina, and will recover unused uranium and plutonium from irradiated nuclear fuels. Environmental impacts are assessed and after consideration of alternatives an environmental benefit cost summary was compiled. The conclusion is to continue the construction permit subject to specified environmental monitoring programs and recommendations for a course of action to alleviate any harmful effects or evidence of irreversible damage due to operation of the plant. (Houser-ORNL)
W74-07792

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE PROPOSED PERRY NUCLEAR POWER PLANT, UNITS 1 AND 2.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 5A.
W74-07793

IODINE-129 LEVELS IN MILK AND WATER NEAR A NUCLEAR FUEL REPROCESSING PLANT,
New York State Dept. of Health, Albany. Radiological Sciences Lab.
J. C. Daly, S. Goodyear, C. J. Paperiello, and J. M. Matuszek.
Health Physics, Vol 26, No 4, p 333-342, April 1974. 4 tab, 16 ref.

Descriptors: *Nuclear powerplants, Fuels, Effluents, Radioactivity, Iodine, *Milk, *Water pollution, Food chains, Water pollution sources, Measurement, Assay, Public health, Environment, Streams, *New York.
Identifiers: *Fuel reprocessing plant, Buttermilk Creek(N.Y.).

Detection of substantial I-129 concentration in animal thyroids collected in the environs of a nuclear fuel reprocessing plant in West Valley, New York, signified a general buildup of I-129 in the environment surrounding the plant. Concern for a possible public health problem led to the development of a program to establish I-129 levels in milk and water in cooperation with the New York State Department of Environmental Conservation. Surveillance for I-129 in milk was begun in September 1971. In a 12-month period the I-129 levels in 95 milk samples from farms surrounding the nuclear fuel reprocessing plant ranged from nondetectable (less than 0.3 pCi/1.) to 2 pCi/1. In addition, 111 water samples collected between June 1971 and July 1972 from streams draining the plant site were analyzed for I-129. Samples from Buttermilk Creek, which is on the plant site, showed I-129 concentrations up to 7.7 pCi/l. The impact of I-129 in the environment surrounding the plant is evaluated. Estimates of dose commitment are provided and are compared, for adults, to radiation protection guides. Recommendations are offered to reduce the potential public health hazard, principally by limiting the release of I-129 levels to the biosphere. (Houser-ORNL)
W74-07798

RADIONUCLIDES IN ECOSYSTEMS, VOLUME II.
Oak Ridge National Lab., Tennessee.
For primary bibliographic entry see Field 5C.
W74-07799

CONCENTRATIONS OF MANGANESE, IRON, AND ZINC IN JUVENILES OF FIVE ESTUARINE-DEPENDENT FISHES,
National Marine Fisheries Service, Beaufort, N.C.
For primary bibliographic entry see Field 5C.
W74-07803

TRACE-ELEMENT INTERACTIONS BETWEEN RIVER WATER AND SEAWATER,
Puerto Rico Nuclear Center, Mayaguez.
W. O. Forster, D. A. Wolfe, F. G. Lowman, and R. McClin.
In: Conf-710501-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee. p 807-815, (1971) 12 fig, 2 tab, 13 ref.

Descriptors: Rivers, Saline waters, *Trace elements, Tracers, *Radioactivity, Cobalt, Zinc, Iron, Manganese, Silver, Tin, Lead, Europium, *Radioisotopes, Mixing, Diffusion, Dispersion, Sediments, Absorption, Biota, Ion exchange, *Puerto Rico.
Identifiers: *Anasco River(P.R.).

The partitioning of several high-specific-activity radionuclides added to Anasco River water was studied as they mixed with various amounts of seawater. The distribution of selected biologically important radionuclides, Co-60, Zn-65, Fe-59, and Mn-54, was examined in their fractionation between the sediment, water, and biota, as well as the distribution for those which represented both soluble and insoluble trace elements, that is, Ag-110, Sn-113, Sb-125, and Eu-155. An effort was made to distinguise between the changes in distribution of these radionuclides due to biota by using replicate tracers with antibiotic added. In order to evaluate the intermediate-term chemical interactions of ions in seawater and river water, sediment-free water was used in selected experiments. The biogeochemical aspects of the above river water radionuclides in their mixing with seawater are discussed. (See also W74-07799) (Houser-ORNL)
W74-07805

TRACE ELEMENTS IN MARINE SHRIMP,
Stanford Univ., Pacific Grove, Calif. Hopkins Marine Station.
For primary bibliographic entry see Field 5C.
W74-07806

BIOLOGICAL HALF-LIVES FOR ZINC AND MERCURY IN THE PACIFIC OYSTER, CRASSOSTREA GIGAS,
Washington Univ., Seattle. Coll. of Fisheries.
For primary bibliographic entry see Field 5C.
W74-07807

A SYSTEMS ANALYSIS METHODOLOGY FOR PREDICTING DOSE TO MAN FROM A

RADIOACTIVELY CONTAMINATED TERRESTRIAL ENVIRONMENT,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5C.
W74-07809

MODELING RADIONUCLIDES AND PESTICIDES IN FOOD CHAINS,
Battelle-Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.
L. L. Eberhardt.
In: Conf-710501-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee, p 894-897, (1971) 1 fig, 11 ref.

Descriptors: *Systems analysis, Ecosystems, *Food chains, *Radioactivity, Pesticides, *Model studies, Insecticides, Cesium, Simulation analysis, Human population, Public health, Sampling, *Kinetics.

Some aspects of modeling the kinetics of trace substances in food chains are discussed. The problems of sampling in space, time, and 'systems' are considered in light of some case histories and a food-chain simulation model. (See also W74-07799) (Houser-ORNL)
W74-07810

ERROR ANALYSIS OF ECOLOGICAL MODELS,
Oak Ridge National Lab., Tenn.
R. V. O'Neill.
In: Conf-710501-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee. p 898-908, (1971) 4 fig, 4 tab, 11 ref.

Descriptors: *Systems analysis, *Simulation analysis, *Ecology, *Ecosystems, *Forecasting, Kinetics, Radioactivity, Model studies, Monte Carlo method, Mathematics, Statistical methods, Measurement.

Systems analysis techniques are valuable in the analysis of radionuclide kinetics in ecosystems. However, the art of systems modeling is relatively new to ecology, and few guides are available for constructing ecological models. As a result, untested hypotheses are sometimes involved in model development. For example, it may be difficult to predetermine optimal model complexity, that is, the number of state variables or compartments to be included in a model for acceptable accuracy. It could be argued that a more complicated model can account more accurately for complexities in the real system. While this argument appears correct intuitively, additional factors need to be considered. The hypothesis that greater complexity leads to greater accurary was tested by analyzing the total uncertainty accompanying a model prediction. In general, systematic bias, resulting from abstracting the system into a few variables, is inversely related to complexity. However, there is a concomitant increase in uncertainity due to measurement effors on individual model parameters. As more parameters are added to the model, they must be quantified in field and laboratory experiments which are never error free. If these measurement errors are promulgated through a simulation, they contribute to uncertainty in model predictions. By applying Monte Carlo simulation techniques, it was possible to account explicitly for each component of the total uncertainty. Particular attention was paid to the balance between systematic bias and measurement errors. This analysis indicates that the gain in precision from increasing model complexity is not as consistent an outcome as might be expected. Results appear valid for a wide range of modeling applications. (See also W74-07799) (Houser-ORNL)
W74-07811

MATHEMATICAL MODEL OF TRITIATED AND STABLE WATER MOVEMENT IN AN OLD-FIELD ECOSYSTEM,
Puerto Rico Univ., Mayaguez. Dept. of Nuclear Engineering.
D. S. Sasscer, C. F. Jordan, and J. R. Kline.
In: Conf-710501-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee, p 915-923, (1971) 8 fig, 7 ref.

Descriptors: Water pollution, Soil contamination, *Tritium, *Model studies, Soil water, Cultivated lands, Simulation, Measurement, On site data collections, Equations, *Mathematical studies, Ecosystem,oil-water-plant relationships, Evapotranspiration, Diffusion, Percolation, Rainfall intensity, *Oil fields.
Identifiers: *Tritiated water.

Water and tritium movement in an old-field ecosystem was simulated by means of a kinetic equation model utilizing data obtained from field measurements of stable and/or tritiated water. The ecosystem was assumed to consist of 49 layers of 1-cm-thick soil and one plant compartment. The water content of the soil and plants was described by a system of 50 simultaneous, first-order, linear, differential equations with discontinuous, variable coefficients. The coefficients were assumed to be functions of the evapotranspiration, Soil-water diffusion, gravity flow of soil water, and the previous 48-hr history of rainfall. A solution for the water content in each compartment as a function of time was arrived at by obtaining successive solutions of the system of differential equations for arbitrarily small periods of time during which the coefficients were assumed to be constant. A pulse of tritium deposited on or near the surface in the spring of the year is predicted to move downward in the soil to a depth of approximately 30 cm and remain there throughout the summer. Rainfall and transpiration rates were found to have a greater effect on water concentration in the soil than diffusion. The predictions made by the model are validated by Jordan et al. by comparison to experimentally determined data. (See also W74-07799) (See W74-05198) (Houser-ORNL)
W74-07812

MODELS OF MATTER FLOW IN A SOUTHERN MIXED HARDWOOD FOREST IN FLORIDA: PRELIMINARY RESULTS,
Florida Univ., Gainesville. Dept. of Botany.
A. E. Lugo, S. C. Snedaker, and J. F. Gamble.
In: Conf-710501-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee. p 929-935, (1971) 7 fig, 2 tab, 18 ref.

Descriptors: *Model studies, *Coniferous forests, Flow system, *Flow measurements, Groundwater movement, *Florida, Mineralogy, Cycles, Cycling nutrients, Cesium, Water pollution, Path of pollutant, Human population, Food chain, Public health, Seasonal, Ecosystems.

The southern mixed hardwood forest is the most diverse forest ecosystem in north central Florida, with a reported 36 tree species per thousand individuals. Although the floristic composition and climax-successional status are adequately known, little information is available on the flows and storages of energy and matter. This work is part of a larger study to trace the peculiar movement of Cs-137 into the food chains leading to man in Florida. This objective is being approached by computer modeling and simulation of the energy and matter dynamics. A qualitative model for the mineral cycles of the southern mixed hardwood forest is presented for ten elements within the major storage compartments (leaves, wood, roots, litter, and mineral soil), precipitation throughfall, and 18-month records of litter fall and accumulation. Seasonal pulsing is quantitatively described with respect to its relationship to ecosystem function. Preliminary results indicate a steady-state system with closed mineral cycling. The implications of steady systems, relative to Cs-137 movement, in Florida are discussed. (See also W74-07799) (Houser-ORNL)
W74-07813

TRANSPORT OF RADIONUCLIDES IN SEDIMENTS,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Center for Inland Waters.
A. Lerman.
In: Conf-710501-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 936-944, (1971) 4 fig, 13 ref.

Descriptors: *Radioisotopes, Distribution, Sediments, Surface waters, *Sediment distribution, Sediment transport, Sedimentation rates, *Diffusion, Absorption, Stratification, Ion exchange, *Tritium, *Great Lakes.

Patterns of distinct peak events in input of radionuclides into sediment may be easily obliterated by diffusion taking place in the interstitial waters of sediments. Rates of sedimentation derived from the positions of diffusion-broadened peaks in sediment may give values exaggerated by factors of 2-3. Diffusion-sedimentation scale distances (D/U) in lake and oceanic sediments are in general appreciably greater than diffusion decay scale distances; consequently, on the time scale of man-produced radionuclides, the rates of sedimentation do not significantly control the amount of radionuclides accumulating in the sediments by diffusion and uptake from overlying water. In a stratified sediment the chemical and physical characteristics of the thin layer near the sediment-water interface strongly control the amount of radionuclide accumulating in the sediment. Exchange and/or adsorption on solid particles in the sediment greatly affect the amount of radionuclide stored in sediment at steady state; for tritium in the Great Lakes, the amount stored in interstitial water without uptake by solids would be only 1-6% of the amount in lake water. For metal radionuclides characterized by strong uptake by solids, the amount stored in sediment may be 10-100 times greater than the amount in lake water at steady state. (See also W74-07799) (Houser-ORNL)
W74-07814

THERMOLUMINESCENT DOSIMETRY OF AQUATIR ORGANISMS,
Battelle-Pacific Northwest Lab., Richland, Wash., Ecosystems Dept.
For primary bibliographic entry see Field 5C.
W74-07819

ECONOMIC EVALUATION OF THE EFFECT OF SELECTED CROP PRACTICES ON NONAGRICULTURAL USES OF WATER,
Illinois Univ., Urbana. Dept. of Agricultural Economics.
H. Onishi, A. S. Narayanan, T. Takayama, and E. R. Swanson.
Available from the National Technical Information Service as PB-232 161, $3.75 in paper copy, $1.45 in microfiche. Illinois Water Resources Center, Urbana, Research Report No 79, March 1974. 58 p, 3 tab, 5 fig, 4 append. OWRR B-049-ILL(5). 14-31-0001-3272.

Descriptors: *Water pollution sources, Evaluation, Water quality, Sedimentation, Linear programming, Nitrates, Income, Crops, Illinois, Watersheds(Basins), Path of pollutants.
Identifiers: *Economic analysis, Nitrate contamination, Crop practices, Farm income.

Cropping systems may have an unfavorable influence on the quality of nearby surface water. Linear programming methods were used to assess the impact of improvements in certain water quali-

ty characteristics on economically optimal crop systems. Thus, the effect of crop practices on water quality is analyzed indirectly by assuming that farmers would alter their cropping practices in the most economical way in order to conform to various water-quality constraints. A 1,200-acre watershed was used to illustrate the procedure. Sediment entering the reservoir was treated as a variable constraint on maximization of farm income. Requiring successively lower amounts of sediment to enter the reservoir caused farm income to decrease at an increasing rate. The analysis was enlarged to include a constraint on nitrate in the leachate below the root zone. This phase of the analysis also included a charge for removing at least some of the sediment entering the reservoir. As the nitrate limit on the leachate was lowered, farm income decreased at an increasing rate. The requirement of removal of the sediment by itself had little or no effect on the nitrate concentration in the leachate. Extensions of the procedure for use in other situations are suggested.
W74-07828

FACTORS CONTROLLING THE DYNAMICS OF NON-IONIC SYNTHETIC ORGANIC CHEMICALS IN AQUATIC ENVIRONMENTS,
Purdue Univ., Lafayette, Indiana, Dept. of Forestry and Conservation.
J. L. Hamelink, and R. C. Waybrant.
Available from the National Technical Information Service as PB-232 267, $4.00 in paper copy, $1.45 in microfiche. Indiana Water Resources Research Center, West Lafayette, Technical Report No 44, December 1973, 68 p, 10 fig, 11 tab, 5 ref, 2 append. OWRR A-017-IND(3).

Descriptors: *Pesticide kinetics, *Distribution patterns, *Persistence, *Pesticide removal, *Organic pesticides, *DDE, Adsorption, Food chain, Lakes, Bottom sediments, Epilimnion, Quarries.
Identifiers: Non-ionic synthetic organic compounds, Flooded quarries, *Lindane, Toxaphene.

The distribution and persistence of DDE and lindane added to the epilimnion of a thermally stratified, ultra-oligotrophic flooded limestone quarry were studied. The quarry was treated with a single sub-lethal dose of each compound at a concentration of 200 pptr in the epilimnion or 50 pptr based on the entire water mass. An adjacent quarry was used as a control. Water, bottom sediments, limestone rock slabs, zooplankton, and fish were periodically analyzed. Dissolved oxygen and temperature profiles were also monitored. Results indicated that persistence of the pesticides may be primarily controlled by adsorption onto suspended particles. DDE was lost from the water approximately 15 times as fast as lindane. DDE was biologically magnified to a greater extent than lindane, and the DDE accumulated and retained by the invertebrates was closely correlated with the DDE concentration in the water. An equilibrium with lindane between fish and water was reached about 12 times faster than that with DDE. The results include the development of a simple two-compartment partition model that may be useful in predicting the distribution and persistence of a variety of non-ionic synthetic organic compounds.
W74-07831

THE DISPERSION OF CONTINUOUSLY INJECTED EFFLUENTS IN OPEN CHANNELS,
Louisiana State Univ., Baton Rouge. Water Resources Research Inst.
D. P. Harrison, and A. H. Wehe.
Available from the National Technical Information Service as PB-232 229, $3.75 in paper copy, $1.45 in microfiche. Completion Report, February 1973. 52 p, 3 fig, 6 ref. OWRR A-024-LA(1).

Descriptors: Effluents, Hydraulic models, Mathematical models, Open channel flow, *Model studies, *Dispersion, *Injection, *Computer models, Simulation analysis, Path of pollutants.
Identifiers: Froude model.

The primary objective has been to determine the feasibility of using physical models to describe the dispersion of continuously injected effluents in open channels. The approach to the problem has been along two lines: (1) examining scale-up relationships applicable to this model to determine factors limiting a realistic scale-up, and (2) constructing a computerized description of simple open channels to test the importance of the limiting factors and to aid in planning future experimental work. Concentration similitude cannot normally be obtained in an undistorted Froude model. By distorting the Froude model in accordance with the requirements of the most important of the two dispersion coefficients, vertical and lateral, one can establish concentration similitude at a short distance downstream from the injection point. This procedure has been verified with a computer model for uniform flow in straight rectangular channels with vertical and lateral dispersion. This computer model should be useful in designing models to study dispersion in open channels.
W74-07833

PROCESS CONTROL MODEL FOR OXYGEN REGENERATION OF POLLUTED RIVERS, PHASES IV AND V, AND SPACIALLY AND TEMPORALLY DISTRIBUTED DISCHARGE OF EFFLUENTS IN ESTUARIES,
Rutgers The State Univ., New Brunswick, N.J. Dept. of Chemical and Biochemical Engineers.
B. Davidson.
Available from the National Technical Information Service as PB-232 226, $3.00 in paper copy, $1.45 in microfiche. New Jersey Water Resources Research Institute, New Brunswick, Completion Report, January 1974, 11 p, 7 ref. OWRR B-045-NJ(1), B-049-NJ(1), A-036-NJ(1).

Descriptors: *Systems analysis, *Mathematical models, *Estuaries, *Dissolved oxygen, Biochemical oxygen demand, Thermal pollution, *New Jersey, Model studies, Simulation analysis, Water pollution control.
Identifiers: *Estuarial dispersion, *Delaware Estuary(N.J.), *Oxygen regeneration.

An intra-tidal-time deterministic, one-dimensional, non-isothermal, multi-state-variable, water quality model for the Upper Delaware River Estuary System between Trenton and Wilmington was developed, verified, and applied to several simulated systems analysis problems. The unique features of the proposed model are associated with its time and space scales, which are of the order of 30 minutes and 1 mile, respectively, and its simultaneous-state equation format, which included an ad hoc tidal velocity equation and conservation balances on dissolved oxygen, BOD, and thermal energy. Numerical routines using central differences for the space derivatives in combination with a forth-order, Runge-Kutta expression for the time derivatives provided stable and accurate results for the integration of the system equations. The capability of the proposed model was demonstrated by comparing the stationary-state, tidal-averaged simulated results with corresponding field data. Parameter sensitivity analysis and simulated shock-loading studies were made in addition to obtaining stationary-state results associated with simulated treatment plant regionalization plans.
W74-07837

A STOCHASTIC MODEL FOR THE JAMES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
H. E. Bard, and R. G. Krutchkoff.
Completion Report, August 1973. 84 p, 17 ref. OWRR A-048-VA(1).

Descriptors: *Computer models, *Statistical models, *Virginia, Sewage, Carbon, Carbon dioxide, Phosphates, Nitrates, Nitrogen, Bacteria, Algae, Model studies.
Identifiers: *Sensitivity study, *James River estuary(Va.), Organic carbon.

Modeling the James River Estuary with the Schofield model was the major goal of the project. The model was set up for a 60 mile stretch of the estuary beginning at Richmond. Sensitivity studies involving rate constants, fresh water flow rate, sewage input, and water temperature were made and the results of these studies were analyzed. The average oxygen deficit concentration is insensitive to random water temperature, moderately sensitive to the sewage input rates investigated, and highly sensitive to changes in the organic carbon utilization rate constant. Organic carbon and carbon dioxide are insensitive to temperature and only moderately sensitive to change in the organic carbon rate constant. Ortho-phosphate concentration is insensitive to changes of the phosphate utilization rate constant and ortho-phosphate, organic carbon, and organic nitrogen are insensitive to a difference in the fresh water flow as great as 40%. Finally, nitrate + nitrite concentration, bacteria growth, and algae growth are insensitive to a reduction of the nitrogen waste from the point sources.
W74-07843

INFLUENCE OF WATER QUALITY ON THE CORROSION AND ELECTROCHEMICAL BEHAVIOR OF MILD STEEL IN SYNTHETIC ACID MINE WATERS,
Department of Energy, Mines and Resources, Ottawa (Ontario).
For primary bibliographic entry see Field 8G.
W74-07876

COLIFORMS ARE AN INADEQUATE INDEX OF WATER QUALITY,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5A.
W74-07885

THE SULFATE-REDUCING BACTERIA AND OILFIELD BACTERIAL CORROSION - A REVIEW OF THE CURRENT STATE-OF-THE-ART,
Superior Oil Co., Houston, Tex.
For primary bibliographic entry see Field 8G.
W74-07902

HYDROLOGY OF LIMESTONE KARST IN GREENBRIER COUNTY, WEST VIRGINIA,
Geological Survey, Morgantown, W. Va.
For primary bibliographic entry see Field 2F.
W74-07908

COLLECTION, DETECTION, IDENTIFICATION, AND QUANTITATION OF HUMAN EFFLUENTS,
Edgewood Arsenal, Aberdeen Proving Ground, Md.
For primary bibliographic entry see Field 5A.
W74-07912

RECONNAISSANCE OF THE WATER RESOURCES IN THE VICINITY OF PROPOSED DEEP-WELL INJECTION SITES IN SOUTHEAST DADE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
J. E. Earle, and F. W. Meyer.
Open-file report 73031, 1973. 20 p, 5 fig, 1 tab, 2 ref.

Descriptors: *Waste disposal wells, *Injection wells, *Florida, Waste water disposal, Sewage disposal, Saline water intrusion.
Identifiers: *Dade County(Fla).

Deep-well injection was selected by the Dade County, Florida Water and Sewer Authority as a means of disposing treated waste water in southeast Dade County. Preliminary plans call for the construction of a county-owned sanitary

sewage treatment plant and several 3,000-foot deep injection wells. A reconnaissance was made in the vicinity of the proposed well sites to determine the chloride content of surface water and groundwater to formulate plans for the safe disposal of saltwater produced during drilling and testing of the injection wells. Most of the area is underlain by the Biscayne aquifer that contains salty water. Chloride in surface-water samples ranged from 15 to 14,600 mg/liter, and in groundwater samples from 26 to 11,500 mg/liter. Deep injection wells at the locations proposed are not expected to affect the fresh groundwater supply. The sites are all coastward from the inland extent of the salt front. (Knapp-USGS)
W74-07915

HYDROLOGY AND CHLORIDE CONTAMINATION OF THE PRINCIPAL ARTESIAN AQUIFER IN GLYNN COUNTY, GEORGIA,
Geological Survey, Atlanta, Ga.
For primary bibliographic entry see Field 2F.
W74-07919

A NUMERICAL STUDY OF THE STEADY CIRCULATION IN AN OPEN BAY,
Florida State Univ., Tallahassee. Dept. of Oceanography., and Florida State Univ., Tallahassee. Geophysical Fluid Dynamics Inst.
For primary bibliographic entry see Field 2L.
W74-07924

BIG EDDIES AND MIXING PROCESSES IN THE GREAT LAKES,
Waterloo Univ. (Ontario).
G. T. Csanady.
Available from Sup Doc, GPO, Washington, D.C. 20402, price $0.50; from NTIS Springfield, Va. 22151, as PB-228 094, $1.45 microfiche. Environmental Protection Agency Ecological Research Series EPA-660/3-73-011, September 1973. 13 p.

Descriptors: *Eddies, *Mixing, *Path of pollutants, *Great Lakes, Lake Huron, Water circulation, Currents(Water), Diffusion, Diffusivity, Dispersion, Dye releases, Turbulence, Mathematical models.
Identifiers: Langmuir circulation, Coastal jets.

Physical factors involved in the disposal of effluents in the Great Lakes were studied on Lake Huron in the summer seasons of 1967 and 1968. Some direct measurements of lake turbulence intensity were obtained. The structure of large eddies was studied. Some information was obtained on the interrelationship of short internal waves and turbulence. The turbulence intensity level is proportional to effective diffusivity. Coastal flow processes are of importance in pollution problems because of the observed coastal entrapment of pollutants discharged near shore. Theoretical models of the coastal boundary layer led to the discovery of coastal jets. (Knapp-USGS)
W74-07926

PROCESSES, PROCEDURES, AND METHODS TO CONTROL POLLUTION FROM MINING ACTIVITIES.
Skelly and Loy, Harrisburg, Pa.
For primary bibliographic entry see Field 5G.
W74-07927

BACTERIOLOGICAL WATER QUALITY DATA, BEACH AREAS, GATINEAU PARK LAKES, NATIONAL CAPITAL COMMISSION, 1973,
Environmental Protection Service, Ottawa (Ontario).
A. D. Tennant, J. A. P. Bastien, R. Toxopeus, J. P. Hayes, and M. Beauchamp.
Surveillance Report EPS-5-WP-74-1 (Water Pollution Control Directorate), February 1974. 45 p, 7 fig, 10 tab, 5 ref.

Descriptors: *Monitoring, *Water quality, *Beaches, *Canada, Water pollution, Bacteria, Coliforms, Bioindicators, Swimming, Recreation.
Identifiers: *Ottawa River(Canada).

Seven Canadian National Capital Commission beaches in Gatineau Park, and Camp Pontiac Beach on the Ottawa River, were monitored bacteriologically during the summer of 1973. A total of 878 water samples from 46 nearshore beach sampling points were subjected to standard membrane filtration density-estimate tests for coliforms, fecal coliforms and fecal streptococci. No significant pollution sources were found, and median bacterial count data for all beach areas easily met all water quality objectives for recreational waters. There has been no degradation of the excellent bacterial water quality which has prevailed in these popular recreational areas since studies began in 1970. (Knapp-USGS)
W74-07932

GROUND-WATER QUALITY MODELS: WHAT THEY CAN AND CANNOT DO,
Water Resources Engineers, Inc., Walnut Creek, Calif.
D. E. Evenson, G. T. Orlob, and T. C. Lyons.
Ground Water, Vol 12, No 2, p 97-101, March-April 1974. 10 ref.

Descriptors: *Water quality, *Groundwater, *Mathematical models, Reviews, Simulation analysis, Data collections, Model studies.
Identifiers: *Water quality models.

The development and application of mathematical models to simulate water quality behavior in groundwater basins is reviewed. In the last few years, models have been developed to simulate conservative and some nonconservative constituents under both saturated and unsaturated soil conditions. In addition, models have been found to provide additional information for calibration of quantity models, to identify major data gaps and deficiencies, to be useful in the design of data collection programs and in the interpretation of collected data, to be valuable to watershed planners and managers through evaluation of alternative regulatory policies, physical facilities and management operational plans, and to point out where future research efforts are needed. (Knapp-USGS)
W74-07933

GEOHYDROLOGY OF THE BURIED TRIASSIC BASIN AT THE SAVANNAH RIVER PLANT,
DuPont de Nemours(E.I) and Co., Aiken, S.C. Savannah River Lab.
I. W. Marine.
Ground Water, Vol 12, No 2, p 84-95, March-April 1974. 9 fig, 4 tab, 32 ref. AEC contract AT(072)-1.

Descriptors: *Hydrogeology, *Groundwater basins, *Georgia, *Radioactive wastes, *Underground waste disposal, Water levels, Hydrologic data, Underground storage, Safety, Groundwater movement, *South Carolina.
Identifiers: *Savannah River Plant(So.Car.-Geo).

At the Savannah River Plant near Aiken, South Carolina, high-level radioactive wastes are stored in concrete and steel tanks buried just beneath the surface of the ground. One concept for the terminal containment of this waste is to store it in excavated chambers within the bedrock, which is covered by about 1000 feet of Coastal Plain sediments. A buried Triassic basin that might have potential for waste storage was discovered beneath the southern third of the plant site. Seismic surveys, gravity and magnetic surveys, and the drilling of several exploratory wells indicate that the Triassic basin is about 30 miles long, 6 or more miles wide, and perhaps 5300 feet thick. The rock is predominantly mudstone of very low permeability with a few lenses of poorly sorted gritty sand. The water yield of all the exploratory wells is extremely low, and water-transmitting fractures are virtually nonexistent. In two wells within the basin, heads above land surface have been measured that cannot be explained by connection with a recharge area. Possible explanations are: tectonic compression, temperature increase, and osmotic membrane phenomena. (Knapp-USGS)
W74-07934

METHODS AND PRACTICES FOR CONTROLLING WATER POLLUTION FROM AGRICULTURAL NONPOINT SOURCES.
Available from Sup Doc, GPO, Washington, D.C. 20402, price $1.10. Environmental Protection Agency Office of Water Program Operations Publications EPA-430/9-73-015, October 1973. 83 p, 18 fig, 34 ref.

Descriptors: *Water pollution control, *Farm wastes, *Sedimentation, *Nutrients, Erosion control, Pesticides, Fertilizers, Wind erosion, Soil conservation, Farm management.

Potential nonpoint agricultural sources of surface and groundwater pollution include sediment, pesticides, fertilizer, and plant and animal wastes and residue from cropland, grazing areas, and farm woodlots. Sound management practices are the key to achieving acceptable water quality. Proper land use and agricultural management practices will keep soil, plant nutrients, and organic matter on the land, rather than allow them to become part of the waterborne pollutant load. Erosion may be reduced by means of conservation tillage, terraces, diversions, stripcropping, contouring, grassed waterways, and crop rotations, and by more efficient range, pasture, and woodlot management. Reducing nutrient losses from agricultural operations can be accomplished by three general approaches: (1) determining the proper amount, time, and method of plant nutrient applications to ensure efficient use by plants, (2) adopting approved cultural practices, including tillage and crop rotations, and (3) reducing soil and water runoff. There are several approaches to reduce the quantity of pesticides entering surface water and groundwater. These include: controlling erosion and minimizing wine drift; reducing the quantity of pesticides used, and using biodegradable rather than persistent pesticides. Appropriate animal and land management practices should be followed. These include: (1) spreading acceptable rates of manure uniformly on land; (2) applying feedlot runoff effluent on land as recommended for specific site conditions; (3) maintaining an adequate land-to-livestock ratio on pastures; and (4) locating feeders and waterers a reasonable distance from streams and watercourses. (Knapp-USGS)
W74-07941

PROCESSES, PROCEDURES, AND METHODS TO CONTROL POLLUTION RESULTING FROM ALL CONSTRUCTION ACTIVITY.
Hittman Associates, Inc., Columbia, Md.
Available from Sup Doc, GPO, Washington, D.C. 20402, price $2.30. Environmental Protection Agency, Office of Air and Water Programs Report EPA 430/9-73-007, October 1973. 234 p, 62 fig, 1 tab, 37 ref.

Descriptors: *Water pollution control, *Sediment control, *Construction, Soil stabilization, Storm runoff, Urbanization, Erosion control.
Identifiers: Water pollution control act.

Methods for controlling sediment, stormwater, and pollutants other than sediment which result from construction activities are described. Processes examined include site planning, preliminary site evaluation and design, use of planning tools, and structural and vegetative design. Methods examined include on-site erosion, sediment, and stormwater management control structures as well as soil stabilization practices useful for achieving control of sediment, stormwater ru-

noff, and other pollutants resulting from construction activities. Stormwater management practices are discussed in detail. Water pollution resulting from sediment and other pollutants generated from construction activities can be prevented by the timely application of structural and soil stabilization measures presently available. (Knapp-USGS)
W74-07942

ICELANDIC GEOTHERMAL ACTIVITY AND THE MERCURY OF THE GREENLAND ICECAP,
Hawaii Univ., Honolulu. Dept. of Microbiology.
B. Z. Siegel, S. M. Siegel, and F. Thorarinsson.
Nature, Vol 24, No 5391, p 526, February 23, 1973. 1 fig, 10 ref.

Descriptors: *Mercury, *Geothermal studies, *Icebergs, Heavy metals, Air pollution, Water pollution, Sampling, Distribution patterns, Analytical techniques, Environmental effects, Sea water, Oceans.
Identifiers: *Geothermal energy, *Greenland.

Following the demonstration of high levels of atmospheric mercury in Hawaiian thermal areas (see W73-05396), similar aerometric studies were conducted at a number of sites in Iceland during June and July 1972. Field air sampling procedures and analyses by flameless atomic absorption were carried out. Although atmospheric mercury levels vary greatly according to site, samples from several widely separated locations yielded Hg concentrations well above the range commonly cited for unpolluted air, 0.001-0.010 micrograms/cu m. The general reliability of field measurements is indicated by samples taken at the Krysuvik thermal area where duplicate analyses on each of four separate sample traps yielded a mean value of 11.3 micrograms/cu m and a standard error of only plus or minus 1.8 micrograms/cu m. (Oleszkiewicz-Vanderbilt)
W74-07944

FOAM FRACTIONATION OF MERCURY(II) NITRO COMPLEXES,
National Lead Co., Hightstown, N.J.
For primary bibliographic entry see Field 5A.
W74-07945

IRON AND ASSOCIATED TRACE MINERAL PROBLEMS IN MAN AND ANIMALS,
Food and Drug Administration, Washington, D.C. Div. of Nutrition.
For primary bibliographic entry see Field 2K.
W74-07950

ORGANO-MERCURY FUNGICIDE TREATMENT OF SUGAR-BEET SEED,
Broom's Barn Experimental Station, Bury St. Edmunds (England).
W. J. Byford.
Annals of Applied Biology, Vol 69, No 3, p 245-252, 1971. 3 fig, 4 tab.

Descriptors: *Fungicides, *Seed treatment, *Mercury, Seeds, Pesticides, Trace elements, Heavy metals, Foods, Agricultural chemicals, Pesticide residues, Laboratory tests, Toxicity.
Identifiers: *Organomercuric compounds, Organomercurials, Pesticide application.

Sugar-beet seed treated with 1% (V/W) of 1.2% ethylmercuric phosphate (EMP) solution applied as a mist gave seedling emergence in the field and final plant stand comparable to those of seed treated by 40 ppm EMP steep. However, when the mist-treated seed was stored after treatment, phytotoxic effects sometimes developed; consequently the treatment is not considered a suitable replacement for the EMP steep, now given to all sugar-beet seed in Britain. (Oleszkiewicz-Vanderbilt)
W74-07951

TISSUE SULFHYDRYL GROUPS IN SELENIUM-DEFICIENT RATS AND LAMBS,
Oregon State Univ., Corvallis. Dept. of Agricultural Chemistry.
M. A. Broderius, P. D. Whanger, and P. H. Weswig.
Journal of Nutrition, Vol 103, p 336-341, 1973. 1 fig, 4 tab, 17 ref.

Descriptors: *Metals, *Nutrients, *Diets, *Animals, Trace elements, Foods, Animal pathology, Metabolism, Laboratory tests.
Identifiers: *Selenium, Selenium deficiency, Tissue, Sulfhydryl groups, Animal tests.

The effects of selenium deficiency on tissue sulfhydryl compounds in rats and lambs were investigated. No significant differences were found in any sulfhydryl fraction in liver, heart or kidney of normal and selenium-deficient (WMD) lambs. A significant decrease of total and protein sulfhydryl groups was found in muscle of WMD lambs compared to normals while a significant increase in nonprotein sulfhydryl and reduced glutathione was found in WMD lamb muscle. No increase in disulfide bonds was found in the muscle of deficient lambs to account for the decrease in sulfhydryls, suggesting they were not being oxidized to disulfides. Livers from selenium-deficient rats had a significantly higher content of total and nonprotein sulfhydryl compared to selenium-supplemented rats. The opposite trend was observed for the protein sulfhydryl groups. The results suggest the involvement of selenium in the metabolism of sulfhydryl compounds. (Oleszkiewicz-Vanderbilt)
W74-07952

POLLUTION CONTROL,
New Mexico State Univ., Las Cruces. Water Resources Research Inst.
For primary bibliographic entry see Field 6D.
W74-07970

REGIONAL ENERGY-WATER PROBLEMS SOUTH ATLANTIC GULF,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 6D.
W74-07972

REGIONAL ENERGY-WATER PROBLEMS, OHIO-GREAT LAKES.
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 6D.
W74-07973

REGIONAL ENERGY-WATER PROBLEMS, MISSOURI RIVER,
North Dakota State Univ., Fargo. Water Resources Research Inst.
For primary bibliographic entry see Field 6D.
W74-07974

A WATER QUALITY PROBLEM IN LOBSTER HOLDING TANKS,
Rhode Island Univ., Kingston. Marine Advisory Service.
For primary bibliographic entry see Field 8I.
W74-07983

HARBOR POLLUTION FROM LARGE SHIPS,
Naval Undersea Center, San Diego, Calif. Dept. of Fleet Engineering.
G. L. Donohue, and J. W. Hoyt.
Available from the National Technical Information Service as AD-769 476 $2.75 in paper copy, $1.45 in microfiche. NUC TP 368, October 1973. 13 fig, 2 tab, 9 ref. SF 53554002, Task 17225.

Descriptors: *Harbors, *Dispersion, *Ships, *Sewage disposal, Water pollution, Diffusion, Bays, Estuaries, Rhodamine, Turbulence, Coliforms, Eddies, Mathematical studies.
Identifiers: Navy ships, San Clemente Island (Calif.)

Data were developed to ascertain the magnitude of sewage pollution arising from Navy ships anchored in or moving through a small harbor, with particular reference to amphibious training exercises in which large numbers of personnel may be brought to nearshore areas. A number of releases of dyed sewage were made in Wilson Cove Harbor, California at rates corresponding to those at which sewage would be discharged by amphibious task forces of from 500 to 10,000 men. The movement of the sewage was traced by photography, bacterial counts, dye, and BOD measurements in the surrounding water and on the shoreline. The sewage was taken from the San Clemente Island sewage outfall, sampled for BOD, then 19,000 liters were dyed with Rhodamine WT and stirred for homogeneity. The sewage was released from both sides of a barge, and flow rates were estimated by catch-and-weigh techniques. Sewage was found to diffuse more slowly in a small harbor than would be expected from open-ocean data. Navy ships carrying significant numbers of men can operate in small harbors for certain times and distances from the shore without danger of pollution if the operational chart included is used as guidance. (Jones-Wisconsin)
W74-08006

PRESENT PROBLEMS IN THE STUDY OF SURFACE-WATER QUALITY (AKTUAL'NYYE PROBLEMY ISSLEDOVANIYA KACHESTVA POVERKHNOSTNYKH VOD),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 5G.
W74-08050

GROUNDWATER POLLUTION AND CONSERVATION.
Environmental Science and Technology, Vol 6, No 3, p 213-215, March, 1972. 2 fig.

Descriptors: *Groundwater, *Aquifers, *Aquifer systems, Areal hydrology, Bodies of water, Dug wells, Groundwater availability, Groundwater resources, Soil water, *Water pollution sources.

A general overview of the groundwater reserves in the United States is presented. Possible sources of contamination are outlined. Suggested programs for regulation of groundwater use are discussed. A map showing the known aquifers in the United States that are capable of yielding wells of 50 gpm or more at salinity levels not higher than 2000 ppm was developed. (Skogerboe-Colorado State)
W74-08071

INJECTION WELLS POSE A POTENTIAL THREAT.
Environmental Science and Technology, Vol 6, No 2, p 120-122, February, 1972. 3 fig.

Descriptors: *Groundwater, *Waste disposal wells, *Injection wells, *Underground waste disposal, Waste disposal, Waste storage, Waste water disposal, Risks.

Injection wells for waste disposal are discussed. There are literally tens of thousands of wells now being used. There are no records of areas where wastes have already been injected. There is a need for further research to develop the needed technology. Since the effects of pollutants in the groundwater system are both slow to appear and correct, great care should be taken to minimize the risks. (Skogerboe-Colorado State)
W74-08072

SOWING OF PONDS AND CARP WITH CLOSTRIDIUM PERFRINGENS, (IN UKRAINIAN),
Belotserkovskii Selskokhozyaistvennyi Institut, Belya Tserkov (USSR).
P. V. Myktytyuk.
Mikrobiol Zh (Kyyiv). Vol 34, No 6, p 790-791, 1972. (English summary).
Identifiers: *Carp, *Clostridium-perfringens, Ponds, *Sowing, *Bacteriological studies.

Results of the bacteriological investigation of environmental objects and carp in a pond farm are discussed. Sowing of the environmental objects of ponds with Cl. perfringens is 66.8, and carp--51.8%, of the total of the samples. Clostridia of the types A, B, C, D are isolated from the samples. The types A and D were the most distributed.--Copyright 1973, Biological Abstracts, Inc.
W74-08076

QUALITY OF DRINKING WATER ON SHIPS IN RELATION TO SAILING CONDITIONS, (IN RUSSIAN),
Black Sea-Azov Watershed Basin Sanitary Epidemiology Station, Odessa (USSR).
A. M. Voitenko.
Gig Sanit. Vol 37, No 10, p 94-95. 1972.
Identifiers: Bacteriological studies, *Black Sea, Coatings, *Gastrointestinal diseases, Ships, Water quality, *Potable water, Human diseases, *Storage tanks.

Laboratory investigations of the physicochemical and bacteriological composition of drinking water during cruises on 6 ships in the Black Sea showed that the water quality depends on many respects on the composition of the inside coating of the tanks for storing fresh water. The most common coatings on the ships were cement, cement-latex, paints and lacquers. Measures were taken to improve the water quality and the incidence of gastrointestinal diseases among sailors dropped by about 50%.--Copyright 1973, Biological Abstracts, Inc.
W74-08082

INFILTRATION AND LANDFILL BEHAVIOR,
Waterloo Univ. (Ontario).
F. A. Rovers, and G. J. Farquhar.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 99, No EE5, p 671-690, October, 1973. 7 fig, 8 tab, 33 ref.

Descriptors: *Environmental engineering, *Landfills, Sanitary engineering, *Infiltration, Leaching, Absorption, Evaporation, Gases, Methane, Temperature, Thawing.

The effects of infiltration on sanitary landfill leachate and gas production were examined under both field and laboratory conditions. Maximum field leachate production occurred during spring thaw. Production was greatly reduced during the summer. Moisture absorption prior to leachate flow ranged from 10.0 cm/m to 14.2 cm/m of compacted refuse. The leachate produced was strong. As an indication, concentrations of COD, calcium, chloride and ammonia nitrogen exceeded 40,000 mg/1, 2,500 mg/1, 1,200 mg/1, and 600 mg/1, respectively. Decomposition proceeded anaerobically with the production of methane and carbon dioxide. Periods of rapid moisture influx were accompanied by increased leachate strength, reduced pH, and decreased methane production thus allowing the accumulation of organic acids and subsequent reductions in pH. The interference appeared to have arisen from an increase in oxidation-reduction potential. (Skogerboe-Colorado State)
W74-08083

RECOVERY, RESIDUAL EFFECTS, AND FATE OF NITROGEN FERTILIZER SOURCES IN A SEMIARID REGION,
Agricultural Research Service, Mandan, N. Dak. Northern Great Plains Research Center.
J. F. Power, J. Alessi, G. A. Reichman, and D. L. Grunes.
Agronomy Journal, Vol 65, No 5, p 765-768, September-October, 1973. 2 fig, 3 tab, 13 ref.

Descriptors: *Nutrient removal, *Leaching, *Nitrogen, *Fertilizers, Nitrates, Crop response, Water pollution sources, *Path of pollutants.
Identifiers: *Fate of pollutants.

In a field experiment four fertilizer N sources were applied to separate areas of corn and bromegrass for four years. From the fifth through seventh years, the two areas were uniformly seeded to barley without additional N fertilization, until residual effects were no longer significant. Sources of N used were ammonium sulfate, ammonium nitrate, calcium nitrate, and urea, applied at either 55 or 110 kg/ha to Parshall fine sandy loam. Recovery of fertilizer N in corn plant tops was greatest for ammonium nitrate. Over 35% of the calcium nitrate and urea applied at 110 kg/ha of N to corn was leached below the root zone. Leaching of fertilizer N applied to bromegrass was insignificant. Except for urea, fertilizer N recovery by bromegrass from the other N sources was nearly equal and usually higher at 55 kg/ha. Residual growth responses were smaller from N applied to bromegrass that to corn. (Skogerboe-Colorado State)
W74-08086

QUALITY OF DRAINAGE WATER FROM A HEAVY-TEXTURED SOIL,
Ohio State Univ., Columbus. Dept. of Agricultural Engineering.
G. O. Schwab, E. O. McLean, A. C. Waldron, R. K. White, and D. W. Michener.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 16, No 6, p 1104-1107, November-December, 1973. 2 fig, 3 tab, 11 ref.

Descriptors: *Water pollution sources, *Runoff, *Leaching, Nutrient removal, Agricultural chemicals, Erosion, Nitrogen, Phosphorus, *Drainage.
Identifiers: *Toledo clay soils.

Sediment, dissolved solids, nine chemical elements or ions, five pesticides, electrical conductivity, pH, and BOD in tile drainage effluent and in surface runoff were measured from one-half acre plots on Toledo silty clay soil near Sandusky, Ohio, for a 3-year period, 1969-1971. Measurements were taken from both conventional tilled and no-tilled plots in continuous corn. Irrigation water was applied each year to simulate heavy rainfall. Recommended fertilizer amounts were applied, but pesticide kinds and amounts were greater than normally required for insect or weed control. Rainfall was above average in 1969 and 1970, and below average in 1971. Sediment losses from the tile and surface drainage water were several times greater for conventional tillage than for no tillage. (Skogerboe-Colorado State)
W74-08088

FLOOD AND SEEPAGE WATER SAMPLING TECHNIQUES IN RICE FIELDS UNDER DIFFERENT WATER MANAGEMENT PRACTICES,
California Univ., Davis. Dept. of Water Science and Engineering.
K. K. Tanji, J. W. Biggar, M. Mehran, and D. W. Henderson.
Soil Science Society of America Proceedings, Vol 37, No 3, p 483-485, May-June, 1973. 3 fig, 1 tab.

Descriptors: *Water pollution sources, *Nutrient removal, Leaching, Water sampling, *Rice, *Flooding, *Seepage.

Sampling equipment enables collection of flood and seepage waters to determine persistence and transport of chemicals applied in flooded rice culture. This system gives a capability of the evaluating the effects of different chemical application methods (water-applied, soil-incorporated) and water management systems (static, flow-through, and recycled). (Skogerboe-Colorado State)
W74-08090

STUDIES ON THE OCCURRENCE OF PLANKTONIC ROTATORIA IN URBAN WATERS AND THEIR RELATIONSHIP TO SAPROBISM. (IN GERMAN),
Hamburg Univ. (West Germany). Museum of Zoology.
For primary bibliographic entry see Field 2I.
W74-08111

EFFECT OF WATER-SOLUBLE DECOMPOSITION PRODUCTS OF HERBACEOUS PLANTS ON UPTAKE OF RADIOISOTOPES IN SOIL. (IN RUSSIAN),
Akademiya Nauk SSSR, Sverdlovsk. Inst. of Plant and Animal Ecology.
For primary bibliographic entry see Field 2G.
W74-08117

5C. Effects Of Pollution

SEASONAL CHANGES IN WATER QUALITY AND PRIMARY PRODUCTIVITY IN DOE VALLEY LAKE,
Kentucky Univ., Lexington. Water Resources Research Inst.
E. J. Bacon, and S. E. Neff.
Available from the National Technical Information Service as PB-232 003, $4.50 in paper copy, $1.45 in microfiche. Research Report No 72, March 1974. 107 p, 32 fig, 17 tab, 85 ref. OWRR A-039-KY(1). 14-31-0001-3517 and 14-31-0001-3817.

Descriptors: Ecology, *Water quality, Environmental effects, Planning, *Kentucky, *Primary productivity, Pre-impoundment, Aquatic habitats, *Seasonaol, Chlorophyll, Standing crops, *Lake stages, Hypolimnion, Lake morphometry, Anaerobic conditions, Phytoplankton.
Identifiers: Oxygen depletion, Monomictic lakes, Dimictic lakes.

Primary productivity and water quality were studied in Doe Valley Lake, a 147-hectare impoundment on Doe Run, a spring-fed stream in Meade County, Kentucky, from 13 June 1969 to 31 July 1972. Doe Valley Lake is monomictic during most winter seasons, but it is dimictic during more severe winters because of its morphometry and location on the borderline climatic region for dimictic lakes (37 degree N latiitude). Oxygen depletion in the hypolimnion is severe, and anaerobic conditions usually prevail by late June. A hypolimnetic areal deficit of 0.038 mg/sq cm/day was calculated. Super-saturation of oxygen in the epilimnion was common, and metalimnetic maxima exceeded 150 percent saturation in spring and early summer. Primary productivity ranged from 44 to 1,192 mgC/sq m/day and annual rates at Stations I and III were 277 and 255 gC/sq m/yr, respectively. Productivity fluctuated considerably at Station I as a result of turbidity, but average daily rates and chlorophyll levels were higher than at Station III. Periodic flooding drastically lowered productivity and phytoplankton standing crops. Negative or low correlations were found between productivity and turbidity, pH, alkalinity, nitrates, and phosphates. The relationship between productivity and standing crop of phytoplankton varied throughout the year but positive correlations were observed on an annual basis. Chlorophyll alpha levels correlated fairly well with net phytoplankton. Except during summer, nannoplankton contributed more than 50 percent of the total carbon assimilation. (Grieves-Kentucky)
W74-07605

EFFECTS OF CRUDE OIL AND SOME OF ITS COMPONENTS ON YOUNG COHO AND SOCKEYE SALMON,
Alaska Univ., College. Dept. of Biological Sciences.
J. E. Morrow.
Copy Available from GPO Sup Doc as EP1.23:660/3-73-018, $0.85; microfiche from NTIS as PB-232 094 $1.45. Environmental Protection Agency, Ecological Research Series Report EPA-660/3-73-018, January 1974. 37 p, 20 tab, 10 ref. EPA Project R 801039 (formerly 16100FWQ).

Descriptors: *Oil pollution, *Alaska, *Sockeye salmon, *Organic compounds, Oil wastes, *Toxicity, Aromatic compounds, Lethal limit, *Mortality, Fish, Water pollution effects.
Identifiers: *Crude oil, *Coho salmon, Aliphatic hydrocarbons, Aromatic hydrocarbons, Monovalent blood ions, Cell membranes(Fish).

Young coho and sockeye salmon, acclimated to 30 o/oo salinity, were exposed in various ways to different amounts of crude oil from the Prudhoe Bay field. Oil poured on the surface of the water in 95 liter (25 gallon) aquaria produced significant mortalities when the oil concentration was 500 ppm or greater. Fish dipped into a crude oil film, or with a drop of oil placed directly on each gill, showed no significant mortalities. The same was true of fish force-fed crude oil at 1 g per 100 g body weight. Oil that had been exposed to air for 30 days produced no significant mortalities. Among oil components tested for toxicity on coho salmon, aliphatic compounds were not lethal. Mono-cyclic aromatics were generally toxic, the degree of toxicity increasing with the degree of unsaturation. It is suggested that the toxicity of these substances is brought about through alteration of cell membrane permeability, especially in the gills. This results in a rapid increase of mono-valent ions in the blood and probably also interferes with CO2-HCO3 regulation. (EPA)
W74-07613

EFFECT OF DEICING CHEMICALS ON GROUND AND SURFACE WATER--(MODUS OPERANDI),
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 5B.
W74-07617

CHESTER RIVER STUDY, VOLUMES I, II, AND III.
For primary bibliographic entry see Field 5B.
W74-07653

BIOCHEMICAL INVESTIGATIONS,
For primary bibliographic entry see Field 5B.
W74-07654

BIOLOGICAL INVESTIGATIONS,
For primary bibliographic entry see Field 5B.
W74-07656

MERCURY IN THE ENVIRONMENT, AN EPIDEMIOLOGICAL AND TOXICOLOGICAL APPRAISAL.

Descriptors: *Mercury, *Environmental effects, *Analytical techniques, *Public health, Air pollution, *Water pollution, Transportation, Chemical analysis, Chemical reactions, Biochemistry, Organic compounds, Inorganic compounds, *Toxicity, Bioindicators, Metabolism, Bioassay, Genetics, Animal pathology, Laboratory tests, Measurement, Evaluation, *Reviews, *Bibliographies.

A comprehensive discussion is presented concerning mercury in the environment and its possible effects on human health. Chapters are included on: methods of analysis; the transport and transformation of mercury in nature; the metabolism of mercury compounds; organic mercury compounds; normal levels of mercury in humans; the genetic effects of mercury compounds and a general discussion and conclusion. A great many studies on all aspects of mercury transport and its effects are reported, but the general conclusion is that still more investigation is needed. (See W74-07681 thru W74-076989) (Jerome-Vanderbilt)
W74-07680

METHODS OF ANALYSIS,
Arbetsmedicinska Institutet, Stockholm (Sweden). Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W74-07681

TRANSPORT AND TRANSFORMATION OF MERCURY IN NATURE AND POSSIBLE ROUTES OF EXPOSURE,
Rochester Univ., N.Y. Dept. of Pharmacology and Toxicology.
For primary bibliographic entry see Field 5B.
W74-07682

METABOLISM,
Karolinska Institutet, Stockholm (Sweden). Dept. of Environmental Hygiene.
For primary bibliographic entry see Field 5B.
W74-07683

SYMPTOMS AND SIGNS OF INTOXICATION,
National Swedish Food Administration, Stockholm. Dept. of Nutrition and Food Hygiene.
S. Skerfving, and J. Vostal.
In: Mercury in the Environment, (Chemical Rubber Co. Press), p 93-107, 1972, 2 tab.

Descriptors: *Mercury, *Toxicity, *Human pathology, *Organic compounds, *Inorganic compounds, Water pollution, Air pollution, Poisons, Metabolism, Respiration, Inhibitors, Investigations.

The effects of acute and chronic poisoning from organic and inorganic mercury compounds and individual variability in tolerance of trace amounts of these compounds are discussed. Acute intoxication by inorganic mercury can result in bronchial irritation or diffuse interstitial pneumonitis from vapor inhalation, and local necrotic changes in the gastrointestinal tract, circulatory collapse or acute renal failure from salts ingestion. Early chronic poisoning by inorganic mercury is characterized by anorexia, loss of weight and minor symptomatology of the central nervous system. Later phases are characterized by tremor, psychic disturbances and personality changes. Idiosyncratic reactions are many and various. Prenatal intoxication from short chain alkylmercury compounds may result in severe mental and motor symptoms. Postnatal poisoning with such organic mercury compounds may give rise to such sensory disturbances as ataxia, concentric constriction of visual fields and hearing loss. In some cases gastrointestinal and pulmonary symptoms have been reported. Phenyl and methyl mercury poisonings result in kidney damage and neurological symptoms. (See also W74-07680) (Jerome-Vanderbilt)
W74-07684

'NORMAL' CONCENTRATIONS OF MERCURY IN HUMAN TISSUE AND URINE,
National Swedish Food Administration, Stockholm. Dept. of Nutrition and Food Hygiene.
S. Skerfving.
In: Mercury in the Environment, (Chemical Rubber Co. Press), p 109-112, 1972, 5 tab.

Descriptors: *Mercury, *Human physiology, *Laboratory tests, *Distribution, Water pollution effects, Air pollution, Metals, Toxicity, Human pathology, Biochemistry, Urine, Measurement, Evaluation.
Identifiers: Blood, Human tissue.

In order to assess the extent of mercury intoxication, a 'normal' level of mercury in the human body must be established. Data concerning persons reported not to have been subjected to any special kind of mercury exposure are presented. Levels of mercury in blood cells, hair, and urine, are of the greatest interest, but concentrations in other tissues and organs are considered also. Analyses of 814 whole blood samples from 15 different countries were performed in one laboratory using an atomic absorption method. Seventy-seven percent of all the samples had concentrations below 5 ng/ml, 85% below 10 ng/ml, and 95% below 30 ng/ml. It was proposed that about 30 ng/ml should be regarded as the upper limit for 'normal' conditions. In several studies of total mercury concentration in hair the mean concentrations were found to range from 1.7 micrograms/g to 7.0 micrograms/g. In analyses of 1.107 urine samples, 79% had levels below 0.5 micrograms/l, 86% below 5.0 micrograms/l, and 95% below 20 micrograms/l. Brain, liver and kidney tissue were also investigated. (See also W74-07680) (Jerome-Vanderbilt)
W74-07685

INORGANIC MERCURY-RELATION BETWEEN EXPOSURE AND EFFECTS,
Karolinska Institutet, Stockholm (Sweden). Dept. of Environmental Hygiene.
L. Friberg, and G. F. Nordberg.
In: Mercury in the Environment, (Chemical Rubber Co. Press), p 113-139, 1972, 10 fig, 12 tab.

Descriptors: *Air pollution, *Mercury, *Inorganic compounds, *Toxicity, *Water pollution effects, Metals, Environmental effects, Human pathology, Animal pathology, Human physiology, Animal physiology, Biochemistry, Metabolism, Urine, Laboratory tests, Measurement evaluation.

Dose-response relationships found in chronic exposure to inorganic mercury and some data relating to acute exposure are considered for humans and other animals. Urine, blood and air levels were correlated with symptoms of mercury poisoning. It was found that no significant symptoms resulted from exposure to mercury below the level of 0.1 mg/cu m of air. The relations of mercury in blood and in urine are discussed in terms of exposure level. Russian studies on micromercurialism indicate there may be some correlation between exposure to very small amounts of mercury and an asthenic-vegetative syndrome and other disorders. In tests using laboratory animals it was found that injected mercury can give rise to poisoning at 5 mg/cu m levels. When exposure is by inhalation of mercury vapor, acute effects occur in the lung, brain, kidney and colon. Concetnrations of 10 mg/cu m may be fatal within one or a few days. In studies of rabbits subjected to concentrations of 0.01 to 0.03 mg Hg/cu m for several months, definite changes in functions of several organs and biochemistry were noted. Changes in conditioned reflexes have been reported even at concentrations in the air of 0.002 to 0.005 mg Hg/cu m. (See also W74-07680) (Jerome-Vanderbilt)
W74-07686

ORGANIC MERCURY COMPOUNDS-RELATION BETWEEN EXPOSURE AND EFFECTS,
National Swedish Food Administration, Stockholm. Dept. of Nutrition and Food Hygiene.
S. Skerfving.
In: Mercury in the Environment, (Chemical Rubber Co. Press), p 141-168, 1972, 6 fig, 7 tab.

Descriptors: *Mercury, *Toxicity, *Water pollution effects, Air pollution, Food chains, Metals, *Organic compounds, Environmental effects, Human pathology, Animal pathology, Bioindicators, Bioassay, Investigations, Growth stages, Metabolism, Laboratory tests, Evaluation, Data collections.
Identifiers: Prenatal, Postnatal, Nervous system.

The effects of human and animal prenatal and postnatal exposure to organic mercury compounds are discussed. Poisoning observed in children of mothers exposed to methyl and ethyl mercury compounds indicates the transplacental capabilities of these compounds. Neurological damage was much more severe in children than in mothers. Some mothers who had concentrations of 100 micrograms Hg/g of hair gave birth to healthy children. No information was available for Hg concentrations in hair or blood of mothers of poisoned children at the time of delivery. Feeding pregnant animals organic mercury compounds resulted in reduced litter size and/or weight, fetal death, resorption, neonatal death, morphological lesions and damage to the central nervous system. Quantitative information on the neurological effects of methylmercury and mono and di- ethyl mercury is scarce. Low exposures have been reported as poisonous while large doses have sometimes not resulted in damage. Oral toxicity of phenylmercury compounds was found to be rather low. There is some evidence of mercury absorption through skin from phenyl mercury compounds. Inhalation of phenylmercury compounds has been known to cause poisoning after a rather short period of exposure. (See also W74-07680) (Jerome-Vanderbilt)
W74-07687

GENETIC EFFECTS,
Stockholm Univ. (Sweden). Environmental Toxicology Group.
C. Ramel.
In: Mercury in the Environment, (Chemical Rubber Co. Press), p 169-181, 1972, 3 fig, 9 tab.

Descriptors: *Mercury, *Cytological studies, *Biochemistry, *Chromosomes, *Genetics, Metals, Environmental effects, Toxicity, Animal physiology, Plant physiology, Metabolism.
Identifiers: *Cell division, Sub-lethal effects.

The genetic activity of mercury compounds is discussed with primary consideration given to effects on cell division, radiomimetic effects and effects on meiosis. All mercury compounds studied cause c-mitosis, an inactivation of the spindle fiber mechanism at cell division, similar to the effect of colchicine. Increased dosage of mercury results in a gradual series of transitions between normal and c-mitotic division, giving more variable chromosome numbers. Mercaptans act as inhibitors against the c-mitotic action of organomercury compounds. Organic mercury compounds also act directly upon the genetic material. Chromosome breakage resulting from these compounds is independent of c-mitotis. Cytological observations revealed that methyl mercury induced inactivation of the spindle fibers during meiosis, resulting in chromosomal effects corresponding to those induced at mitosis. The fact that mercurials act on basic genetic systems justifies the assumption of the same effect in different organisms as long as the compound reaches the target molecules. (See also W74-07680) (Jerome-Vanderbilt)
W74-07688

GENERAL DISCUSSION AND CONCLUSIONS-NEED FOR FURTHER RESEARCH,
Karolinska Institute, Stockholm (Sweden). Dept. of Environmental Hygiene.
L. Friberg, and J. Vostal.
In: Mercury in the Environment, (Chemical Rubber Co. Press), p 183-186, 1972.

Descriptors: *Mercury, *Environmental effects, *Toxicity, *Research priorities, Air pollution, Water pollution, Metals, Metabolism, Reproduction, Growth rates, Biochemistry, Animal pathology, Organic compounds, Inorganic compounds, Genetics, Analysis, Laboratory tests, Evaluation, Projects.

The increasing amounts of mercury and mercury compounds in the environment can constitute a serious health problem. Of the different types of mercury, alkylmercury compounds must be considered the primary hazard. Monomethylmercury and monoethylmercury are highly toxic, giving rise to severe damage to the central nervous system. Organic mercury compounds are highly active genetically. Differences in toxicity of mercury compounds can be explained in terms of metabolism. Methylmercury and ethylmercury have considerable stability in the body, while other forms are transformed into mercuric mercury. The distribution of mercury in the body is affected by biotransformation. Dose-response relationships are not known for most exposure situations. The concentration of mercury in hair in relation to mercury in blood in man is about 300:1, corresponding to about 60 micrograms/g hair as a critical concentration. Increased research is needed on dose-response relationships with particular attention to subclinical effects. (See also W74-07680) (Jerome-Vanderbilt)
W74-07689

LIVER ZINC IN CARCINOMA,
Whittington Hospital, London (England). Dept. of Chemical Pathology.
E. B. Wright, and T. L. Dormandy.
Nature, Vol 237, No 5351, p 166, May 19, 1972, 2 tab, 16 ref.

Descriptors: *Cytological studies, *Disease resistance, *Zinc, Biochemistry, Pathology, Diseases, Microbiology, Heavy metals, Analytical techniques, Bioindicators, Spectroscopy.
Identifiers: *Carcinoma.

The relationship of zinc to malignant disease was investigated through the examination of samples of liver tissue from 50 necropsies, using atomic-absorption spectroscopy, microscopic examination, and wet weight/ash ratio. The samples came from fatty livers, normal livers, apparently uninvaded livers from organs containing secondary malignant deposits, and livers from patients with malignant disease but no obvious liver secondaries, and they were compared on parts per million zinc content. The carcinomatous deposits themselves had a low zinc concentration, while in organs harboring such deposits an abnormally high zinc concentration was found. The high concentrations of zinc in unaffected liver tissue of subjects with carcinoma is suggested to be a defense reaction to invasion by malignant cells. The accumulation of zinc could be useful in the interpretation of liver biopsy material. (Jerome-Vanderbilt)
W74-07690

THE DISTRIBUTION OF LEAD IN HUMAN DECIDUOUS TEETH,
Harvard Medical School, Boston, Mass.
K. G. Carroll, H. Needleman, O. C. Tuncay, and I. M. Shapiro.
Experientia, Vol 28, No 4, p 434-435, 1972. 1 fig, 4 ref. PHS DE 02623.

Descriptors: *Lead, *Human pathology, *Distribution, *Toxicity, Human diseases, Toxins, Heavy metals, Metals, Pathology, Environmental effects, Air pollution, Public health.
Identifiers: *Human teeth, Teeth, Poisoning, Lead pollution.

Lead absorbed into the body by various routes is stored in teeth and bone. Substantial increases in the lead content of deciduous teeth of children dying of lead poisoning have been demonstrated. Asymptomatic children from areas where lead poisoning is frequent have significantly higher lead levels in shed deciduous teeth than controls from areas in which lead poisoning is unknown. This suggests that the deciduous tooth may provide a means of identifying lead ingestion long after the ingestion has stopped. This preliminary report describes the use of the electron probe in the study of the distribution of lead in human dental tissues, and verifies some of the existing hypotheses. (Oleszkiewicz-Vanderbilt)
W74-07691

POLYACRYLAMIDE GEL DISC ELECTROPHORESIS OF RAT BILE AFTER INTRAVENOUS ADMINISTRATION OF 52 MNC12, 64CUC12, 203HGC12 AND 210 PB(N03)2,
Institute of Industrial Hygiene and Occupational Diseases, Prague (Czechoslovakia).
M. Cikrt, and M. Tichy.
Experientia, Vol 28, No 8, p 383-384, 1972. 1 fig, 17 ref.

Descriptors: *Metabolism, *Heavy metals, *Proteins, *Rodents, Biochemistry, Copper, Manganese, Lead, Mercury, Physiology, Chemical properties, Chemical reactions, Semipermeable membranes, Laboratory tests, Analytical techniques.
Identifiers: Rat liver bile.

The reactions of copper, manganese, lead and mercury with liver bile are used in an attempt to explain why copper and manganese are excreted rapidly while lead and mercury are retained. The investigation focuses on the fact that in biological systems quite a number of proteins are known to bind metals. Using polyacrylamide gel disc electrophoresis, the protein spectrum of rat bile was compared with the location of 210Pb, 52Mn, 64Cu, and 203Hg on the electrophoreogram. With mercury, the radioactivity existed predominantly in the prestacking gel zone containing high-molecular bile specific protein. In the cases of both Mn (++) and Cu (++) the radioactivity appeared mostly in the region of the pigment zone. The maximum amount of Pb (++) was found in the post-albumin zone. The more rapid excretion of Mn (++) and Cu (++) into the bile could be explained by formation of relatively small complexes of these metals which may penetrate through membranes more rapidly than complexes of Hg (++) and Pb (++) which are predominantly bound to proteins of greater molecular weight. (Jerome-Vanderbilt)
W74-07694

THE ENVIRONMENTAL CONTEXT,
Connecticut Univ., Storrs.
T. F. Malone.
EOS Transactions American Geophysical Union, Vol 52, No 7, p 508-512, July 1971, 1 fig.

Descriptors: *Environmental control, *Water pollution, *Air pollution, *Land use, *Legislation, Pesticides, Pesticide toxicity, Eutrophication, Heavy metals, Trace elements, Oil, Natural resources, Environmental effects.

There are basically three problems of the human environment: (1) Pollution of air, water and land; (2) Land use and misuse; and (3) Exploitation of natural resources. Several examples of threats to the environment are presented: (1) increasing concentrations of chlorinated hydrocarbons; (2) accumulation of toxic heavy metals; (3) increase of carbon dioxide in the air; (4) particle load in the air; (5) 2 million tons of oil released to the ocean annually; (6) biostimulation of lakes; (7) population displacement; and (8) finite character of the world's natural resources and their uneven utilization. A discussion of indispensable international action is included. (Oleszkiewicz-Vanderbilt)
W74-07696

METALS FOCUS SHIFTS TO CADMIUM,
For primary bibliographic entry see Field 5B.
W74-07697

THE INFLUENCE OF TEMPERATURE AND SALINITY ON THE TOXICITY OF CADMIUM TO THE FIDDLER CRAB, UCA PUGILATOR,
South Carolina Univ., Columbia Belle W. Baruch Coastal Research Inst.
J. O'Hara.
Fishery Bulletin; Vol 71, No 1, p 149-153, 1973, 2 fig, 1 tab, 12 ref.

Descriptors: *Cadmium, *Temperature, *Salinity, *Crabs, *Toxicity, Lethal limit, Environmental effects, Water pollution effects, Heavy metals, Thermal pollution, Marine animals, Animal pathology, Bioassay, Animal diseases, Pathology.
Identifiers: *Fiddler crabs, Accumulation.

The concentrations of cadmium lethal to the fiddler crab, Uca pugilator, were determined for various environmental regimes of temperature and salinity. Mortality was greatest in high temperatures and low salinities when tested for 240 hr. The concentration fatal to 50% of the organisms in 240 hours was 2.9 ppm Cd (++). Concentrations of cadmium determined by use of radioactive cadmium were greatest in green gland followed by gill, hepatopancreas, and muscle. No differences appeared between results from males and from females. The rapid accumulation of cadmium from the surrounding water results in considerable tissue destruction in the first 24 hours. (Oleszkiewicz-Vanderbilt)
W74-07699

THE LD(50) VALUE OF TETRAETHYL LEAD,
Colorado State Univ., Fort Collins. Dept. of Zoology.
T. Schroeder, D. D. Avery, and H. A. Cross.
Experientia, Vol 28, No 4, p 425-426, 1972. 8 ref. GI-4.

Descriptors: *Lead, *Toxicity, *Bioassay, *Laboratory animals, *Lethal limit, Toxins, Heavy metals, Metals, Environmental effects, Animal pathology, Pathology.
Identifiers: *Tetraethyl lead, Lead pollution, Clinical studies.

Toxicity studies on laboratory animals treated with tetraethyl lead are described. The mortalities which resulted were 1 of 4 at 10.0 mg/kg, 0 of 4 at 13.0, 4 of 4 at 16.9 and 4 of 4 at 21.97. The mortality data were then matched to Weil's tables. All animals displayed neurological signs of the initial phase beginning the second day. Violent movement and aggression represented the second stage. Convulsions and death in stage three occurred around the sixth day with progressive stages occurring faster in animals receiving higher doses. The LD(50) and its confidence interval can thus be estimated as 14.18 (12.62 to 15.93) mg/kg. See also W74-07701) (Oleszkiewicz-Vanderbilt)
W74-07700

TETRAETHYL LEAD DOSE RESPONSE CURVE FOR MORTALITY IN LABORATORY RATS,
Colorado State Univ., Fort Collins. Dept. of Zoology.
T. Schroeder, D. D. Avery, and H. A. Cross.
Experientia, Vol 28, No 8, p 923-924, 1972. 1 fig, 1 tab, 2 ref.

Descriptors: *Lead, *Toxicity, *Bioassay, *Laboratory animals, Toxins, Heavy metals, Metals, Environmental effects, Lethal limit, Animal pathology, Pathology.
Identifiers: *Mortality, Tetraethyl lead, Lead pollution, Clinical studies.

This step in the research follows previously described work on finding the LD(50) value of tetraethyl lead, and represents an assessment of the dose response curve for single dose, oral administration for a standard 14 day period. As in the previous research, 3 stages in the progress of the toxicity were noted: Stage 1: lethargy; Stage II: aggression and thrashing, and Stage III: convulsions and, in higher dosages, death. An interesting phenomenon observed in the third stage of the disease was that 14 of the animals exhibited self-cannibalization of the feet and tail. The LD(50) value (11.50-13.16 mg/kg) was found to be lower than previously believed. (See also W74-07700) (Oleszkiewicz-Vanderbilt)
W74-07701

EVALUATION OF ZINC AVAILABILITY IN FOODSTUFFS OF PLANT AND ANIMAL ORIGIN,
Missouri Univ., Columbia. Dept. of Agricultural Chemistry.
B. L. O'Dell, C. E. Burpo, and J. E. Savage.
Journal of Nutrition, Vol 102, No 5, p 653-660, 1972. 2 fig, 5 tab, 19 ref.

Descriptors: *Birds, *Rodents, *Zinc, *Diets, *Absorption, Biochemistry, Physiology, Laboratory tests, Metabolism, Measurements, Evaluation, Growth rates, Nutrients, Protein, Carbohydrates.

Growth response of chicks and rats was used to evaluate the biological availability of zinc in selected cereal grains and animal products. Two sources of protein, soybean and casein-gelatin, were used in the basal low zinc diets and graded levels of ZnCO3 were added to establish the standard response curve. Thus, the availability values are based on the assumption that 100% of the zinc in ZnCO3 is available. A plot of weight gain during a 4-week period versus the logarithm of zinc added gave a straight line relationship over the range of 3 to 12 ppm. The 5 to 10 ppm range was used to evaluate the supplements which were added to the basal diets in lieu of carbohydrate. The minimum zinc requirement for chicks and rats fed the soybean diets was 19 ppm and for chicks fed the casein-gelatin diet it was 12 ppm. Chick and rat assays obtained biological availability for a number of food substances. In general the zinc in plant seeds was less available than that in animal products, and rats utilized the zinc in plant seeds less well than chicks. (Jerome-Vanderbilt)
W74-07706

EFFECT OF ASCORBIC ACID ON CADMIUM TOXICITY IN THE YOUNG COTURNIX,
Food and Drug Administration, Washington, D.C. Div. of Nutrition.
M. R. S. Fox, B. E. Fry, Jr., B. F. Harland, M. E. Schertel, and C. E. Weeks.
Journal of Nutrition, Vol 101, No 10, p 1295-1306, 1971. 6 tab, 33 ref.

Descriptors: *Metabolism, *Cadmium, *Absorption, *Game birds, *Toxicity, Biochemistry, Physiology, Nutrients, Diets, Laboratory tests, Deficient elements, Bioassay, Evaluation, Heavy metals, Zinc, Iron, Copper, Chromium, Cobalt, Inhibitors, Molybdenum, Birds.
Identifiers: *Ascorbic acid, *Quail.

To evaluate the effects of dietary supplements in altering the toxicity of dietary cadmium, day-old coturnix (Japanese quail) were fed 75 mg Cd/kg of an adequate purified diet for 2- or 4-week periods. Cadmium produced moderate growth retardation, severe anemia, decreased ash content of the tibia, and deviations from the normal concentrations of zinc, iron, cadmium, copper, and calcium in one or more of the cells or tissues assayed (erythrocyte, liver, kidney, and tibia). Dietary supplements of zinc, iron (III), copper, and L-cystein-HCl and injected ascorbic acid produced slight to moderate protection against cadmium-induced anemia, whereas iron (II), ascorbic acid, and D-isoascorbic acid had marked effects in preventing the anemia, growth retardation, poor bone mineralization, and perturbations in elemental concentrations of tissues. Chromium, cobalt, selenium, nickel, molybdenum, and pteroylglutamic acid had no effects. Initiation of ascorbic acid feeding at 2 weeks was beneficial to birds fed cadmium throughout the 4-week experiment. Under the conditions of these experiments, cadmium produced a functional iron deficiency and less clear-cut effects on zinc functions. It appears that a primary effect of cadmium was to prevent absorption of dietary iron (III). (Jerome-Vanderbilt)
W74-07707

INFLUENCE OF DIETARY AND INJECTED SELENIUM ON WHOLE-BODY RETENTION, ROUTE OF EXCRETION, AND TISSUE RETENTION OF 75SEO3 (--) IN THE RAT,
Army Medical Research and Nutrition Lab., Denver, Colo.
R. F. Burk, D. G. Brown, R. J. Seely, and C. C. Scaief, III.
Journal of Nutrition, Vol 102, No 8, p 1049-1056, 1972. 5 fig, 2 tab, 12 ref.

Descriptors: *Rodents, *Metabolism, *Distribution, *Selenium, *Retention, Biochemistry, Physiology, Laboratory tests, Measurement, Evaluation, Heavy metals, Analytical techniques, Diets, Nutrients, Bioassay.

Rats which had been fed a Torula yeast diet with selenium supplements of from 0 (basal) to 1 ppm for 35 days were injected with a tracer dose of 75SeO3 (--). Similar animals, all fed the basal diet, received carrier selenium in the injection at three levels (20, 50, and 200 micrograms). Whole-body counting was performed at frequent intervals; urine and fecal 75Se were determined for 10 days; and the animals were killed 35 days after injection and tissue retention was determined. Increase of either dietary or carrier selenium decreased whole-body retention of the 75Se in all cases and increased its urinary excretion except in the animals given 200 micrograms of carrier in which volatilization apparently occurred. Fecal excretion was about the same for all groups. Testis, brain, spleen, kidney, small intestine, eye, and thymus contained the greatest percentage of the whole-body 75Se when the basal diet was fed. This decreased as dietary selenium was increased. Skeletal muscle and blood showed the opposite pattern. The liver had the smallest percentage of whole-body 75Se in animals fed the basal diet. Supplementation with 0.10 ppm Se almost quadrupled it, but subsequent increases caused it to drop again. (Jerome-Vanderbilt)
W74-07708

AERIAL POLLUTION AND THE RAPID EVOLUTION OF COPPER TOLERANCE,
Liverpool Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 5B.
W74-07713

SENSITIVITY OF VERTEBRATE EMBRYOS TO HEAVY METALS AS A CRITERION OF WATER QUALITY-PHASE I,
Kentucky Univ., Lexington. Water Resources Research Inst.
W. J. Birge, J. J. Just, A. Westerman, and A. D. Rose.
Available from the National Technical Information Service as PB-232 075; $3.25 in paper copy, $1.45 in microfiche. Research Report No 71, 1974. 33 p, 5 tab, 6 fig, 53 ref, 1 plate. OWRR B-028-KY(1). 14-31-0001-3890.

Descriptors: Water quality control, *Heavy metals, Bioindicators, Fish, *Embryonic growth stage, Mercury, Cadmium, Lead, Toxicity, Water quality standards, Lethal limit, Mortality, Trout, Channel catfish, Water pollution effects, Criteria, Amphibians, Metallic poisoning, Methyl mercury, Goldfish, Avian embryos.

Avian, amphibian and fish embryos were given continuous treatment with inorganic mercury, methyl mercury, cadmium and lead, to determine the sensitivity of embryogenesis to metallic poisoning. All metals produced substantial degrees of lethality and/or gross anatomical anomalies at 10 ppb or less. Treatment with inorganic mercury at 10 ppb produced 100% kill of frog embryos. Chick and rainbow trout embryos suffered 10-20% lethality when exposed to 1 ppb of either inorganic or methyl mercury. Lead and cadmium at 1 ppb produced 24-32% lethality in chick embryos. No significant differences were observed in the embryopathic effects of inorganic or methyl mercury.

Concerning toxic effects of mercury, cadmium and lead, the 'embryonic stage' appears to constitute the critical 'sensitive link' in the vertebrate life cycle. The reproductive potential of vertebrate populations may be severely restricted (e.g., embryonic mortality) by such pollutants at trace levels which may not prove hazardous to adult animals, and environmental standards based on tolerance levels for adults may not provide adequate protection for sensitive developmental stages. Mercurial sensitivity of the goldfish, channel catfish and trout embryos increased in respective order, correlating with differences in egg size and hatching time of these species. A 50-fold difference in threshold levels was observed between goldfish and more sensitive trout embryos. This positive correlation suggests that fish with larger eggs and/or longer periods of embryological development are more susceptible targets of mercurial poisoning. (Grieves-Kentucky)
W74-07715

ENVIRONMENTAL CONTROL OF NITROGEN FIXATION IN LAKES, I. IN SITU NITROGEN FIXATION BY FREE LIVING BLUE-GREEN ALGAE, AND II. NITROGEN FIXATION BY THE DUCKWEED-ALGAL ASSOCIATION,
Michigan State Univ., East Lansing. Dept. of Crop and Soil Sciences.
J. M. Tiedje, T. P. Duong, and M. Cichowski.
Available from the National Technical Information Service as PB-232 085; $3.25 in paper copy, $1.45 in microfiche. Michigan Institute of Water Research, East Lansing, Completion Report, (March 1974). 35 p, 12 fig, 7 tab, 44 ref. OWRR A-046-MICH(1). 14-31-0001-3222.

Descriptors: *Michigan, *Cyanophyta, *Eutrophication, *Nitrogen fixation, Algae, Anabaena, Nostoc.
Identifiers: *Wintergreen Lake(Mich), *Acetylene reduction, Duckweeds, Algal growth, Gloeotrichia, Lemma, Spirodela, Aphanizomenon.

In situ acetylene reduction studies in hypereutrophic Wintergreen Lake showed that nitrogen fixation occurred from early July until mid-August and was correlated with the presence of heterocyst-bearing blue-green algae. Aphanizomenon was the dominant nitrogen fixing organism in 1970 while Anabaena was dominant in 1971; the Anabaena bloom resulted in 10 times more fixation than the Aphanizomenon bloom. Significant acetylene reduction was limited to the euphotic zone (0-3 m). Acetylene reduction at night was significant and for Aphanizomenon was greater than during the day. For the Anabaena bloom, maximum fixation occurred at 1 and 2 meter depths and was inhibited at the surface by high light intensities. Inorganic nitrogen was not detectable in the lake waters during the bloom period. The estimated nitrogen addition to the lake by fixation was 21 kg NH3/ha for the 1971 bloom. The duckweeds Lemna and Spirodela were found to have a commensalistic relationship with blue-green algae that resulted in significant nitrogen fixation. Acetylene reduction by this association was widespread as it occurred in 27 of 30 sample sites over 3 years (1971-1973). Quantities of nitrogen fixed averaged 4 to 7 kg/ha per season but could range up to 10 times higher when Lemna trisulca was the dominant host plant. The associated heterocyst-bearing algae were Nostoc, Gloeotrichia and Anabaena. They were found either in reproductive pockets or attached to the lower mesophyll. Plant excreted nutrients, an attachment surface and shading appeared to favor the algal colonization of this niche. The quantities of nitrogen fixed could represent major sources of nitrogen particularly for shallow and/or intermittent bodies of water.
W74-07716

AN INVESTIGATION OF THE WATER QUALITY AND PRODUCTIVITY OF POLSON BAY, FLATHEAD LAKE, MONTANA,
Montana Univ., Missoula. Dept. of Zoology.
A. R. Gaufin.
Available from the National Technical Information Service as PB-232 119; $3.00 in paper copy, $1.45 in microfiche. Montana Water Resources Research Center, Bozeman, Completion Report No. 48, (1974). 14 p. OWRR A-043 MONT(1).

Descriptors: *Phytoplankton, *Zooplankton, *Lakes, *Thermal stratification, *Carbon radioisotopes, *Montana, Water quality, Biomass, *Primary productivity, Nutrients, Pollutant identification.
Identifiers: *Flathead Lake(Mont).

Zooplankton and phytoplankton collections were taken in Polson Bay at the lower end of Flathead Lake, Montana, and a biomass estimate obtained. Exchange of nutrients with bottom sediments was measured, particulate matter in the water was analyzed for carbon and ash-free dry weight, and the gross primary productivity of Flathead Lake was measured by means of the carbon 14 method. Thermal stratification occurred at only a few locations in Flathead Lake. Nutrients and dissolved solids, although normally at low concentrations, were usually sufficient to support the growth of phytoplankton. Most components increased in concentration during the summer months. Coliform were almost non-existent in Polson Bay. (Williams-Montana)
W74-07717

SURVIVAL OF INTESTINAL BACTERIA IN OLIGOTROPHIC WATERS,
Washington State Univ., Pullman. Dept. of Civil and Environmental Engineering.
D. L. Johnstone, and A. M. Kubinski.
Available from the National Technical Information Service as PB-232 156, $3.25 in paper copy, $1.45 in microfiche. State of Washington Water Research Center, Pullman, Completion Report No 14, July 1973. 29 p, 11 fig, 4 tab, 26 ref. OWRR A-048-WASH(1). 14-31-0001-3848.

Descriptors: *Protozoa, *Periphyton, *Oligotrophy, *Bacteria, *Coliforms, *Streptococcus, Aquatic plants, *Washington, Physicochemical properties, Water pollution effects.
Identifiers: Predator-prey relationships, Indigenous bacterial flora.

Direct predator-prey relationships involving a few species of ciliated and flagellated protozoans from the periphyton of oligotrophic waters appear to be the major mechanism in such environments responsible for removal of fecal bacteria. Other factors, such as the indigenous bacterial flora and the physicochemical properties of these waters, are relegated to a more indirect role. The lengthy lag period (4-5 days) required for initial predatory responses indicates the delicate nature of high-quality waters and the need for strict sanitary guidelines to ensure their future safety and quality. The sanitary quality of oligotrophic waters can best be determined by the enumeration of fecal streptococci in conjunction with fecal coliforms.
W74-07737

STUDIES ON SOUTHEASTERN AQUATIC INSECTS,
Georgia Univ., Athens. Dept. of Entomology.
J. B. Wallace.
Available from the National Technical Information Service as PB-232 183, $9.75 in paper copy, $1.45 in microfiche. Environmental Protection Agency, Report EPA 660/3-73-016, May 1974. 131 p, 15 fig, 20 tab, 87 ref. EPA Project 18050 DFQ.

Descriptors: *Aquatic insects, *Systematics, Ecology, Caddisflies, Insects, Distribution, Water quality, Insecticides, Insect resistance, Nutrients, Feeding rates, *Southeast U.S., *Dieldrin, *Stoneflies, Standing crops, Biomass, Appalachian mountain region, Chlorinated hydrocarbon pesticides, Pesticide residues, Water pollution effects.
Identifiers: *Trichoptera, *Savannah River basin, Hydropsychidae.

This report is concerned with taxonomic studies of adult and immature Trichoptera in the southeast and several aspects of the ecology and distribution of southeastern aquatic insects. The distribution of the family Hydropsychidae in the Savannah River basin in relation to water quality parameters was studied. The effects of prolonged exposure to a chlorinated hydrocarbon insecticide, dieldrin, and its effect on aquatic insect populations and residue levels are discussed. The feeding habits and feeding rates of an herbivorous stonefly were studied as well as the effect of such feeding on water quality--such as increased leaching from leaves as a result of insect feeding. In conjunction with the preceding laboratory experiments, an extensive study was carried out on the benthic fauna of four small streams of various plant cover types (Hardwood, Coppice Hardwood, White Pine and Pasture) in the southern Appalachians. The pine stream had lowest diversity and standing crop biomass, whereas the coppice had greatest standing crop biomass. Wholebody and standing crop of calcium, potassium and magnesium were also studied in the above streams. (EPA)
W74-07740

ACCUMULATION PHENOMENON WHICH TAKES PLACE IN A MUSSEL (MYTILUS GALLOPROVINCIALIS LMK) GROWN IN AN ARTIFICIALLY POLLUTED ENVIRONMENT, VERIFICATION OF A SIMPLIFIED MODEL OF THE DYNAMIC EQUILIBRIUM OF METAL RIPARTITION BETWEEN MUSSELS AND SEAWATER, NOTE II-POLLUTION FROM COPPER, (FENOMENO DI ACCUMULO NEL MITILO (MYTILUS GALLOPROVINCIA-LIS LMK) STABULATO IN AMBIENTE ARTIFICIALMENTE INQUINATO. VERIFICA DI UN MODELLO SEMPLIFICATO PER L'EQUILIBR IO DINAMICO DI RIPARTIZIONE DEL METALLI FRA MITILO E ACQUA MARINA, NOTA II: INQUINAMENTO DA RAME),
L. Majori, and F. Petronio.
L'Igiene Moderna, Vol 66, No 1, p 64-78, January-February, 1973. 7 fig, 3 tab, 31 ref, (English summary).

Descriptors: Investigations, Evaluation, Metals, *Water pollution sources, *Mussels, *Bioindicators, Model studies, *Copper, Heavy metals.
Identifiers: *Bioaccumulation.

Research consisting of the evaluation of the potential damage due to pollution by metals using as the biological indicator, mussels, and its capability to act as a local pollution warning-signal, is explained. Such evaluations are quantified by the use of a dynamic kinetic model of the metal division between mussel and water. Results of experimental research show mussel ability to accumulate copper in polluted waters thus confirming aforementioned research purposes. (Sandoski-Franklin)
W74-07746

RESULTS OF RED TIDE FORMATION IN TOKYO BAY,
Tokyo Univ. (Japan). Faculty of Science.
T. Tsuji, H. Seki, and A. Hattori.
Journal Water Pollution Control Federation, Vol 46, No 1, p 165-172, January 1974. 6 fig, 2 tab, 9 ref.

Descriptors: *Eutrophication, Investigations, Coasts, Hypolimnion, *Phytoplankton, *Red tide, Oxygen requirements, *Degradation(Decomposition), Bays, *Aerobic conditions, *Stratification.
Identifiers: *Japan(Tokyo Bay).

The status of eutrophication in Tokyo Bay was investigated from August 1971 to May 1972 with special attention given to the formation of a microaerobic zone. This zone appeared in the bottom layer in the region of a gyre of the coastal water in the inner part of the bay, after the occurrence of the red tide caused by phytoplankton. On the basis of measured oxygen consumption rates, it is suggested that the multiple crops of phytoplankton in a red tide are transported downward to the bottom layer before their easily decomposable fraction has been decomposed in the upper layers. (Sandoski-Franklin)
W74-07770

SEASONAL AND SPATIAL CHANGES IN PRIMARY PRODUCTION AND NUTRIENTS IN LAKE MICHIGAN,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
D. C. Rousar.
Water, Air, and Soil Pollution, Vol 2, No 4, p 497-514, December 1973. 17 fig, 1 tab, 31 ref.

Descriptors: *Primary productivity, *Sampling, Wisconsin, Michigan, *Nutrients, Phytoplankton, Seasonal, Plant physiology, Physical properties, Chemical properties, Conductivity, Phosphorus, Silica, *Lake Michigan, Temperature, Hydrogen ion concentration, Nitrates, *Eutrophication, Plant growth.
Identifiers: Carbon uptake, Plant pigments, Phenolphthalein alkalinity.

Samples were collected from a railroad ferry between Wisconsin and Michigan over a period of 17 months to determine the spatial and temporal distribution of primary production and several physical and chemical variables. Conductivity, silica, total phosphorus, soluble reactive phosphorus, plant pigments, and carbon uptake exhibited inshore-offshore differences, and all but silica were highest at the Wisconsin inshore station, thus suggesting nutrient enrichment of Lake Michigan by Milwaukee. Temperature, pH, phenolphthalein alkalinity, nitrate, silica, plant pigments, and C uptake showed varying degrees of seasonal change. A bimodal seasonal abundance of phytoplankton was revealed. (Sandoski-Franklin)
W74-07773

A NOTE CONCERNING THE ENVIRONMENTAL ACCEPTABILITY OF NITRILOTRIACETIC ACID (NTA): THE EFFECT OF NTA ON THE GROWTH OF GYMNODINIUM BREVE,
University of South Florida, Tampa. Dept. of Chemistry.
M. T. Doig, and D. F. Martin.
Environmental Letters, Vol 6, No 1, p 31-36, 1974. 1 tab, 12 ref.

Descriptors: *Nitrilotriacetic acid, *Gymnodinium, *Analytical techniques, Domestic wastes, *Eutrophication, Toxicity, *Growth rates.
Identifiers: Lag time, Growth constant, Mean generation time, Maximum cell count.

The effect of NTA on the growth of Gymnodinium breve was determined by a modification of the flask test. The response of G. breve to enrichment of natural waters with NTA alone or NTA in the presence of domestic waste materials was evaluated in terms of the following four growth parameters: lag time, growth constant, mean generation time, and maximum cell count. NTA was not toxic to G. breve at concentrations up to 10 ppm and no biostimulatory effects were noted. (Sandoski-Franklin)
W74-07775

THE USE OF ALGAL ASSAYS FOR DETERMINING THE EFFECT OF IRON AND PHOSPHORUS COMPOUNDS ON THE GROWTH OF VARIOUS ALGAL SPECIES,
Wahnbachtalsperrenverband, Siegburg (West Germany).
J. Clasen, and H. Bernhardt.
Water Research, Vol 8, No 1, p 31-44, 1974. 16 fig, 7 tab, 58 ref.

Descriptors: *Eutrophication, *Bioassays, *Algae, Water samples, Testing, Fertility, Filtration, *Iron, *Phosphorus, Growth rates, *Algal control, *Productivity.
Identifiers: Algal growth.

Algal assays were performed with unialgal cultures to determine the productivity of the water samples tested. The productivity of the water samples rich in turbid materials and algae was higher in heat sterilized samples than those prepared by filtration. There is a clear correlation between the productivity of unfiltered sterilized water samples and their iron and total phosphorus content. Assays proved that the large decrease in productivity is due chiefly to the removal of phosphorus compounds and the removal of iron and other unknown substances. There are indications that the amount of iron required for growth, as compared with that of phosphorus, varies greatly depending on the individual algal species. The significance of the algal assay and the results relating to measures for limiting eutrophication using phosphorus removal plants are discussed. (Sandoski-Franklin)
W74-07776

INORGANIC NITROGEN REMOVAL IN A COMBINED TERTIARY TREATMENT-MARINE AQUACULTURE SYSTEM - II. ALGAL BIOASSAYS,
Woods Hole Oceanographic Institution, Mass.
J. C. Goldman, K. R. Tenore, and H. I. Stanley.
Water Research, Vol 8, No 1, p 55-59, 1974. 3 fig, 2 tab, 9 ref.

Descriptors: *Waste water treatment, *Bioassays, Sampling, *Tertiary treatment, Discharge(Water), *Nitrogen, *Algal control, Waste water(Pollution), Coasts.
Identifiers: Algal growth, *Combined treatment.

Algal bioassays, conducted on samples from various components of the combined tertiary treatment-marine aquaculture process, demonstrated that nitrogen removal is necessary to prevent increasing the algal growth potential of coastal marine waters receiving wastewater discharges. When nitrogen was removed from secondarily treated domestic wastewater, the wastewater in varying dilutions with seawater could not support more algal growth than the seawater alone. By adding nitrogen back to the treated wastewater the algal growth potential was increased to that of the untreated wastewater. This was demonstrated by assaying samples containing both artificially added nitrogen and nitrogen regenerated by oysters. Assays of the effluent from the seaweed system showed that the removal of regenerated nitrogen reduced the algal growth potential to that of natural seawater. (Sandoski-Franklin)
W74-07777

EXPERIMENTAL STUDY OF THE HAZARD DUE TO CHLORINATED QUINONES AND THEIR SAFETY LEVELS IN WATER BODIES (IN RUSSIAN),
Institut Gigieny Truda i Profzabolevanii, Ufa (USSR).
V. G. Murzakaev, and Z. V. Latypova.
Gig Sanit, Vol 37, No 5, p 15-19, 1972, Illus, English summary.
Identifiers: *Chloranil, *Chlorinated hydrocarbons, *Organoleptic properties, *Quinones, Safety, Potable water, Lethal limit, Toxicity index, Public health, Water pollution effects.

A study was done on the hazard due to certain chlorinated quinones and their safety levels in water bodies. The introduction into a water body of tetrachlorhydroquinone (TCHC) had a noxious effect responsible for deterioration of the organoleptic properties of the water. In a water body intended for human drinking and recreation the content of chloranil is permissible within the level of 0.05 mg/l and that of TCHC within the level of 0.5 mg/l. Their sanitary toxicological effects may serve as index of their noxious action.--Copyright 1973, Biological Abstracts, Inc
W74-07778

ENVIRONMENTAL EFFECTS OF THE CONSTRUCTION AND OPERATION OF A GASEOUS DIFFUSION PLANT.
Goodyear Atomic Corp., Portsmouth, Ohio.
Available from NTIS, Springfield, Va., as Rept No. ORO-725; $4.00 per copy, $1.45 microfiche. Report No ORO-725, July 1973. 33 p, 5 fig, 7 tab, 8 ref.

Descriptors: *Nuclear energy, *Energy conversion, *Radioactivity, *Environmental effects, Effluents, Water pollution, *Ohio River, Uranium, Biology, Balance of nature, Ecology, Pollutants, Measurement, Assay, Assessment, Safety, Evaluation, Public health, Operations, Regulation.
Identifiers: *Gaseous diffusion plant, Portsmouth(Ohio).

Described are the impacts upon the environment resulting from construction, start-up, and operation of a gaseous diffusion plant. Some of the impacts are typical regardless of location of the plant. Others are atypical and depend upon location; those are presented, by way of example, as they occur at the Portsmouth Gaseous Diffusion Plant. The various environmental contaminants that may be produced in the operating plant are described. The concentrations of those contaminants are stated; and the adverse biological effects of pertinent contaminants are elucidated. The environmental impact of the plant varies somewhat according to U-235 concentrations. However, commercial plants are not expected to enrich U-235 in concentrations greater than 4%; for this reason, environmental effects due to Portsmouth operations within that range are emphasized. The study revealed that present discharges from the plants generally have no detrimental effects upon the environment. (Houser-ORNL)
W74-07781

ENVIRONMENTAL RADIOACTIVITY,
New York Univ. Medical Center, N.Y. Inst. of Environmental Medicine.
For primary bibliographic entry see Field 5B.
W74-07791

ENVIRONMENTAL STATEMENT RELATED TO CONSTRUCTION AND OPERATION OF BARNWELL NUCLEAR FUEL PLANT.
Directorate of Licensing, Fuels and Materials (AEC), Washington, D.C.
For primary bibliographic entry see Field 5B.
W74-07792

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE PROPOSED PERRY NUCLEAR POWER PLANT, UNITS 1 AND 2.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 5A.
W74-07793

IODINE-129 LEVELS IN MILK AND WATER NEAR A NUCLEAR FUEL REPROCESSING PLANT,
New York State Dept. of Health, Albany. Radiological Sciences Lab.
For primary bibliographic entry see Field 5B.
W74-07798

RADIONUCLIDES IN ECOSYSTEMS, VOLUME II.
Oak Ridge National Lab., Tennessee.
Available from NTIS, Springfield, Va., as CONF-710501, Proceedings, Vol. II, $13.60 per copy, $1.45 microfiche. Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971. Oak Ridge, Tennessee, D. J. Nelson, Editor. Report CONF-710501-P2, (1971). 678 p.

Descriptors: *Ecosystems, *Radioecology, *Radioisotopes, Ecology, *Radioactivity, *Path of pollutants, Environmental effects, Assay, Measurement, *Water pollution effects.

Contents of Volume II are divided into four parts: Radionuclides in Marine Ecosystems; Models of Radionuclides in Ecosystems; Effects of Ionizing Radiation on Plants and Plant Communities; and Effects of Ionizing Radiation on Species and Populations. (See also W74-07800 thru W74-07825)
W74-07799

PLUTONIUM IN NORTH ATLANTIC OCEAN ORGANISMS; ECOLOGICAL RELATIONSHIPS,
Woods Hole Oceanographic Institution, Mass.
V. E. Noshkin, V. T. Bowen, K. M. Wong, and J. C. Burke.
In: CONF-710501 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971. Oak Ridge, Tennessee, p 681-688, (1971). 1 fig, 2 tab, 20 ref.

Descriptors: *Atlantic Ocean, *Plutonium, *Radioisotopes, *Aquatic life, *Ecology, Aquatic environment, *Assay, Analytical techniques, Radiochemical analysis, Fallout, Absorption, Diets, Nutrients, Toxicity, Sediments, Trophic level, Balance of nature, Ecosystems.

A series of North Atlantic Ocean organisms have been analyzed, by radiochemistry and alpha spectrometry, for fallout plutonium-239, -240, and -238. Organisms from the near-shore environment have been selected to show the effects on plutonium uptake of variations in feeding habits, association with sediment or with absorptive surfaces, and of trophic level. In general, plutonium concentrations are higher in organisms feeding on sediment or on surfaces than in those drawing largely on the water itself. There is some evidence that plutonium concentrations are higher in organisms of higher trophic levels. (See also W74-07799) (Houser-ORNL)
W74-07800

DISTRIBUTION OF ZN, FE, MN, AND SR IN MARINE FISHES OF DIFFERENT FEEDING HABITS,
Puerto Rico Nuclear Center, Mayaguez.
R. Y. Ting.
In: Conf-710501-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee. p 709-720, (1971) 4 fig, 5 tab, 16 ref.

Descriptors: *Radioisotopes, *Zinc, *Iron, *Manganese, *Strontium, *Fish diets, Foods, Absorption, Sediments, Gulfs, *Puerto Rico, Speciation, Diatoms, Detritus, Algae, Biology, Biological membranes, Bioindicators.
Identifiers: Dietary habit, *Gulf of Panama, Body organ.

The levels of Zn, Fe, Mn, and Sr concentrations in the muscle, viscera, skin, scales, and bone of seven species of fish with four different feeding habits were determined by means of atomic absorption spectrophotometry. Samples were taken from the Gulf of Panama and Puerto Rican waters and included herbivores and carnivores of three distinctly different feeding habits. These were herbivorous, mullet (Mugil curema Valenciennes); plankton feeders, Pacific thread herring (Opisthonema libertate Gunther) and Atlantic thread herring (Opisthonema oglinum LaSueur); benthic carnivorerous, sea trout (Cynoscion reticulatus Jordan and Evermann) and sand perch (Diplectrum euryplectrum Jordan and Evermann); pelagic carnivores, yellowfin tuna (Thunnus albacares Bonnaterre) and skipjack tuna (Euthynnus pelamis Linnaeus). There were no significant differences in the levels of Zn, Fe, Mn, and Sr concentrations in the muscle, viscera, skin, scales, and bone in the seven species of fish composed of four different feeding habits, except that the levels of Fe in the viscera were significantly different. The viscera of the herbivores, mullets, contained a significantly higher amount of Fe than the carnivores. This probably was due to the sediments ingested with diatoms, detritus, and algal matter when mullets are feeding from the bottom. The levels of the elemental concentrations in all body parts often varied to significant degrees between species within the same feeding habits. (See also W74-07799) (Houser-ORNL)
W74-07801

RADIOECOLOGY OF THE PLAICE (PLEURONECTES PLATESSA L) IN THE NORTHEAST IRISH SEA,
Ministry of Agriculture, Fisheries, and Food, Lowestoft (England). Fisheries Radiobiological Lab.
R. J. Pentreath, D. S. Woodhead, and D. F. Jefferies.
In: Conf-710501-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee. p 731-737, (1971) 5 fig, 5 tab, 15 ref.

Descriptors: Effluents, *Nuclear powerplants, Cesium, Fish, Absorption, Foods, Fish diets, Biology, Bioindicators, Model studies, Ruthenium, Cerium, Zirconium, Niobium, Silts, Soils, Sediments, *Radioecology.
Identifiers: *Windscale plant, *Irish Sea, *Plaice.

Of the radionuclides discharged from the UKAEA fuel processing plant at Windscale only Cs-134 and Cs-137 are accumulated to any extent in the flesh of the plaice (Pleuronectes platessa L.). A study of the roles of food and water uptake of Cs-137 by I-group fish, which remain inshore throughout the summer, showed that approximately 50% is derived from each. The relationship between dietary changes and the contribution of food to the Cs-137 body burden has been examined by monthly sampling of the gut contents of the plaice and the benthic fauna of the Windscale area. The internal radiation dose rates to the gonads of I-group plaice from the Cs-137 body burden and other radionuclides present in the gut have been calculated using a simple model. As a large proportion of the Windscale radioactive waste, particularly Ru-106, Ce-144, and Zr-95/Nb-95, is reconcentrated on the seabed silt, demersal fish may receive an external radiation dose which is significantly greater than natural background. In situ measurements of such external dose rates received by larger plaice have been made with lithium fluoride dosimeters, and the results largely substantiate calculations based on seabed radioactivity levels. (See also W74-07799) (Houser-ORNL)
W74-07802

CONCENTRATIONS OF MANGANESE, IRON, AND ZINC IN JUVENILES OF FIVE ESTUARINE-DEPENDENT FISHES,
National Marine Fisheries Service, Beaufort, N.C.
F. A. Cross, and J. H. Brooks.
In: Conf-710501-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee. p 769-775, (1971) 7 fig, 2 tab, 22 ref.

Descriptors: *Estuarine fisheries, Assay, Measurement, *Manganese, *Iron, *Zinc, Fish, Speciation, Juvenile fish, Path of pollutants, Radioisotopes, Cycles, *North Carolina.
Identifiers: *Newport River(N.C).

Concentrations of Mn, Fe, and Zn were measured in five species of fish collected from estuarine waters in the vicinity of Beaufort, North Carolina. Concentrations of Mn, Fe, and Zn varied significantly with weight in Atlantic menhaden and Atlantic croaker, and concentrations of Fe and Zn varied significantly with weight in bay anchovy. With the exception of Mn in menhaden, concentrations of trace metals decreased as weight increased. Significant differences among five species (spot, Atlantic croaker, pinfish, bay anchovy, and Atlantic menhaden) were observed for concentrations of Fe and Zn. Concentrations of Mn, however, were very similar among these five species. (See also W74-07799) (Houser-ORNL)
W74-07803

IRON-55 AND RUTHENIUM-103 AND -106 IN THE BRACKISH-WATER CLAM RANGIA CUNEATA,
National Marine Fisheries Service, Beaufort, N.C.
For primary bibliographic entry see Field 5A.
W74-07804

TRACE-ELEMENT INTERACTIONS BETWEEN RIVER WATER AND SEAWATER,
Puerto Rico Nuclear Center, Mayaguez.
For primary bibliographic entry see Field 5B.
W74-07805

TRACE ELEMENTS IN MARINE SHRIMP,
Stanford Univ., Pacific Grove, Calif. Hopkins Marine Station.
G. A. Knauer, R. C. Harriss, and W. A. Glooschenko.
In: Conf-710501-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee. p 836-839, (1971) 3 fig, 12 ref.

Descriptors: *Shrimp, *Gulf of Mexico, *Water pollution effects, *Radioisotopes, *Absorption, *Food chains, Measurement, Public health, Bioassay, Biology, Habitats, Water pollution sources, Membranes, Manganese, Iron, Zinc, Copper, Magnesium.

The concentrations of manganese, iron, zinc, copper, and magnesium in the exoskeleton, whole body, and abdominal muscles of adult penaeid shrimp were determined. The concentration of the five elements in the exoskeleton samples exhibited extremely wide variability. The freshly shed exoskeleton concentrated significantly higher amounts of all the elements studied, with the exception of copper, than did the newly molted whole-body samples. The concentrations of the five elements in the abdominal muscle samples were in general less than those concentrations found in the exoskeleton or whole-body samples. The calcium carbonate fraction of the exoskeleton is an important carrier for all of the elements investigated except copper. No correlation of shrimp size with element concentration was observed. (See also W74-07799) (Houser-ORNL)
W74-07806

BIOLOGICAL HALF-LIVES FOR ZINC AND MERCURY IN THE PACIFIC OYSTER, CRASSOSTREA GIGAS,
Washington Univ., Seattle. Coll. of Fisheries.
A. H. Seymour, and V. A. Nelson.
In: Conf-710501-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee. p 849-856, (1971) 5 fig, 2 tab, 3 ref.

Descriptors: *Oysters, *Pacific Ocean, *Radioisotopes, *Zinc, *Mercury, *Absorption, Degradation, Biology, Biodegradation, Ion exchange, Cytological studies, Ecology, Food chains, Public health.
Identifiers: *Biological half-life, Effective half-life, Physical half-life.

The biological half-life for zinc was calculated from the rate of loss of Zn-65 by individual oysters. After direct uptake of Zn-65 as ZnC12 in a laboratory aquarium, the marked oysters were returned to their natural habitat and at monthly intervals between January 1969 and March 1971 were returned to the laboratory for Zn-65 measurement. Following the first month after uptake, the rates of Zn-65 loss were essentially exponential for two periods, late summer-early fall and the remainder of the year. The average biological half-life values for these periods were 300 and 850 days respectively. The biological half-life for an oyster that lost Zn-65 at a constant rate for the entire experiment was 910 days. The loss of Hg-203 by the oyster was more rapid than the loss of Zn-65. The biological half-life values increased from 5 days to 44 days during the course of the 19-week experiment. For a longer experiment, a longer biological half-life would be expected. Reliable estimates of biological half-life can be calculated from data obtained from long-term experiments with radionuclides unless the values for effective half-life and physical half-life are similar. (See also W74-07799) (Houser-ORNL)
W74-07807

ACCUMULATION OF CALCIUM-45 IN DEVELOPING COHO SALMON EGGS AND FRY REARED IN VARYING CONCENTRATIONS OF STABLE CALCIUM,
Washington Univ., Seattle. Coll. of Fisheries.
P. R. Olson.
In: Conf-710501-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee, p 866-874, (1971) 7 fig, 2 tab, 22 ref.

Descriptors: *Salmon, *Radioecology, *Calcium, *Cytological studies, *Embryonic growth stages, Absorption, Measurement, Incubation, Fertilization, Fish management, *Fish eggs.

Coho salmon eggs were fertilized and reared in Ca-45 solutions that contained varying amounts of stable calcium, ranging from 6 to 76 mg/liter. As evidenced in one of two egg lots, the eggs in calcium concentrations above 6 ppm showed a significant improvement in fertility. Eggs reared in 76 ppm calcium hatched a day earlier than those reared in calcium concentrations of 16 and 36 ppm, which in turn hatched a day earlier than the egg lots reared in 6 ppm calcium. The stable calcium accumulated during the rearing period, 80 days, was similar in all lots regardless of the concentration of calcium. The amount of Ca-45 accumulated was inversely proportional to the concentration of stable calcium. A significant amount of Ca-45 entered the egg during the water-hardening process, but only a slight amount was taken up during the 57 days to hatching. In the two-week period after hatching, there was at least a tenfold increase in the uptake of Ca-45, which was associated with ossification. (See also W74-07799) (Houser-ORNL)
W74-07808

A SYSTEMS ANALYSIS METHODOLOGY FOR PREDICTING DOSE TO MAN FROM A RADIOACTIVELY CONTAMINATED TERRESTRIAL ENVIRONMENT,
Oak Ridge National Lab., Tenn.
R. S. Booth, S. V. Kaye, and P. S. Rohwer.
In: Conf-710501-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee, p 877-893, (1971) 5 fig, 3 tab, 14 ref.

Descriptors: *Radioactivity, *Path of pollutants, *Radioisotopes, *Systems analysis, Computers, Food chains, Human population, Public health, Forecasting, Environment, Habitats, Fallout, Ecology, Air pollution, Water pollution, Soil contamination, Transfer.

A systems analysis methodology has been developed to predict intakes by man, estimate dose commitments, and identify 'critical' exposure pathways resulting from radioactivity releases to a terrestrial environment. A mathematical model was constructed simulating selected terrestrial pathways by which fallout radioactivity can be transferred ultimately to man. This model is intended for preliminary predictions of radionuclide intakes by man through consumption of milk, beef, and plant parts contaminated directly by fallout as well as by uptake from the soil. Differential equations were written describing the radionuclide transfers, and the parameters required to impement these equations were derived. In verification tests, model predictions of Cs-137 concentrations in environmental compartments agreed within a factor of 2 with experimental data. More extensive verification studies involving other radionuclides are needed. The intake rates and total intakes of seven sample radionuclides were predicted for a 'reference' man based on a hypothetical fallout of pCi/cm-2 of each radionuclide. These predicted intakes were used as input to an internal dosimetry model which calculated dose commitments for each radionuclide and pathway. The results of these calculations are discussed in relation to individual radionuclide contributions to dose commitment. This generalized food-chain model is sufficiently versatile that it can be applied to many terrestrial environments and to all radionuclides. This first version of the model is expected to undergo future refinements. (See also W74-07799) (Houser-ORNL)
W74-07809

MODELING RADIONUCLIDES AND PESTICIDES IN FOOD CHAINS,
Battelle-Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.
For primary bibliographic entry see Field 5B.
W74-07810

ERROR ANALYSIS OF ECOLOGICAL MODELS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W74-07811

MATHEMATICAL MODEL OF TRITIATED AND STABLE WATER MOVEMENT IN AN OLD-FIELD ECOSYSTEM,
Puerto Rico Univ., Mayaguez. Dept. of Nuclear Engineering.
For primary bibliographic entry see Field 5B.
W74-07812

MODELS OF MATTER FLOW IN A SOUTHERN MIXED HARDWOOD FOREST IN FLORIDA: PRELIMINARY RESULTS,
Florida Univ., Gainesville. Dept. of Botany.
For primary bibliographic entry see Field 5B.
W74-07813

TRANSPORT OF RADIONUCLIDES IN SEDIMENTS,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Center for Inland Waters.
For primary bibliographic entry see Field 5B.
W74-07814

EFFECTS OF IONIZING RADIATION ON PROCESSES INFLUENCING TOLERANCE OF TREE SEEDLINGS,
Oak Ridge National Lab., Tenn.
W. F. Harris, and J. P. Witherspoon.
In: Conf-710501-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 961-971, (1971) 2 fig, 5 tab, 35 ref.

Descriptors: *Radiation, *Radioactivity effects, *Radioecology, Seeds, *Trees, *Germination, Plant morphology, *Dormancy, Viability, Photosynthesis, Foliar, Root development, Carbohydrates, Transpiration, Water demand, Water supply.
Identifiers: Yellow poplar, Silver maple.

Effects of acute doses (up to 500 rads) of fast neutrons on dormant seedlings of yellow poplar and silver maple, which were grown posturradiation in light environments of 100, 50, and 25% of full sunlight, indicated specific mechanisms which would reduce seedling tolerance to normal environmental stresses, thus increasing apparent radiosensivities of higher plants as predicted from nuclear parameters. Morphological and physiological responses were monitored periodically. Morphological response varied considerably along a gradient of reduced light, except for bud mortality. Physiological responses were dependent on structural modifications. hotosynthetic capacity of irradiated seedlings was modified by (1) reduced rates of photosynthesis per unit area, (2) early senescence of foliage of irradiated seedlings, and (3) annual variation in recovery of leaf area development. As a consequence of reduced photosynthate accumulation, root production was decreased, occurrence of root production was delayed, and concentration of storage carbohydrates was reduced. Transpiration rates of excised, aberrant yellow poplar foliage were 1.6 times greater than those of normal foliage. Previously observed increases in drought susceptibility of radiation-damaged plants are postulated to result from increased water requirement of tissue and decreased capacity to supply water because of altered leaf histology and resultant imbalance of leaf area-root biomass ratios following radiation damage to developing buds and leaves. (See also W74-07799) (Houser-ORNL)
W74-07815

RADIATION EFFECTS ON SERUM PROTEINS, HEMATOCRITS, ELECTROPHORETIC PATTERNS AND PROTEIN COMPONENTS IN THE BLUEGILL (LEPOMIS MACROCHIRUS),
Oak Ridge National Lab., Tenn.
G. U. Ulrikson.
In: Conf-710501-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee. p 1100-1105, (1971) 2 fig, 3 tab, 23 ref.

Descriptors: *Radioactivity, *Radioactivity effects, *Fish, Fish toxins, Radioecology, Biology, Biological degradation, *Sunfishes, Research and development.
Identifiers: *Radiation exposure, Dose, Blood.

Gel electrophoresis was used in conjunction with a spectrophotometric protein analysis to study the effects of radiation on the concentration of serum protein fractions in bluegill (Lepomis macrochirus). Four groups of 40 bluegills each were acclimated in aquaria at 20C for 30 days. Three groups were then exposed to 1000, 2000, and 3000 R, respectively, at 167 R/min. Blood samples were taken from each test group at intervals of 2 hr, 24 hr, and then every 48 hr thereafter. A severe decrease (approx. 50%) occurred in the beta globulins, alpha globulins,and albumins within 2 to 24 hr after exposure. After the initial decrease, hemoconcentration occurred. (See also W74-07799) (Houser-ORNL)
W74-07816

SENSITIVITY OF CARP (CYPRINUS CARPIO) EMBRYOS TO ACUTE GAMMA RADIATION,
Oak Ridge National Lab., Tenn.
M. L. Frank.
In: Conf-710501-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee. p 1106-1112, (1971) 3 fig, 10 ref.

Descriptors: *Carp, *Fish eggs, Hatching, Radioactivity, *Radiation, *Gamma rays, *Reproduction, *Propagation(Biological), *Radioactivity effects, Larval growth stage.
Identifiers: Organogenesis, Radiosensitivity.

Cyprinus carpio Linnaeus eggs were exposed to acute gamma radiation (500 to 16,000 rads) at different stages of development to observe the effects of radiation on development and hatchability. Except for an increase in radiosensitivity during late cleavage, radiosensitivity decreased as development increased; however, the rate of change was not constant throughout development. Stages in order of decreasing radiosensitivity were: zygote, late cleavage, early cleavage, and post-organogenesis. Differences in radiosensitivity were related to the physiological state of cells at the time of irradiation. During early cleavage when cell division was synchronous, radiosensitivity was probably influenced by the stage of mitosis at the time of irradiation. Hatchability of eggs irradiated after organogenesis was not affected by any of the experimental doses. The typical development of carp eggs from the zygote to larval stage is shown in a series of photomicrographs. (See also W74-07799) (Houser-ORNL)
W74-07817

EFFECT OF RADIATION, SALINITY AND TEMPERATURE ON THE IONIC REGULATION OF THE BLUE CRAB, CALLINECTES SAPIDUS,
National Marine Fisheries Service, Beaufort, N.C. Center for Estuarine and Menhaden Research.
D. W. Engel, E. M. Davis, J. W. Angelovic, and D. E. Smith.
In: Conf-710501-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee. p 1113-1118, (1971) 5 fig, 12 ref.

Descriptors: *Crabs, *Radiation, *Radioactivity effects, *Salinity, *Water temperature, *Ions, Animal physiology, Environmental effects, Amino acids, Sodium, Potassium, Chlorine, Magnesium.
Identifiers: Blue crabs.

The interaction of ionizing radiation with environmental factors affects the survival of aquatic organisms, due to physiological responses which are not clearly understood. Although studies have been made on the effects of interacting environmental factors on survival, physiological response studies have been neglected. Experiments were designed to define how radiation-salinity-temperature interactions affect the ionic regulation of a euryhaline, poikilothermic crustacean, the blue crab, Callinectes sapidus. Immature blue crabs were exposed to an acute radiation dose of 10,000 rds at various combinations of three temperatures (12, 20, and 28 C) and two salinities (5 and 35 p.p.t). At predetermined times after irradiation hemolymph samples were collected from the crabs and analyzed for Na(plus), K(plus), Cl(Minus), and Mg(2plus) and total free amino acids. Salinity and temperature significantly affected the ionic composition and free amino acid level of the hemolymph, with the highest levels found at the highest salinity. Temperature, however, affected the magnitude of the response and was virtually independent of salinity. Radiation interacted with these two variables to cause alteration in ionic regulation with time after irradiation. Thus the degree of radiation damage to ionic regulation in the blue crab was influenced by the crabs' environment before and after irradiation. (See also W74-07799) (Houser-ORNL)
W74-07818

THERMOLUMINESCENT DOSIMETRY OF AQUATIR ORGANISMS,
Battelle-Pacific Northwest Lab., Richland, Wash., Ecosystems Dept.
D. G. Watson, and W. L. Templeton.
In: Conf-710501-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee. p 1125-1130, (1971) 1 fig, 2 tab, 11 ref.

Descriptors: *Aquatic life, Aquatic environment, *Columbia River, Fish, Benthos, Water pollution sources, Nuclear powerplants, Effluents, Plutonium, Measurement, Assay, Assessment, Suspended solids, Aqueous solutions, *Radioisotopes.
Identifiers: *Radiophosphorus, Body burden, *Thermoluminescent dosimetry.

Lithium fluoride thermoluminescent dosimeters were employed to estimate the radiation exposure to Columbia River organisms downstream from the effluent outfalls of the Hanford plutonoum-producing reactors. Highest dose measurements were made in the river benthos. Observed dose was inversely related to distance downstream from the effluent outfalls. Radionuclides in suspension or solution in the river water contributed significantly to the total radiation exposure to both fish and benthic organisms. The dose to fish homogenate and intact fish kept frozen during dosimeter exposure was generally inversely related to fish size. This relationship did not hold for the major gamma-emitting nuclides contained in the fish carcass, but appeared to be associated with the body burden of radiophosphorus. (See also W74-07799) (Houser-ORNL)
W74-07819

CHROMOSOME ABERRATIONS IN CHIRONOMUS RIPARIUS DEVELOPING IN DIFFERENT CONCENTRATIONS OF TRITIATED WATER,
Oak Ridge, National Lab., Tenn.
B. G. Blaylock.
In: Conf-710501-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee. p 1169-1173, (1971) 2 fig, 1 tab, 15 ref.

Descriptors: Environment, Bloodworms, *Tritium, Water pollution sources, Nuclear explosions, Nuclear powerplants, Effluents, Radiation, Radioactivity effects, Biological degradation, Larval growth stage, Chromosomes, Aquatic animals, *Diptera.
Identifiers: *Tritiated water, *Chromosomal aberrations, *Chironomus riparius.

Since most tritium released to the environment eventually becomes tritiated water, there is a need for data on the biological effects of tritium acquired by organisms from environmental tritiated water. The salivary gland chromosomes of Chironomus riparius which had developed in different concentrations of tritiated water were examined for chromosome aberrations. The concentration of tritium ranged from 0.01 to 500 micro-Ci/ml. The concentrations of tritium in the larvae were determined and dose calculations were made for each concentration. Chromosome aberrations were observed in larvae which had developed in concentrations of 125, 250, and 500 micro Ci/ml of tritiated water; however, no aberrations were detected at concentrations of 0.1 micro-ci/ml or lower. A response curve developed to relate the frequency of chromosome aberrations to the concentration of tritiated water in which they developed was similar to a two-hit dose response for chromosome aberration produced by x or gamma radiation. (See also W74-07799) (Houser-ORNL)
W74-07820

EFFECTS OF CHROME RADIATION EXPOSURE ON MOSQUITOES (DIPTERA: CULICIDAE). 1. EFFECTS OF REARING IN SR-90 + Y-90 SOLUTIONS,
Atomic Energy of Canada Ltd., Pinawa (Manitoba). Whiteshell Nuclear Research Establishment.
J. E. Guthrie, and R. A. Brust.
In: CONF-710501 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee, p 1174-1178, (1971) 3 tab, 14 ref.

Descriptors: *Radioactivity, *Water pollution effects, *Radioactivity effects, *Mosquitoes, Larvae, Aquatic insects, Public health, Breeding, Reproduction, Biology, Insect eggs, Growth stages, Strontium, Yttrium, Insect control, *Diptera.
Identifiers: *Culicidae.

Larvae of Aedes aegypti and A. atropalpus were reared in various concentrations of Sr-90 + Y-90 ranging from 0.1 to 20 microcuries/ml. All these concentrations produced some effects. In many individuals the testes and ovaries of the adults were atrophied. In others, the production of viable sperm and their transfer to the spermathecae were affected, and the oocytes did not mature. Females that received viable sperm laid non-viable eggs. Irradiated females retained their mating competitiveness did not take any blood-meals. Thus, their release with sterile males might increase the effectiveness of the sterile-male technique for mosquito control. (See also W74-07799) (Houser-ORNL)
W74-07821

EFFECTS OF GAMMA IRRADIATION ON THE REPRODUCTIVE PERFORMANCE OF ARTERMIA AS DETERMINED BY INDIVIDUAL PAIR MATINGS,
Division of Biology and Medicine (AEC), Washington, D.C.
R. L. Holton, C. L. Osterberg, and W. O. Forster.
In: CONF-710501 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee. p 1191-1197, (1973), 3 fig, 1 tab, 18 ref.

Descriptors: *Radioactivity, *Cobalt, *Radioactivity effects, *Marine animals, *Brine shrimp, *Reproduction, Breeding, Water pollution, Environment, Growth stages, Broods, Food chains, Public health.
Identifiers: Doses.

The brine shrimp, Artemia, was used as an experimental organism to study the effects of Co-60 gamma irradiation on the reproductive performance of an animal species. The total reproductive ability of the brine shrimp was fractionated into various components, and the effect of irradiation on each of these components was then determined by studies of reproductive behavior in individual pair matings. In this study the components identified were the number of broods produced per pair, the number of nauplii voided per brood, the survival of nauplii to sexual maturity, the number of mature adults produced per brood, and finally the number of mature adults produced per pair. All component parameters of total reproductive performance were shown to be affected by irradiation within the range of doses used in this experiment. However, the number of broods per pari was shown to be the factor most sensitive to irradiation, with effects noted at doses of 900 rads and above. (See also W74-07799) (Houser-ORNL)
W74-07822

EFFECTS OF GAMMA IRRADIATION ON THE MAINTENANCE OF POPULATION SIZE IN THE BRINE SHRIMP, ARTEMIA,
Division of Biology and Medicine (AEC), Washington, D.C.
R. L. Holton, C. L. Osterberg, and W. O. Forster.
In: CONF-710501 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee. p 1198-1205, (1971), 6 fig, 2 tab, 5 ref.

Descriptors: *Radioactivity, *Cobalt, *Radioactivity effects, *Brine shrimp, Marine animals, Environment, Water pollution, Growth

stages, Reproduction, Broods, Zinc, Phosphorus, Analytical techniques, Breeding, Mortality, Food chains, Public health, Fish population.
Identifiers: Doses.

Population cultures of the brine shrimp, Artermia, were irradiated with acute doses of gamma irradiation from a Co-60 source. The subsequent reproductive performance and size of the cultures were studied for a period of 20 weeks. It was demonstrated that the population cultures may be maintained with only a small part of the reproductive potential exhibited in the pair matings. Therefore, the results of pair matings must necessarily be used to assess the amount that the reproductive potential of Artemia is decreased due to various doses of irradiation. Population cultures at all doses were shown to have the same sized populations at the end of 20 weeks. However, the populations irradiated at higher doses had not recovered to their full reproductive potential at the end of this time. (See also W74-07799) (Houser-ORNL)
W74-07823

STRUCTURE AND FUNCTION OF HARDWOOD LITTER AND SOIL SUBSYSTEMS AFTER CHRONIC GAMMA IRRADIATION, I. MESOFAUNA, NITROGEN, AND TOTAL SOIL RESPIRATION,
Georgia Univ., Athens. Dept. of Zoology.
D. C. Coleman, and G. T. Cowley.
In: CONF-710501 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee. p 1222-1228, (1971), 6 fig, 4 tab, 33 ref.

Descriptors: Soil structure, *Radioactivity, *Cesium, *Radioactivity effects, *Hardwood, *Litter, *Soil contamination, Systems analysis, Hydrologic, Systems, Soil water, Soil temperature, Soil moisture, Subsoil, Soil water movement, Respiration, Carbon cycle, Research and development, Research facilities, *Nitrogen.

Several enclosures of hardwood litter-soil received dosages of gamma radiation ranging from 3600 to 4 kR. Some plots had reduced microflora and -fauna, others were low in fauna only, and the least dosed had not significant changes in numbers. Only the most heavily irradiated enclosure was significantly below the controls in CO2 output, indicating that microflora are more important contributors to overall CO2 output than are mesofauna. Temperature was a more important factor than soil moisture in governing soil respiration. A wide spectrum of radiation tolerances in the forest flood community is reported. Bacteria are the most resistant fungi resistant up to about 1 megarad and the small artropods much less resistant. (See also W74-07799) (Houser-ORNL)
W74-07824

STRUCTURE AND FUNCTION OF HARDWOOD LITTER AND SOIL SUBSYSTEMS AFTER CHRONIC GAMMA IRRADIATION. II. MICROFUNGI,
South Carolina Univ., Columbia. Dept. of Biology.
G. T. Cowley, J. W. Martin, and D. C. Coleman.
In: CONF-710501 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee. p 1229-1236, (1971), 2 fig, 11 tab, 15 ref.

Descriptors: *Radioactivity, *Cesium, *Radioactivity effects, *Microorganisms, *Fungi, *Rain forests, Savannah River, Soil, Litter, Population, Plant population, Environmental effects, Reproduction, Mortality, Plant pigments, Speciation.
Identifiers: Doses.

The microfungal populations in six experimental and two control plots were studied before and after irradiation for 113 days with a 9200-ci Cs-137 source. Experimental plots received cumulative doses ranging from 5 million to 4 thousand rads. The number of detectable propagules was reduced sharply in the three plots receiving the highest dosages. Recovery was slow, since reduced populations in the soil were still in evidence 13 months after termination of irradiation. Species composition of soil and litter populations was also seriously altered. Before irradiation, population in all plots were predictably similar. However, immediately after irradiation, an abnormally high percentage of both soil and litter species isolated from the most heavily irradiated sites was darkly pigmented, and populations displayed little similarity to those in control and lightly irradiated sites. Some lightly pigmented or nonpigmented species soon became reestablished. However, similarities between heavily irradiated plots and nonirradiated plots remained low and had not returned to preirradiation levels in the soil by 13 months after irradiation. Apparent recovery of litter populations was more rapid than for soil populations in regard to both number of detectable propagules and species composition. (See also W74-07799) (Houser-ORNL)
W74-07825

HYDROLOGIC RESPONSE OF ICE-COVERED STREAMS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 2E.
W74-07832

THE FATE AND EFFECTS OF PESTICIDES IN THE AQUATIC ENVIRONMENT OF THE FLATHEAD LAKE DRAINAGE AREA,
Montana Univ., Missoula. Dept. of Zoology.
A. R. Gaufin.
Available from the National Technical Information Service as PB-232 252, $3.25 in paper copy, $1.45 in microfiche. Completion Report, Montana Water Resources Research Center, Bozeman, Report No 47, January 1974, 45 p. OWRR A-040-MONT(1).

Descriptors: *Pesticide residues, Water quality, Waterfowl, Lakes, *DDT, *Montana, Sampling, Water pollution effects, Birds, Gas chromatography, Pollutant identification.
Identifiers: *Flathead Lake(Mont), *Osprey, *Tordon.

A one-year preliminary sampling of pesticide practices on the Flathead Indian Reservation was conducted, with later work concentrating on the effects of DDT on osprey survival and nesting on Flathead Lake, Montana. The first year's sampling program indicated that major surface, underground and culinary waters were contaminated with Tordon and probably other pesticides and/or herbicides. The phenomenon was believed responsible for the catastrophic decline of the populations of many predatory birds, with evidence that it might also be responsible for the decline of the Flathead Lake osprey population. The later work provided additional confirmation of the osprey population decline and delineated possible reasons. Reduction in food resources did not, however, appear to be significant, nor was there evidence of the decline in population being a result of human interference. There was considerable evidence that pesticides in the water of Flathead Lake were responsible for the decline in bird population. (Williams-Montana State)
W74-07835

DETERMINING A RECREATIONAL LAKE'S TOLERANCE FOR DEVELOPMENT AND USAGE,
New Hampshire Univ., Durham. Water Resources Research Center.
For primary bibliographic entry see Field 5A.
W74-07836

SURVIVAL OF ENTERIC PATHOGENS AND INDICATOR ORGANISMS IN NATURAL WATERS,
Tennessee Univ., Knoxville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W74-07840

AQUATIC INVERTEBRATE RECOVERY IN THE CLINCH RIVER FOLLOWING HAZARDOUS SPILLS AND FLOODS,
Virginia Polytechnic Inst and State Univ., Blacksburg. Dept. of Biology, and Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies
J. S. Crossman, J. Cairns, Jr., and R. L. Kaesler
Available from the National Technical Information Service as PB-232 269 $3.75 in paper copy, $1.45 in microfiche. Virginia Water Resources Research Center, Blacksburg, Bulletin 26 December 1973. 66 p, 20 fig, 6 tab, 47 ref. OWRR A-054-KAN(1).

Descriptors: *Benthos, Acid streams, *Invertebrates, *Virginia, *Floods, Water pollution effects, Mollusks, Acids, Powerplants
Identifiers: *Benthic recovery, Clinch River(Va), *Hazardous materials, Sulfuric acid.

The aquatic environment of the Clinch River in southwestern Virginia has been acutely stressed by two spills of hazardous materials. In 1967, fluid from a fly-ash retaining pond caused extensive damage to the biota. In 1970, a spill of sulfuric acid had a similar, though more restricted, effect. Both spills came from a power plant at Carbo, Va. In addition to the acute pollutional stress from the two spills, the environment has been stressed chronically by the day-to-day operations of the power plant. Moreover, periodic flooding has had a deleterious effect on the biota. The benthic macroinvertebrate community was surveyed in 1969, 1970, and 1971 to assess the effects of the two spills and secondarily to determine the effects of flooding. Numbers of organisms, density, diversity, and cluster analysis of presence-absence data were all used. Results showed that except for the molluscs, the benthic macroinvertebrate community had virtually recovered from the 1967 spill by the summer of 1969. In the reach of the stream immediately downstream from the power plant, recovery was not complete, probably due to chronic stress from the power plant. The 1970 survey revealed the impact of the spill of acid and showed that by the end of the summer recovery was nearly complete, again with the exception of the molluscs. Flooding in the spring before the 1971 survey disrupted the fauna and had a homogenizing effect, in that previously sparsely inhabited stations became richer in species, probably due to increased stream drift with high water.
W74-07841

A STOCHASTIC MODEL FOR THE JAMES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W74-07843

REDUCTION OF LEAD ABSORPTION FROM THE INTESTINE IN NEWBORN RATS,
Yugoslav Academy of Sciences and Arts, Zagreb. Inst. for Medical Research.
K. Kostial, I. Simonovic, and M. Pisonic.
Environmental Research, Vol 4, p 360-363, 1971. 2 tab, 13 ref.

Descriptors: *Lead, *Retention, *Rodents, *Diets, Biochemistry, Pollutants, Animal physiology, Nutrients, Metabolism, Bioassay, Laboratory tests, Data collections, Measurements, Calcium, Phosphates, Organic compounds, Radioisotopes.
Identifiers: Alginate.

The effects of calcium, phosphate and alginate additives to milk on lead absorption from the intestines were investigated in 5-7 day-old rats. The animals were artificially fed over a period of 8 hours with cow's milk and with milk with calcium chloride, potassium dehydrogen phosphate and alginate additives to which tracer amounts of lead-203 were added. They were returned to their mothers and after 90 hours were sacrificed. Lead-203 was determined for the whole body before and after removal of the intestinal tract and also for the liver and the kidney. The retention of lead-203 in the body and organs was greatest in the group of animals fed cow's milk with only lead added. Retention was 1.4 times lower in animals fed with calcium and phosphate milk additives and approximately 2.5 times lower in animals with calcium, phosphate, and alginate additives. (Oleszkiewicz-Vanderbilt)
W74-07953

ENDOGENOUS ZINC EXCRETION AND 65ZINC METABOLISM IN HOLSTEIN CALVES FED INTERMEDIATE TO HIGH BUT NONTOXIC ZINC LEVELS IN PRACTICAL DIETS,
Georgia Univ., Athens. Dept. of Dairy Science.
W. J. Miller, E. S. Wells, R. P. Gentry, and M. W. Neathery.
Journal of Nutrition, Vol 101, No 12. p 1673-1682, 1971. 2 fig, 5 tab, 18 ref.

Descriptors: *Metabolism, *Zinc, *Distribution, Biochemistry, Physiology, Nutrients, Retention, Measurment, Laboratory tests, Radiochemical analysis, Bioassay, Diets, Cattle.

Zinc and 65Zn metabolism, from a single intravenous dose (given 7 days after diets were initiated) were studied in Holstein bull calves fed a practical diet containing 38 ppm zinc or the same diet with 200 or 600 ppm supplemental zinc (zinc oxide). The supplemental zinc increased endogenous fecal 65Zn excretion by 30% with 200 ppm added zinc having as much influence as 600 ppm. The supplemental zinc has a very variable effect on 65Zn distribution in different tissues 14 days after dosing. With some tissues including testicle, rumen wall and abomasum (fundic) each increase in dietary zinc reduced 65Zn content. In muscle, dietary zinc level had no effect on 65Zn concentration. Adding 200 ppm zinc to the diet increased 65Zn and stable zinc in pancreas, liver and kidney; however, a further increase to 638 ppm caused very large increases in these tissues indicating a breakdown in homeostatic control for both injected and absorbed zinc. With the 638 ppm diet smaller increases in 65Zn occurred in bone and small intestine. Serum 65Zn increased with the high zinc diet. Except for muscle, where there was no change, specific activity in every tissue studied decreased with each increase in dietary zinc. (Jerome-Vanderbilt)
W74-07954

ANTAGONISTIC EFFECT OF ARGININE ON ZINC METABOLISM IN CHICKS,
Ralston-Purina Co., St. Louis, Mo.
B. W. Coleman, E. M. Reimann, R. H. Grummer, M. L. Sunde, and W. G. Hoekstra.
Journal of Nutrition, Vol 101, No 12, p 1695-1702, 1971. 4 tab, 19 ref.

Descriptors: *Deficient elements, *Zinc, *Poultry, *Animal pathology, Biochemistry, Physiology, Nutrients, Diets, Metabolism, Growth rates, Environmental effects, Birds, Bioassay, Distribution, Laboratory tests.
Identifiers: *Arginine.

Experiments using dried egg white, isolated soybean protein or casein as the dietary protein source were conducted to study the effect of various levels of dietary arginine on zinc deficiency in chicks. Addition of high levels of arginine to each of these protein sources, limiting in zinc, greatly increased the incidence and severity of leg abnormalities and tended to lower body weights of chicks. Arginine added to low zinc egg white- or soybean protein-based diets increased feather abnormalities. With a casein-based diet, it was possible to either eliminate or render very severe the leg abnormalities caused by zinc deficiency simply by feeding a low or high amount, respectively, of supplemental arginine. Supplemental zinc completely prevented the adverse effect of excess arginine. The leg abnormalities were also alleviated by histidine and histamine. Increasing the dietary level of arginine resulted in marked decreases in tibia and feather zinc concentrations but did not significantly affect liver zinc concentration. It was suggested that arginine is the previously postulated 'complicating factor' of zinc-deficient soybean protein diets, since arginine can account for the differences in zinc deficiency signs which occur among chicks fed the different amino acid sources. (Jerome-Vanderbilt)
W74-07955

HYDROBIOCHEMICAL EFFECTS OF SPRAYING WASTE-TREATMENT EFFLUENT IN ST. PETERSBURG, FLORIDA,
Geological Survey, Tallahassee, Fla.
R. N. Cherry, D. P. Brown, J. K. Stamer, and C. Z. Goetz.
Open-file report, 1973. 21 p, 2 fig, 4 tab.

Descriptors: *Waste water disposal, *Water reuse, *Florida, *Sprinkler irrigation, Sprays, Denitrification, Nitrification, Infiltration, Artificial recharge.
Identifiers: *Land disposal(Wastes), St. Petersburg(Fla).

A spray-irrigation system was tested for wastewater reclamation and reuse in St. Petersburg, Florida. Tests were made of the effectiveness of the soil, bacteria, and vegetation in removing nitrogen and phosphorus from the waste water. Water samples from wells and the lake at the test site were collected and analyzed before and after irrigation using sewage effluent. The total N content of the applied effluent decreased by the time water infiltrated to the 5- and 10-foot depths. At depths of 15 feet and greater, total N content was low compared to the applied effluent. Changes in the concentrations of nitrogen species occurred as the applied effluent infiltrated the soil. The dominant form of nitrogen in the applied effluent was NH4-N. At the 5-foot depth, the dominant nitrogen form was NO3-N. The change from NH4-N to NO3-N can be attributed to the action of nitrifying bacteria. Total PO4 content decreased in samples from the 10-foot depth compared to both the effluent and water from the 5-foot depth. The decrease was not a function of dilution by groundwater. (Knapp-USGS)
W74-07978

A PRELIMINARY CHECK-LIST OF THE MARINE ALGAE OF THE MOSS LANDING JETTY: AN ANNOTATED FLORISTIC COMPILATION,
Moss Landing Marine Labs., Calif.
J. B. Jensen, and S. J. Tanner.
Available from the National Technical Information Service as COM-73-11646, $3.50 in paper copy, $1.45 in microfiche. Technical Publication 73-7, May 1973. 4 plates, 9 ref. SGP2-94.

Descriptors: *Marine algae, *Baseline studies, *Systematics, *Aquatic plants, Distribution, Phaeophyta, Chlorophyta, Rhodophyta, Habitats, Speciation.
Identifiers: *Moss Landing(Calif.).

Base line studies of marine algae at the Moss Landing, California jetty provide a list of algal species present, along with notations but do not represent a compilation of ecological data. The purpose was to describe the basic flora upon which ecological analyses can be begun. The notes supplement presently available information and are therefore uniquely applied to plants growing on the jetty. A synopsis is given of the relative abundance and location of all the species detected. Plants conspicuously, or unusually absent from the jetty are listed; these are species commonly found that would generally be expected to occur at such a location. Species expected to be discovered growing on the jetty in the future, and a set of keys to all the species detected thus far are included. Several specific locations on the jetty have become defined both by their physical description and by their floristics, i.e., the water-sand-jetty community comprised of rocks partially and completely buried by sand, the sand spit locality, and the harbor end of the jetty. (Jones-Wisconsin)
W74-07981

PROGRESS IN ECOLOGICAL RESEARCH AT EDGEWOOD ARSENAL, MARYLAND: FISCAL YEARS 1971 AND 1972,
Edgewood Arsenal, Aberdeen Proving Ground, Md. Biomedical Lab.
F. P. Ward.
Available from the National Technical Information Service as AD-761 028, $2.75 in paper copy, $1.45 in microfiche. Special Publication EASP 1100-13, April 1973. 19 p. 18 ref. 1W662710AD6302.

Descriptors: *Chemical warfare, *Ecology, *Maryland, *Testing, Monitoring, Toxicity, Tracers, Environmental effects, Birds, Amphibians, Mammals, Food chains, Fish, Chesapeake Bay, Invertebrates, Zooplankton, Reptiles, Aquatic plants, Physicochemical properties.
Identifiers: *Edgewood Arsenal(Md.).

An ecological study of Carroll Island test area was initiated to establish procedures whereby toxic (or nontoxic) effects caused by the testing of chemical agents by the Edgewood Arsenal are continuously monitored and made known. Research was channeled into laboratory tests to determine toxicities of agents and stimulants to plants, algae, and aquatic organisms and into continuous field studies on the area to measure the environmental impact of the total agent testing program. Several comparative surveys in song and game bird populations were conducted; distribution and abundance of reptiles and amphibians, and thirteen mammalian species have been identified. Fish taken from the Gunpowder River and identified comprise 40 species. Invertebrates on and around Carroll Island were studied in detail. Based on the abundance and diversity of zooplankton, the viability of aquatic and surrounding terrestrial vegetation, the unique co-occurrence of two species of diaptomids, and normal seasonal events in life histories of two species of fairy shrimp, the Carroll Island pond showed no evidence of deleterious effects of chemical agents. Physicochemical parameters, toxicities to aquatic plants and to fish were measured and fish kills and other incidents investigated. The studies indicated that no measurable acute ecological damage has resulted from the tests. (Jones-Wisconsin)
W74-07986

THE EFFECTS OF CRUDE OIL POLLUTION ON THE BEHAVIOR OF MARINE INVERTEBRATES,
City of Hope National Medical Center, Duarte, Calif.
J. S. Kittredge.
Available from the National Technical Information Service as AD-762 047. Office of Naval Research, Arlington, Va., Final Report June 1973. 12 p. 1 tab, 6 ref. N00014-71-C-0103.

Descriptors: *Oil pollution, *Animal behavior, *Marine animals, Invertebrates, Psychological aspects, Solubility, Crabs, Insect repellents.
Identifiers: *Aromatic hydrocarbons, Chemoreception, Feeding inhibition.

Effect of crude oil pollution on behavior of marine invertebrates was investigated. Since almost all marine invertebrates depend on chemoreception as their prime receptor of environmental information, effects of oil pollution on two aspects of this reception were examined. Although petroleum products are considered to be insoluble in sea water many fractions do have a limited solubility. Methods were devised for examining the effects of this soluble fraction on chemoreception. Utilizing the Lined Shore crab, Pathygrapsus crassipes, two bioassays were devised, one for the 'specialist' receptors and one for the 'generalist' receptors. Initial studies revealed that the water soluble extract of crude oils completely inhibited both the 'specialist' and the 'generalist' chemoreceptors. These observations suggest that the sublethal effects of water soluble components of petroleum products may alter species survival by inhibiting reproduction and growth. Both of these elements, because of the major role of chemoreception in the marine environment, are sensitive to low levels of aromatic hydrocarbon pollution. Supplemental research on natural 'cryptic odors' used to 'blind' the chemoreceptors of predators suggests development of synthetic 'cryptic odors' that could inhibit the settlement of fouling organisms or, in the terrestrial environment, as insect repellents. (Jones-Wisconsin)
W74-07987

PHYTOPLANKTON COMMUNITY STRUCTURE AND NUTRIENT RELATIONSHIPS IN LAKE CARL BLACKWELL, OKLAHOMA,
Oklahoma State Univ., Stillwater.
For primary bibliographic entry see Field 2H.
W74-07992

A PREDICTION OF CHANGES IN THE THERMAL CYCLE OF A STRATIFIED LAKE USED TO COOL A 1000 MW POWER PLANT,
Cornell Univ., Ithaca, N.Y. Dept. of Thermal Engineering.
F. K. Moore, and J. F. Mackenzie.
Publication No 32, presented at Water Resources and Marine Sciences Conference, January 1971, Cornell Univ., Ithaca, N.Y. 23 p. 9 fig, 9 ref.

Descriptors: *Mathematical models, *Water temperature, *Stratification, *Cooling water, Mixing, Thermocline, Diffusion, Hypolimnion, Thermal pollution, Lakes, Nuclear powerplants.
Identifiers: Cayuga Lake(N.Y.).

A model is computed showing the effects of nuclear powerplant cooling water pumped across the thermocline of a deep, stratified lake. A one-dimensional or lake-averaged representation is adopted on the basis that horizontal diffusion is so rapid that only vertical temperature gradients need be considered. Basically, the lake and therefore the representational model, can be considered to be a one-dimensional thermal oscillator responding to an oscillatory heat input to its surface. The equations for the model are simply the heat balances for the separate layers involved. The simple model is proposed for the estimation of changes in the temperature cycle due to thermal discharge from one or more 1000 MW power plants. The mixing process is modeled by semi-empirical stratification criteria and a single summer diffusion coefficient. The power plant is considered to increase heat input and to enhance the lake's mixing process during the summer by the withdrawal and return of lake water. Calculations are made for various numbers of power plants and heat dilution ratios. Heat and mixing enhancement are shown to have comparable effects on the onset and termination of stratification, summer maximum, and winter minimum temperatures of a typical lake. (Jones-Wisconsin)
W74-07998

ENVIRONMENTAL FACTORS OF LEUKEMIA MORBIDITY, (IN POLISH),
K. Janicki.
Patol Pol. Vol 23, No 1, p 29-48. 1972. (English summary).
Identifiers: Carcinogenesis, Cattle, Environmental effects, Herbicides, *Human diseases, Insecticides, *Leukemia morbidity, *Poland Cracow region, Pollution, Poultry, Seed dressings, Water supply, *Potable water, *Public health.

A retrospective analysis of leukemia morbidity and 25 environmental factors connected with demographic data, health service, agricultural chemicals, water supply and breeding of some domestic animals in 18 units of the Cracow region from 1961-1968 is reported. A statistical analysis of rectilinear and multiple correlations between leukemia morbidity and intensity of the environmental factors was made. A significant (at the 1% confidence level) positive rectilinear correlation was demonstrated between leukemia morbidity in rural environments and consumption of seed dressings, percentages of the population supplied with water from wells or local waterlines, intensity of cultivation of cattle and poultry and indexes of the size of herds. A significant positive rectilinear correlation was also found between morbidity of acute leukemias in different administration units of the region and indexes of consumption of chemical herbicides and insecticides used for spraying. A negative rectilinear correlation significant at the 1% confidence level was found between indexes of leukemia morbidity in the rural environment and population density per 1 km squared, numbers of physicians per 100,000 population and percentages of the population supplied with water for drinking and domestic purposes from collective water reservoirs. The first of these correlations was rejected as being due to inhomogeneous population density. The second and third correlations were attributed to a favorable indirect influence of sanitary supervision, a larger number of physicians and better sanitary state of water supplies compared with water from wells or other open, uncontrolled sources.--Copyright 1973, Biological Abstracts, Inc.
W74-07999

DISTRIBUTION OF PHOSPHORUS, SILICA, CHLOROPHYLL A, AND CONDUCTIVITY IN LAKE MICHIGAN AND GREEN BAY,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
D. C. Rousar, and A. M. Beeton.
Transactions of Wisconsin Academy of Science, Arts and Letters, Vol LXI, p 117-140, 1973. 10 fig, 4 tab, 25 ref.

Descriptors: *Phosphorus, *Silica, *Chlorophyll, *Conductivity, *Lake Michigan, Standing crops, Phytoplankton, Wisconsin, Michigan, Illinois, Indiana, Eutrophication, Spatial distribution.
Identifiers: *Green Bay(Wis.), Phaeopigments.

Spatial distribution of total phosphorus, silica, chlorophyll-a, and conductivity were determined by sampling 17 stations in central Lake Michigan and 21 stations in southern Green Bay at various depths. Results were compared with previous data to see if nutrient enrichment had occurred. Lake Michigan water averaged 10.4 micrograms phosphorus/1 as total phosphorus, 1.0 mg silicate/1 as soluble reactive silica, 3.0 micrograms chlorophyll-a/1 as total chlorphyll, and 256.1 micromhos/cm as specific conductance. Green Bay values were 87.8 micrograms phosphorus/1, 0.9 mg silicate/1, 32.9 micrograms chlorophyll-a/1, and 257.7 micromhos/cm as specific conductance. Surface concentrations of phosphorus, chlorophyll, and conductivity varied little in the lake but decreased along a 10 mile transect extending from the mouth of Fox River to a bay station. Silica, uniformly distributed in the bay, showed some inshore-offshore differences in the lake. At most Green Bay stations, vertical differences in parameters tested were minor. In Lake Michigan, conductivity and phosphorus were relatively constant with depth. Silica increased with depth except at one station; chlorophyll was highest at the 30 m depth of 13 of 17 stations. (Jones-Wisconsin)
W74-08000

ECOLOGY OF THE EULITTORAL ZONE O LAKES,
Warsaw Univ (Poland) Lab of Hydrobiology.
E. Pieczynska
Ekologia Polska, Vol 20, No 44, p 637-732. 29 fi 10 tab, 136 ref.

Descriptors: *Littoral, *Ecology, *Lake *Shores, *Shallow water, Organic matte Degradation(Decomposition), Hydrology Physicochemical properties, Primary productiv ty, Light intensity, Thermal properties, Hydro raphy, Sediments, Biological communities, O ygen, Nutrients.
Identifiers: *Eulittoral zone, Masurian Lak land(Poland).

Environmental conditions and biologic processes in the eulittoral--the intermediate zo between lake and surrounding land--of 36 Masu an lakes (eutrophic, mesotrophic, and dystrophi in Poland were analyzed. Characteristics of t hydrological and physicochemical condition regularity of occurrence of plant and animal co munities, production and decompositi processes, and the role of the eulittoral zone in t functioning of lake ecosystems were studie Three sources of organic matter were disti guished: matter produced in the eulittoral by t producer community living in this habitat, acc mulated matter of lake origin (produced elsewhe in the lake and accumulated in the eulittoral due wave action), and accumulated matter of terrest al origin. The eulittoral is characterized by specif biological processes and its role in the lak ecosystem differs from other zones. It is an e tremely differentiated habitat, a typical ecoton in which terrestrial and aquatic organisms a found and also specific organisms. An observe phenomenon is described as the 'edge effect;' it characterized by periodically great prima production rates and is an accumulating 'store' various kinds of matter of terrestrial and aquat origin. Environmental conditions and biologic processes are, to a considerable extent, affecte by water level fluctuations. (Jones-Wisconsin)
W74-08003

PLANKTON PRODUCTION AND WATE QUALITY IN SPANISH RESERVOIRS. FIRS REPORT ON A RESEARCH PROJECT,
Centro de Estudios Hidrograficos, Madrid (Spain
R. Margalef, D. Planas, J. Armengol, J. Toja, and A. Guiset.
Prepared for 21st Congress of International Co mission on Large Dams, June 11-15, 1973, Madri Spain. 46 p, 19 fig, 4 tab.

Descriptors: *Plankton, *Productivity, *Wat quality, *Reservoirs, Nitrogen, Phosphorus, S ica, Diatoms, Bacteria, Eutrophication, Manag ment, Limnology, Phytoplankton, Zooplankto Alkalinity, Indicators, Crustaceans, Trophic lev Distribution, Rotifers.
Identifiers: *Spain, Arcodiaptomus ibericus.

A survey was started of water characteristics Spanish reservoirs and the ecological effects plankton production and composition. The a was to define the impact of the whole ecosyste on the quality of stored water and describe ba characteristics of the dammed rivers or artific lakes. Broadly, Spain consists of tertiary basi limited by sierras of mesozoic limestones; lar areas in the west and especially northwest, as w as some outcrops in the axis of the main mounta ranges are of siliceous materials, paleozoic or i trusive. Nitrogen and phosphorus are usually co sidered limiting factors for primary productio silica may be limiting for diatom growth. So preliminary bacterial counts are summarize More than 50% of the studied reservoirs can considered as eutrophic with a larger proportion the smaller reservoirs in such a conditio

Euthrophy parallels the age of artificial lakes. When several reservoirs are linked in a chain, careful management can lead to an improvement of the water quality. Arcodiaptomus ibericus (Crustacea Copepoda) hitherto undescribed is now common in reservoirs although not found in natural environments; it is described and illustrated. (Jones-Wisconsin)
W74-08005

OXYGEN DEPLETION MODEL FOR CAYUGA LAKE,
California Univ., Berkeley. Dept. of Civil and Environmental Engineering.
J. D. Newbold, and J. A. Liggett.
Journal of the Environmental Engineering Division American Society of Civil Engineers, Vol 100, No EE1, p 41-59, February 1974. 9 fig, 4 tab, 35 ref. NSF Grant GK-23992.

Descriptors: *Oxygen sag, *Mathematical models, Dissolved oxygen, Hypolimnion, Stratification, Eutrophication, Anaerobic conditions, Productivity, Organic matter, Water temperature, Lake morphology, Respiration, Diffusion, New York.
Identifiers: Cayuga Lake(N.Y.).

Depletion of dissolved oxygen from hypolimnia of stratified lakes is both an integral and serious aspect of eutrophication. While it has been established that the degree of deoxygenation is related to productivity, questions remain regarding the specific processes by which the depletion occurs and the quantitative relationships among the thermal structure of a lake, its biological activity, and the resultant oxygen regime. These parameters are related through the use of a mathematical model of Cayuga Lake, New York from which a clearer explanation of the physical and biological processes of oxygen depletion are derived. The limitations of a one-dimensional model are evident and the inclusion of horizontal transport would conform better to reality. However, knowledge of the biological process is the real limiting factor. The model, and others of similar nature, can indicate what the critical parameters might be. In the lowest parts of the lake the benthic demand, still largely unknown, appears to dominate; in the upper parts benthic demand (depending on lake configuration), respiration, and decay all play important parts and interact with diffusion. Obviously an accurate determination of benthic demand would contribute greatly to the construction of a reliable model. (Jones-Wisconsin)
W74-08007

SOURCES, SINKS, AND METHODS OF ANALYSIS OF ORGANIC NITROGEN COMPOUNDS IN FRESH WATER SYSTEMS,
J. A. Kelly.
Available from the National Technical Information Service as ORO-4254-10 $3.75 in paper copy, $1.45 in microfiche. Atomic Energy Commission Report (undated). 28 p, 4 fig, 2 tab, 46 ref.

Descriptors: *Sinks, *Analytical techniques, *Nitrogen compounds, *Organic compounds, Freshwater, Water pollution sources, Industrial wastes, Municipal wastes, Runoff, Metabolism, Agriculture, Nitrogen fixation, Nitrification, Nitrates, Ammonia, Euthrophication, Distillation, Colorimetry, Freezing, Ion exchange, Spectrophotometry, Chromatography, Oklahoma, Odor, Measurement.
Identifiers: Deamination, Lysis, Kjeldahl method, Ultraviolet combustion, Titrimetry, Liquid-liquid extraction, Lake Carl Blackwell (Okla.)

'Basic' trace organics in natural systems are reviewed in order to delineate the significance of their sources, sinks and analytical methods. A major objective of the study is the eutrophication process in Lake Carl Blackwell, Oklahoma, organic nitrogen sources, and its dynamics. Sources include industrial and domestic wastes, natural runoff, and metabolic products of aquatic life and microbial action. A great proportion of organic nitrogen compounds are caught up in a cycle of biological assimilation, decomposition, and inorganic processes in the economy of the ecosystem. Depending upon the efficiency of the community, certain quantities of these and other compounds will be lost. Methods of analysis used for total organic nitrogen are Kjeldahl, ultraviolet combustion, distillation and titrimetry, and colorimetry. In identifying organic nitrogen compounds, concentration is determined by carbon adsorption, liquid-liquid extraction, freezing-out, distillation, and ion exchange. Determination methods are spectrophotometric analysis (visual range, ultraviolet range, infrared) and gas-liquid, paper and thin-layer, and liquid-liquid chromotographic analysis. Basic ecological principles and concepts are illustrated. Some colorimetric methods for the determination of non-aromatic organic nitrogen compounds are tabulated. Characteristics of organic pollution and odors are classified by chemical types. (Jones-Wisconsin)
W74-08008

THE PHOTOSENSITIZING ACTION OF CARCINOGENS. I. THE ACTION OF 2-NAPHTHYLAMINE ON ESCHERICHIA COLI K-12 AND PARAMECIUM CAUDATUM,
Auburn Univ., Ala. Dept. of Chemistry.
S. P. Ellis, R. C. Smith, and W. C. Neely.
Candian Journal of Microbiology, Vol 20, No 2, p 125-129, 1974, 2 fig, 25 ref. OWRR A-017-ALA(4).

Descriptors: *Photoactivation, *Ciliates, Organic compounds, *E. coli, Photysynthesis, Light.
Identifiers: *Photosensitizing, 2-Naphthylamine, *Paramecium caudatum, *Carcinogens.

Cultures of Paramecium caudatum incubated with .0000007 M 2-naphthylamine were rapidly killed when exposed to light of 366 nm. Cultures not exposed to the amine were unaffected by the light; cultures kept in the dark were unaffected by the amine. Escherichia coli K-12 populations were markedly reduced after irradiation of suspensions in water containing .0003 M 2-naphythylamine with light simulating natural sunlight in intensity and wavelength distribution. Suspensions of E. coli in deionized water were unaffected by the light and E. coli suspended in solutions of the amine but kept in the dark were also unaffected. Since 2-naphthylamine is a known water pollutant these results may be of ecological importance.
W74-08095

A SCANNING ELECTRON MICROSCOPIC STUDY OF SECONDARY LAMELLAE AND CHLORIDE CELLS OF RAINBOW TROUT (SALMO GAIRDNERI),
Michigan State Univ., East Lansing. Dept. of Physiology.
K. R. Olson, and P. O. Fromm.
Z. Zellforsch, Vol 143 p 439-449, 1973. 12 fig, 18 ref. OWRR A-064-MICH(2). 14-31-0001-3822.

Descriptors: Chlorides, *Rainbow trout, Analytical techniques, *Electron microscopy.
Identifiers: Scanning electron microscope, *Chloride cells, Gills, *Lamellae, Ultrastructure.

Scanning electron micrographs of gill tissue from rainbow trout fixed with 50% glutaraldehyde revealed the presence of microridges on surfaces of epithelial cells of the secondary lamellae. These microridges vary in length from 1 to 7 microns, with a mean height of 0.75 microns. Calculations show that they increase the total lamellar epithelial surface area approximately 2.5 fold. Mucus secreting cells are present on the body of the filament and on secondary lamellae. Chloride cells are located primarily in the interlamellae filamental epithelium and on the basal area of lamellae. Extensions of the chloride cell epithelium are microvillous in nature and their height is only slightly greater than that of the microridges of typical lamellar epithelial cells. A reduction in number of complete absence of microvilli on chloride cells appeared to be related to degenerative changes in these cells observed in transmission electron micrographs. Non secretory interlamellae filamental epithelial cells have microridges of very attenuated lengths.
W74-08096

TOXICITY OF AN ALGAL COMPLEX ON FRESHWATER FAUNA: 1. ACTION ON SOME BENTHIC ANIMALS AND FISHES. (IN FRENCH),
Lyon-1 Univ., Villeurbanne (France). Laboratoire de Biologie Animaux et d'Ecologie.
S. Michel, J. Gevrey, and J. Wautier.
Bull Soc Sci Vet Med Comp Lyon. Vol 74, No 2, p 185-189, 1972. Illus. English summary.
Identifiers: *Algal, Anodonta, Benthic, Chironomid, *Fauna(Freshwater), Fishes, *France(Lac du Bounget), Microcystis, Pseudanaboena, *Toxicity, Aquatic animals.

The algal complex studied was Microcystis Farlowiana with Pseudanaboena Franquetii, Cyanophyceae that occur in the Lac du Bourget (Savoie) in France and that inhibit benthic fauna in their environment. Experiments showed that 1 or several toxic factors liberated after death of the algal cells can kill fish, chironomid larvae and mollusks (Anodonta spp.). Chemical composition of the toxic factor is being studied.--Copyright 1973, Biological Abstracts, Inc. (See also W74-08109)
W74-08108

TOXICITY OF AN ALGAL COMPLEX ON FRESHWATER FAUNA: 2. ACTION ON LYMNAEA SPP. (IN FRENCH).
Ecole Nationale Veterinaire de Lyon (France). Laboratoire de Recherches de la Chaire of Parasitologie.
J. Gevrey, S. Michel, and J. Euzeby.
Bull Soc Sci Vet Med Comp Lyon. Vol 74, No 2, p 191-194, 1972. English summary.
Identifiers: *Algal, *Fauna(Freshwater), Lymnaea-auricularia, *Lymnaea-spp, Lymnaea-truncatula, Microcystis, Pseudanaboena, *Toxicity, Water pollution effects.

The algal Cyanophyceae complex Microcystis Farlowiana + Pseudanaboena Franquetii was tested in laboratory against L. auricularia and L. truncatula. Algae were used after being heated, frozen and thawed, dessicated, pulverized or disintegrated by an ultrasonic apparatus. Only lysed cells are toxic; and within 48 h, they kill the snails after paralyzing them. The toxic factor is thermoresistant (100C) and water soluble.--Copyright 1973, Biological Abstracts, Inc. (See also W74-08108)
W74-08109

SPECIES COMPOSITION OF EPIPHYTIC BACTERIA OF GREEN FILAMENTOUS ALGAE IN THE NORTHERN DONETS-DONBAS CANAL, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
G. N. Oleinik.
Gidrobiol Zh. Vol 8, No 5, p 97-99, 1972.
Identifiers: *Algae, *Bacteria(Epiphytic), Canals, Cladophora-fracta, Enteromorpha-intestinalis, Filamentous, Species, Spirogyra-sp, *USSR(Donets-Donbas canal), Chlorophyta.

An investigation of N. Donets-Donbas canal showed that the species composition of heterotrophic bacteria inhabiting the surface of green filamentous algae (Cladophora fracta, Enteromorpha intestinalis, and Spirogyra sp.) is rich.--Copyright 1973, Biological Abstracts, Inc.
W74-08112

LIMNOLOGICAL OBSERVATIONS ON THE 'NATIONAL WATERSPORTBAAN GEORGES

NACHEZ' AT GHENT IN 1968, 1969, 1970 AND 1971,
Rijksfaculteit der Landbouwwetenschappen, Ghent (Belgium).
J. De Maeseneer.
Meded Fac Landbouwwet Rijksuniv Gent. Vol 37 No 1, p 289-313, 1972. Illus.
Identifiers: *Belgium(Ghent), Biological studies, Chemical studies, Fish, *Limnological studies, *Mortality(Fish), Physical studies, Water pollution effects.

Various physical, chemical and biological aspects of the 'Nationale Watersportbaan Georges Nachez' at Ghent (Belgium) were studied. This stagnant water has beta-mesosaprobic characteristics. The chemistry and biology of the water was influenced by the extensive fish-mortality that occurred on Dec. 17, 1969.--Copyright 1973, Biological Abstracts, Inc.
W74-08113

INVESTIGATIONS ON THE OCCURRENCE OF PHENOL-DECOMPOSING MICROORGANISMS IN WATERS AND SEDIMENTS. (IN GERMAN),
Kiel Univ. (West Germany). Institut fuer Meereskunde.
R. Iturriaga, and G. Rheinheimer.
Kiel Meeresforsch. Vol 28, No 2, p 213-218, 1972. Illus. English summary.
Identifiers: Baltic Sea, *Decomposing organic matter, *Micro organisms, *Phenols, Polluted waters, Rivers, Season, Sediments, Temperature, *West Germany.

In the Baltic and the North Sea, as well as in the small Schwentine river, experiments were made on the presence of microorganisms which decompose phenol. For this purpose, a method of determining the phenol-degradation capacity of water and sediment samples was worked out. Phenol-oxidizing microorganisms were present in polluted waters in the summer as well as in the winter. Microbial decomposition of phenol takes place mainly during the warm season at water temperatures above 10C. At the outer end of the Kiel-fjord (West Germany) the capacity to degrade phenol increased in the spring and summer with the temperature of the water. In the open Baltic and North Sea, phenol-decomposers were found only in some sediment samples, not, however, in the water.--Copyright 1973, Biological Abstracts, Inc.
W74-08115

RELICS OF THE BOGGY VEGETATION IN SODIC TERRITORIES, (IN HUNGARIAN),
Lajos Kossuth Univ., Debrecen (Hungary). Dept. of Botany.
For primary bibliographic entry see Field 2H.
W74-08122

EFFECT OF ORGANIC AND INORGANIC FERTILIZERS ON THE GROWTH AND DEVELOPMENT OF JUVENILE CARP IN SPAWNING PONDS, (IN RUSSIAN),
V. A. Vlasov.
Dokl Mosk S-Kh Akad Im K A Timiryazeva. 181, p 220-223. 1972.
Identifiers: *Carp(Juveniles), *Fertilizers, *Growth, Inorganic fertilizers, Organic fertilizers, Ponds(Spawning).

Faster growth of juvenile carp was noted in fertilized ponds. The weight of food in the intestine as percent of body weight was 1650% as opposed to 985% in the unfertilized ponds.--Copyright 1973, Biological Abstracts, Inc.
W74-08124

PRIMARY PRODUCTION AND RESPIRATION OF THE PHYTOPLANKTON OF THE RIVERS THAMES AND KENNET AT READING,
Warsaw Univ. (Poland). Dept. of Hydrobiology.
A. Kowalczewski, and T. J. Lack.
Freshwater Biol. Vol 1, No 2, p 197-212. 1972. Illus.
Identifiers: Chlorophyll, Light, Pheo pigments, *Phytoplankton, *Primary production, *Respiration, Rivers, Seasonality, Solar radiation, Dark bottle technique, *United Kingdom(Thames-Kennet Rivers).

During the period April 1967-April 1968 the phytoplankton production and respiration of the River Thames and its tributary, the River Kennet(England), were measured at approximately 2-wk intervals using the light and dark bottle technique. Concentrations of chlorophyll and pheopigment were determined weekly. On 14 occasions, sets of light and dark bottles were rotated in a specially designed apparatus, and production and respiration values obtained were 1.38 plus or minus 0.31 times higher than in stationary bottles at identical depths over the same period. There are little horizontal, vertical or diurnal variation in chlorophyll concentration. Peaks of chlorophyll were found in spring, summer and autumn in the Thames (max. 219 mg/m3) but there was very little variation in the Kennet (max. 38.2 mg/m3). Pheopigment concentration was low in both rivers for most of the period, although the Kennet this represented on average 50% of the pigments present. In the Thames, a peak of pheopigments (133.5 mg/m3) was associated with the autumnal bloom and represented 61% of the total pigments. No pheopigments were detected during the spring bloom. The average concentration of suspended organic matter was identical in both rivers but in the Thames over 25% was due to phytoplankton and in the Kennet almost 95% was non-algal. In the Thames, net oxygen production reached a peak in May and was negative from Nov. to Feb. In the Kennet, maximum production also occurred in May but was negative from the middle of May until the following March. The average annual net production was 1250 and -78 g O2/m2 in the Thames and Kennet respectively. Respiration rates showed similar fluctuations, 4.59 g O2/m2/day in spring in the Thames to 0.09 g O2/m2/day in Nov. The Kennet was almost always lower (1.05-0.34 g O2/m2/day). The average annual respiration was almost 3 times higher in the Thames than in the Kennet (641-228 g O2/m2). Various factors which might influence production are discussed.--Copyright 1973, Biological Abstracts, Inc.
W74-08132

INVESTIGATIONS ON THE OCCURRENCE AND DECOMPOSITION OF FATS AND FATTY ACIDS IN LAKES, (IN GERMAN),
Biochemisches Institut Umweltcarciogene, Ahrensburg (West Germany).
J. Poltz.
Arch Hydrobiol Supplement B. Vol 40, No 4, p 315-399. 1972, Illus. (English summary).
Identifiers: *Bacteria, *Decomposition(Organic matter), *Fats, *Fatty acids, Lakes, Phytoplankton, Zooplankton, Lake sediments.

The main proportion of particulate organic matter, lipids, fatty acids, and triglycerides in lakes derives from the phyto -and zooplankton. A part of those substances in the seston, and especially in the sediments, originates in bacteria. The most rapid decomposition takes place in the epilimnion, in the hypolimnion and in the sediments it is much slower. The main decomposition and alterations in the sediments are found in the surface layer of the sediments according to the distribution of bacteria.--Copyright 1973, Biological Abstracts, Inc.
W74-08141

SEASONAL CHANGES OF BENTHOS ALGAE OF THE HIGHER PART OF VORSKLA RIVER, (IN RUSSIAN),
Leningrad State Univ. (USSR).
A. S. Shaaban.
Vestn Leningr Univ Ser Biol. Vol 27, No 3, p 63-67. 1972, Illus. (English summary).
Identifiers: *Algae Bacillariophyta *Benthos Chlorophyta, Cyanophyta, Euglenophyta Rivers Saprobity, *Seasonal *USSR(Vorskla River) Water pollution effects

Benthos algae of Vorskla river, USSR, were studied in the Belgorod region at 3 points in the course of 6 mo from April to Sept 1969 and 1970. From 6 divisions of algae, 267 taxa were identified. Benthos algae of the river have a diatom character during the periods of collection. The quantity of Chlorophyta, Euglenophyta, Cyanophyta and Bacillariophyta increases with the increase of water temperature. Each of dominants taxa of different divisions of algae has maximum growth at the different seasonal periods of the year. It can be shown also that phytobenthos at sampling points 1 and 2 by systematical composition and dominant taxa are similar, but at point 3 systematical composition was less varied and the number of separate species especially by Cyanophyta and Euglenophyta rather lower. This difference is probably due to the fact that at point 3 the river is deeper and the saprobity of the water is lower.--Copyright 1973, Biological Abstracts, Inc.
W74-08142

DETERMINATION OF COUNTING EFFICIENCY BY 14C BY LIQUID SCINTILLATION IN PRIMARY PRODUCTION MEASUREMENTS IN A LAGOON ENVIRONMENT, (IN FRENCH),
Tunis Univ. (Tunisia). Laboratoire d'Oceanographie.
For primary bibliographic entry see Field 5A.
W74-08143

ENVIRONMENTAL STRESS IN THE PASTURE SCARAB SERICESTHIS NIGROLINEATA BOISD.: MORTALITY IN LARVAE CAUSED BY HIGH TEMPERATURE,
Commonwealth Scientific and Industrial Research Organization, Armidale (Australia). Pastoral Research Lab.
R. L. Davidson, J. R. Wiseman, and V. J. Wolfe.
J Appl Ecol. Vol 9, No 3, p 783-797. 1972, Illus.
Identifiers: Environmental stress, *Larvae mortality, *Scarab(Pasture), *Sericesthis Nigrolineata, *Thermal stress, *Thermal pollution

First- and 2nd-instar larvae of S. nigrolineata (Scarabaeidae; Coleoptera) were exposed for short periods to temperatures between 30-45C, to define empirically the effects of duration, number of exposures and recovery periods on mortality. The data are needed to collate field microclimate measurements to predict larval survival in the field. At moderate soil moistures the longest exposure to 30C (192 hr) was harmless and the shortest exposure to 40C (45 min) was lethal. Above 30C, the effect of temperature for any one duration of exposure was exponential. At any one temperature the relationship between duration of exposure and mortality appeared to be linear, but the gradients between the 2.5C temperature intervals were too steep to be clearly defined. Repeated exposures to sublethal temperatures caused a slightly lower percentage mortality than at the previous exposure to the same temperature. When the interval between repeated exposures was extended from 1 day to 2 or 4 days the mortality was slightly less than that after the same number of exposures on consectuvie days, but the difference was not statistically significant over all temperatures. All these exposures to temperature stress were in soil with moisture contents above wilting point. No temperature X moisture interaction occurred. (See also W74-08147)--Copyright 1973, Biological Abstracts, Inc.
W74-08146

ENVIRONMENTAL STRESS IN THE PASTURE SCARAB SERICESTHIS NIGROLINEATA BOISD.: II. EFFECTS OF SOIL MOISTURE

AND TEMPERATURE ON SURVIVAL OF FIRSTINSTAR LARVAE,
Commonwealth Scientific and Industrial Research Organization, Armidale (Australia). Pastoral Research Lab.
R. L. Davidson, J. R. Wiseman, and V. J. Wolfe.
J Appl Ecol. Vol 9, No 3, p 799-806. 1972, Illus.
Identifiers: Environmental stress, Instar larvae, Molting, *Scarab(Pasture), *Sericesthis-Nigrolineata, Survival, *Soil moisture, *Soil temperature.

First-instar larvae of S. nigrolineata were exposed, for various periods of up to 8 days, to a range of soil moistures equivalent to pF 1-5.8 at temperatures from 16-45C. Maximum survival occurred at pF 2.7-4.2, equivalent to soil moistures of 5-10% in silt and 6-12% in loam. In drier soil, water loss was rapid, and most larvae died in one day. Increasing temperature in the range 16-30C caused a greater mortality in dry soil. In soils moister than pF of 2.7 there was a significant increase in mortality after 2 and 4 days exposure, but the causes of death could not be identified. After all treatments the larvae were maintained under optimum conditions until after ecdysis. No residual effect of temperature or moisture stress was apparent from a comparison of survival data before and after molting. (See also W74-08146)--Copyright 1973, Biological Abstracts, Inc.
W74-08147

5D. Waste Treatment Processes

IRRIGATION OF CITRUS WITH CITRUS WASTE WATER,
Florida Univ., Lake Alfred. Inst. of Food and Agricultural Sciences.
R. C. J. Koo.
Available from the National Technical Information Service as PB-232 046, $4.00 in paper copy, $1.45 in microfiche. Florida Water Resources Research Center, Gainesville, Publication No 28, March 1974. 73 p, 7 fig, 17 tab, 28 ref, 4 append. OWRR A-016-FLA(1). 14-31-0001-3209, 14-31-0001-3509, and 14-31-0001-3809.

Descriptors: *Irrigation, *Waste water disposal, Plant growth, Soil moisture, Leachate, *Citrus, Return flow, *Florida, *Water reuse, Soil profiles, Path of pollutants, Waste water treatment.

Several citrus scion-rootstock combinations were grown in greenhouses for 3 years and irrigated with treated waste water from 2 citrus processing plants in central Florida. No harmful effects were observed from the use of treated citrus waste water. Supplemental fertilization was necessary to sustain the trees because treated citrus waste water was low in nutrients. Observations of young and mature citrus trees irrigated with untreated citrus waste water under field conditions indicated that it is feasible to grow citrus with citrus waste water. Both quantity and quality of the waste should be considered in the design and management of irrigation systems for disposal of waste water. Soil in the citrus grove served as a filtering system to waste water. A marked reduction in the BOD, COD, and N contents were found as the waste water percolated through the soil profile. The results were similar to that obtained by biological treatment of citrus waste water by aeration. Fruit juice quality was not affected by irrigating with citrus waste water. Soil analysis showed little change from samples collected before and after citrus processing seasons. Leaf analysis showed absorption of N, K, and Na in trees irrigated with citrus waste water. The potential practical applications of the data are discussed. (Morgan-Florida)
W74-07603

PART I - A CONCEPTUAL MODEL FOR A TERRESTRIAL ECOSYSTEM PERTURBED WITH SEWAGE EFFLUENT, WITH SPECIAL REFERENCE TO THE MICHIGAN STATE UNIVERSITY WATER QUALITY MANAGEMENT PROJECT; PART II - A PERSONALIZED BIBLIOGRAPHI C RETRIEVAL PACKAGE FOR RESOURCE SCIENTISTS,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
W. H. Conley, and A. R. Tipton.
Available from the National Technical Information Service as PB-232 002, $5.50 in paper copy, $1.45 in microfiche. Completion Report, Michigan Institute of Water Research, East Lansing (November 1973), 140 p. OWRR A-063-MICH(1). 14-31-0001-3522.

Descriptors: *Waste water disposal, *Effluents, *Sewage treatment, Ecosystems, Management, *Land disposal, Irrigation, *Bibliographies, Model studies, *Information retrieval, Water quality, Water reuse.

Part I contains discussions of management and design problems, components of terrestrial ecosystems, and specific site descriptions, all as they pertain to the sewage effluent spray program of the Michigan State University Water Quality Management Project. Part II is a description of a 2,500 citation bibliography specifically oriented towards sewage effluent treatments. A retrieval system is currently operative and available for interested researchers.
W74-07606

USING SEWAGE EFFLUENT AND LIQUID DIGESTED SLUDGE TO ESTABLISH GRASSES AND LEGUMES ON BITUMINOUS STRIP-MINE SPOILS,
Pennsylvania State Univ., University Park. School of Forest Resources.
W. E. Sopper, L. T. Kardos, and B. R. Edgerton.
Available from the National Technical Information Service as PB-232 069, $5.00 in paper copy, $1.45 in microfiche. Pennsylvania Institute for Research on Land and Water Resources, University Park, Research Project Technical Completion Report, March 1974. 153 p, 19 fig, 58 tab, 43 ref. OWRR B-047-PA(3). 14-31-0001-3639.

Descriptors: *Strip mine wastes, Sewage, Effluents, Sludge, Lysimeters, Grasses, Legumes, Metals, Acidity, Nitrogen, Leachate, *Sewage disposal, Spoil banks, *Vegetation establishment, Liquid wastes, *Water reuse, *Sludge treatment.

Six large lysimeters were filled with strip-mine spoil material. The spoil was then seeded with 8 grass and 8 legume species and then treated with sewage effluent and liquid digested sludge at the following treatment rates: control (no treatment), one-inch effluent plus one-inch sludge combination (1E + 1S), and two-inch effluent plus two-inch sludge combination (2E + 2S). The spoil was irrigated weekly during the period May 24 to September 21, 1972. The results indicated that treatment ameliorated the harsh site conditions and greatly facilitated establishment of the grasses and legumes. The grasses did much better than the legumes in both dry matter production and percent areal cover of the spoil. Weeping lovegrass and Blackwell switchgrass gave the best growth response of the grasses with 11,067 and 4,689 pounds of dry matter per acre, respectively, with the 2E + 2S treatment. Bristly black locust gave the best growth of the legumes with 1812 pounds per acre averaged over both treatment rates. Weeping lovegrass, Blackwell switchgrass, Reed canarygrass and deertongue gave the best percentage cover of the spoil with 100, 100, 100 and 96 percent areal cover respectively on the 2E + 2S treatment. Ladino clover (99), bristly black locust (90), Iroquois alfalfa (90), sericea lespedeza (90), and sweet clover (90) also gave good cover on the 2E + 2S treatment. Highest concentrations of metals and lowest concentrations of nitrogen were found in leachate from the control spoil. Leachate from spoil receiving the 2E + 2S treatment had the lowest concentrations of metals and acidity, and the highest concentrations of nitrogen, more favorable for grass and legume establishment.
W74-07612

WATER QUALITY AND TREATMENT OF DOMESTIC GROUNDWATER SUPPLIES,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 5F.
W74-07637

ESTIMATION OF IMPERVIOUSNESS AND SPECIFIC CURB LENGTH FOR FORECASTING STORMWATER QUALITY AND QUANTITY,
Metropolitan Washington Council of Governments, Washington, D.C. Dept. of Health and Environmental Protection.
For primary bibliographic entry see Field 5B.
W74-07640

A STREAMFLOW MODEL FOR METROPOLITAN PLANNING AND DESIGN,
Metropolitan Sanitary District of Greater Chicago, Ill.
For primary bibliographic entry see Field 2A.
W74-07721

WATER RESOURCES MANAGEMENT FOR METROPOLITAN WASHINGTON: ANALYSIS OF THE JOINT INTERACTIONS OF WATER AND SEWAGE SERVICE, PUBLIC POLICY AND LAND DEVELOPMENT PATTERNS IN AN EXPANDING METROPOLITAN AREA.
Metropolitan Washington Council of Governments, D.C.
For primary bibliographic entry see Field 6B.
W74-07723

APPENDICES TO WATER RESOURCES MANAGEMENT FOR METROPOLITAN WASHINGTON: ANALYSIS OF THE JOINT INTERACTIONS OF WATER AND SEWAGE SERVICE, PUBLIC POLICY, AND LAND DEVELOPMENT PATTERNS IN AN EXPANDING METROPOLITAN AREA.
Metropolitan Washington Council of Governments, D.C.
For primary bibliographic entry see Field 6B.
W74-07724

PRICING OF INDUSTRIAL WASTEWATER TREATMENT SERVICE,
Connecticut Univ., Storrs. Dept. of Agricultural Economics.
R. L. Leonard.
Available from the National Technical Information Service as PB-232 185, $6.75 in paper copy, $1.45 in microfiche. Connecticut Institute of Water Resources, Storrs, Report No 20, November 1973, 64 p, 8 tab, 38 ref, 4 append. OWRR B-006-CONN(1). 14-31-0001-3266.

Descriptors: *Pricing, *Industrial water, *Computer models, *Waste water treatment, Municipal wastes, Biochemical oxygen demand, Chemical oxygen demand, Capital costs, Operating costs, Maintenance costs, Marginal costs, Mathematical models, Simulation analysis, Activated sludge, *Treatment facilities, *Pollution taxes(Charges).
Identifiers: Waste water management, Effluent charges, Pricing parameters, Contaminants, Loading rates.

A component pricing method was developed for allocating actual treatment costs in proportion to the marginal cost for industry's volume and each priced contaminant. The component pricing system can be applied to capital cost as well as operating and maintenance cost. Charges are usually in the form of surcharges based on the weight of selected contaminants in excess of specified concentrations. A charge for volume and for the entire weight of each priced contaminant is

recommended. The selection of pricing parameters depends on the treatment process and wastewater characteristics. Biochemical oxygen demand (BOD) and suspended solids despite limitation are the major current and classical cost determinants for conventional primary and secondary treatment and have been the most common pricing parameters. More comprehensive measures of pollutional content are needed for allocating the cost of more advanced treatment processes to account for dispersed and difficult to degrade materials that can enter the aquatic environment. Cost data and computer models developed for preliminary design of water pollution control facilities can be used in estimating component marginal costs. A management model was derived from a design model. The operation of an existing treatment plant was simulated, and estimates of treatment were encouraging, but additional comparison of simulation results with operating plants is recommended. (Heltgott-Connecticut)
W74-07727

ACTIVATED SILICA IN WASTEWATER COAGULATION,
Michigan Univ., Ann Arbor. Environmental and Water Resources Engineering.
W. J. Weber, Jr., and L. H. Ketchum, Jr.
Available from the National Technical Information Service as PB-232 454, $11.50 in paper copy, $1.45 in microfiche. Environmental Protection Agency, Athens, Georgia, Report EPA-670/2-74-047, June 1974. 146 p, 52 fig, 6 tab, 81 ref. EPA Grant 17030 DUW.

Descriptors: *Waste water treatment, *Coagulation, *Silica, Lime, *Alkalinity, Phosphates, Calcium, Sewage treatment, Storm water.
Identifiers: *Activated silica, *Lime treatment, Low alkalinity waste waters, *Chemical treatment.

The role of activated silica in coagulation of wastewaters with lime was examined. Laboratory studies were conducted on synthetic wastewaters to simulate certain wastewater characteristics and verification studies were conducted on samples of natural waters and wastewaters. For high alkalinity wastewaters activated silica provides no substantial benefit; reasons for the loss of effectiveness are discussed. For low alkalinity wastewaters however, significant (3 to 10-fold) reduction in lime requirement is possible; the addition necessary to accomplish this lime reduction is small, 2 to 4 mg/l as SiO2. In low alkalinity wastewaters high in phosphate concentration (approximately 7 mg/l as PO4) coagulation is accomplished with low lime addition only; multinuclear silica is as effective and in most cases more effective than activated silica. Activated silica-lime coagulation carries no risk of adding foreign materials to the treated water in the event of chemical carry-over; and it adds no anionic salts to the treated water, only hydroxide is added which may be neutralized by acids if the resulting pH is too high. This treatment scheme is proposed for low alkalinity wastewaters; it may provide a convenient method of treating storm and combined sewer discharges which are commonly low in alkalinity. (EPA)
W74-07738

ADSORPTION FROM AQUEOUS SOLUTION,
Michigan Univ., Ann Arbor. Environmental and Water Resources Engineering.
W. J. Weber, Jr., and P. J. Usinowics.
Available from the National Technical Information Service as PB-232 453, $15.00 in paper copy, $1.45 in microfiche. Environmental Protection Agency, Cincinnati, Ohio, Report EPA-670/2-74-012, June 1974. 236 p, 130 ref, 4 append. EPA Project 17020 EPF.

Descriptors: *Waste water treatment, *Mathematical models, *Activated carbon, *Kinetics, *Adsorption, *Forecasting, Model studies, Chemical oxygen demand, Mixing.

A model based on material balance concepts and second-order reaction kinetics is presented for prediction of the performance of expanded-bed adsorption systems for treatment of complex mixtures of dissolved organic materials in aqueous solution. The model utilizes system parameters measured or calculated from bench-scale batch experiments, correlative techniques, and hydrodynamic considerations. The major focal point of these investigations is the description of the mixtures as composite solutes by using an overall concentration parameter (chemical oxygen demand, COD) and mathematical treatment of the mixtures as single-solute systems for prediction of continuous flow adsorber breakthrough profiles. (EPA)
W74-07739

OXYGENATION OF AQUEOUS BODIES USING LIQUID OXYGEN-LOXINATION,
Midwest Research Inst., Kansas City, Mo.
T. D. Bath, W. Garner, and A. E. Vandegrift.
Available from the National Technical Information Service as PB-232 455 $6.00 in paper copy, $1.45 in microfiche. Environmental Protection Agency, Report EPA-670/2-74-048, June 1974. 52 p, 14 fig, 8 tab, 50 ref. Project EPA 17050 EEY 14-12-168.

Descriptors: *Oxygenation, *Waste water treatment, *Aeration, *Aerobic treatment, Environmental engineering, Oxygen demand, Oxygen requirements, Pollution abatement, Waste assimilative capacity, *Water pollution control.
Identifiers: *Liquid oxygen, Loxination, Mass transport coefficient, Sorption efficiency.

An experimental system was designed, constructed, and tested for the introduction of oxygen in the liquid state (LOX) into a body of water at 7 to 30C. The sorption of LOX, both by static water columns and by flowing water columns, was examined. Sorption efficiency and mass-transfer coefficients were calculated. Under experimental conditions investigated, these coeffiecients did not appear significantly different from those observed for gaseous oxygen. Water temperature, initial dissolved-oxygen concentration, and shear at the point of oxygen injection were less significant in affecting the mass-transfer coefficients than was gross water turbulence. The mass-transfer coefficients correlated with the corresponding Reynolds number. (EPA)
W74-07741

BOD, SOLIDS AND NUTRIENT REMOVAL BY FOAM FLOTATION,
San Jose Dept. Public Works, Calif.
E. R. Becker.
Available from the National Technical Information Service as PB-232 184 $7.00 in paper copy, $1.45 in microfiche. Environmental Protection Agency, Cincinnati, Ohio, Report EPA-670/2-73-096, June 1974. 71p, 20 fig, 10 tab, 11 ref. EPA Grant WPRD 30-01-67.

Descriptors: *Sewage treatment, *Biochemical oxygen demand, *Nutrient removal, *Flotation, *Waste water treatment, *Suspended solids, Effluents, Water pollution(Treatment), Phosphorus, Costs, Treatment facilities.
Identifiers: *Foam flotation.

The results of a field demonstration project to investigate the removal of BOD, suspended solids and nutrients from a secondary effluent flowstream by the foam flotation process are presented. Two major tasks were accomplished: (1) operation of and the accumulation of data from a 0-10 gpm foam flotation pilot plant using secondary effluent from the San Jose-Santa Clara Water Pollution Control Plant, and (2) economic evaluation of the foam flotation process. It was found that efficient phosphorus and suspended solids removals and an improved effluent saturated with oxygen could be effected by the foam flotation process. Based on a 10 MGD plant, the projected costs for the foam flotation process were shown to be 5.76 cents/1000 gallons for chemicals and power. (EPA)
W74-07742

TREATMENT METHODS FOR HEAVY METAL-CONTAINING LIQUID WASTE (IN JAPANESE),
T. Ishihara.
PPM, Vol 5, No 2 p 26-33, February, 1974. 10 fig, 1 tab, 13 ref.

Descriptors: *Waste water treatment, Reduction(Chemical), Oxidation, *Biological treatment, Adsorption, Flotation, Neutralization, Liquid wastes, *Heavy metals, *Waste treatment.
Identifiers: Sulfurization.

Neutralization, sulfurization, reduction, oxidation, biological treatment, ion flotation, and adsorption are discussed with respect to heavy metal-containing liquid wastes. The neutralization method, in which metal ions in solution are settled and form hydroxides, is the most widely used for recovering heavy metals. Other methods are usually applied in combination with the neutralization method either as pretreatment (biological, oxidation, or reduction), or post-treatment (adsorption or sulfurization) methods. (Sanduski-Franklin)
W74-07745

THE TREATMENT OF WASTE WATER FROM INDUSTRIES AND COMMERCE IN PUBLIC PURIFICATION PLANTS (IN GERMAN),
Kantonales Amt fuer Gewasserschutz, Sankt Gallen (Switzerland).
R. Ott.
Industrieabwaesser, p 8-11, 1973. 6 ref.

Descriptors: *Waste water treatment, *Treatment facilities, *Activated sludge, Domestic wastes, *Industrial wastes, *Feasibility studies, Efficiencies, *Water purification.
Identifiers: *Joint treatment.

Most domestic wastewater can be treated in public purification plants without problems and in these mechanical-biological plants a balance can be maintained which is disturbed only by the entry of industrial wastewater. Thus industrial wastewater must be analyzed and its effect on the purification process studied prior to its discharge to an existing facility if feasible. If the facility is inadequate, the wastewater goes to a regional purification plant. For joint treatment of industrial and domestic wastewater, certain procedures and requirements, detailed herein, must be followed. (Sanduski-Franklin)
W74-07748

REVERSE OSMOSIS PROCESS AND ITS APPLICATION, (IN JAPANESE),
K. Mori, and H. Tsuge.
Kobe Steel Engineering Reports, Vol 24, No 1, p 20-26, January, 1974. 12 fig, 2 tab, 54 ref.

Descriptors: *Waste water treatment, *Ion exchange, Research and development, *Reverse osmosis, *Heavy metals, Separation techniques, Reviews, Industrial wastes, *Membrane processes.
Identifiers: *Japan(Kobe).

The status of research on reverse osmosis is briefly reviewed. Recent work conducted at Kobe Steel Ltd. which includes preparation of semipermeable membranes and separation of heavy metal ions from plating rinse water is discussed. (Sanduski-Franklin)
W74-07750

THE DESIGN, PLANNING AND CONSTRUCTION OF A 45 INCH DIAMETER WATER MAIN ACROSS A CONGESTED AREA OF WEST BROMWICH,
South Staffordshire Waterworks Co. (England). Distribution Dept.
For primary bibliographic entry see Field 8A.
W74-07751

THE SNODLAND-IGHTHAM REGIONAL DRAINAGE SCHEME: DESIGN AND OPERATION,
R. W. Kellock.
Water Pollution Control, Vol 72, No 8, p 658-665, 1973. 7 tab.

Descriptors: *Sewage treatment, *Treatment facilities, Pumping plants, Flow measurement, Equipment, Sludge treatment, *Operation and Maintenance, *Data collections, Performance, *Waste water treatment.
Identifiers: Facilities extension, *United Kingdom(Snodland-Crouch).

As a result of investigations since the late 1950's, extension to the treatment works at the Snodland and Crouch areas has been undertaken. There are six pumping stations and six ejector stations conveying sewage a maximum of 16 km. All stations are of a standard design, fitted with dataphonic equipment, and maintained by one crew of two men. Sewage treatment is examined together with equipment employed at the facilities. Sludge treatment and operational procedures are examined. (Sandoski-Franklin)
W74-07752

A SIMPLE METHOD FOR RETENTION BASIN DESIGN,
Oakland County Drain Commissioner's Office, Pontiac, Mich.
G. Yrjanainen, and A. W. Warren.
Water and Sewage Works, Vol 120, No 12, p 35, 41-42, December, 1973.

Descriptors: *Storm runoff, Retention, *Design criteria, *Mathematical studies, Outlets, *Storage requirements, *Treatment facilities.
Identifiers: *Retention basins.

Due to the development of land for agrarian, residential, commercial, or industrial use, the temporary storage of storm runoff in an onsite retention basin has become essential because of inadequate outlets for the increased storm runoff created. Because of ever increasing construction costs and the infeasibility of installing large-diameter storm drains, the concept of ultimate design or improvement of collector storm water system water systems is impractical. Thus, retention basins that meter or restrict flow, are adequate alternatives. Design methods, mathematical derivation for an orifice outlet, derivation for a constant rate outlet, and the retention basin design criteria are given. (Sanduski-Franklin)
W74-07753

AUTOMATION OF THE CONTROL AND OPERATION OF WATER POLLUTION CONTROL WORKS,
Norwich Sewage Treatment Works (England).
P. Cotton.
Water Pollution Control, Vol 72, No 8, p 635-657, 1973. 25 ref.

Descriptors: *Automation, Equipment, *Water pollution control, Data collections, Operation and maintenance, *Computers, Computer programs, Control systems, Filtration, Sedimentation, Equipment, Activated sludge, Sludge treatment, Sludge disposal, *Sewage treatment, Biological treatment.
Identifiers: *United Kingdom.

The development of automation for water pollution control does not appear to have matched that in many other industries due mainly to the following factors: inadequacy in fundamental process design knowledge; lack of investment and hence development in process-control equipment; lack of coordination between plant designers and plant operators; relatively wide range of flow rates coupled with the rapid changes in character and strength of crude sewage; and, methods of financing both capital and running expenses of sewage treatment. Existing and potential systems of automation of individual process units are discussed with respect to their coordination in providing a greater degree of automatic operation. The function and expected advantages of the computer-controlled system at Norwich, England is described. (Sanduski-Franklin)
W74-07758

REDEVELOPMENT OF HAVEN SEWAGE-TREATMENT WORKS, COLCHESTER,
R. Suriyadasa.
Water Pollution Control, Vol 72, No 8, p 693-704, 1973. 6 tab, 1 ref.

Descriptors: *Sewage treatment, *Treatment facilities, Equipment, Pumping plants, Storage tanks, *Storm runoff, Sedimentation, Biological treatment, Activated sludge, Tertiary treatment, Sludge treatment, Sludge disposal, Powerplants, *Control systems, *Costs, Waste water treatment.
Identifiers: Facilities extension, *United Kingdom(Colchester).

Redevelopment of the Haven sewage treatment works, constructed in 1884, was initiated in 1901, completed in November 1970, and stressed mainly extensions to the main drainage system and sewage treatment works. Described are the low-level pump house, sewage treatment, sludge treatment and disposal, power generation, central control, aesthetics, and costs. (Sanduski-Franklin)
W74-07759

LIME STABILIZATION OF PRIMARY SLUDGES,
National Environmental Research Center, Cincinnati, Ohio.
J. B. Farrell, J. E. Smith, Jr., S. W. Hathaway, and R. B. Dean.
Journal Water Pollution Control Federation, Vol 46, No 1, p 113-122, January, 1974. 3 fig, 9 tab, 15 ref.

Descriptors: *Sludge treatment, *Treatment facilities, *Pilot plants, Investigations, Iron, *Lime, Pathogenic bacteria, Aluminum, Filtration, Hydrogen ion concentration, Odor, *Waste water treatment, Water pollution control, Effluents, *Ohio.
Identifiers: *Chemical treatment.

Preliminary studies conducted on sludges supplied by the Lebanon, Ohio wastewater treatment facility's pilot plant operation indicated that costs of lime treatment would be low, pathogens and odor greatly reduced, and filterability improved. These findings led to lime treatment of sludge on a plant scale during alum and iron addition experiments. The following results are reported: lower sludge solids are obtained when alum and iron are added to the primary clarifier; the addition of lime to alum and iron chemical-primary sludges increases the vacuum filter yields to reasonable rates; lime addition does not make the sludges chemically stable; and the pH eventually falls and surviving bacteria may return if conditions are favorable, yet lime treatment of sludge raising it to a pH of 11.5 reduces bacterial hazard to a negligible value. (Sanduski-Franklin)
W74-07760

MAJOR WASTEWATER TREATMENT PLANT TO BE UPGRADED,
Malcolm Pirnie, Inc., White Plains, N.Y.
J. H. Foster.
Public Works, Vol 104, No 12, p 47-50, December 1973. 2 fig, 3 tab.

Descriptors: *Waste water treatment, *Sewage treatment, *Treatment facilities, Economic efficiency, *Construction costs, Nitrification, Laboratory tests, Phosphorus, *Design criteria, Sedimentation, Activated sludge, Filtration, Disinfection.
Identifiers: *Cleveland(Ohio), Phosphorus removal.

Cleveland, Ohio's Southerly Treatment Plant, in meeting the most cost effective solution, is an example of designing to meet high effluent quality standards where major financial investments were required to modify facilities that have been outmoded according to present regulations. As a prelude to finalizing design concepts and selection of unit treatment processes, prototype and bench scale studies were made to determine process parameters for nitrification and phosphorus removal. Based on these studies and evaluation of data on current and future conditions, a treatment system was selected consisting of primary sedimentation, a two-stage activated sludge process, and effluent polishing by filtration and disinfection. The basic design criteria for the expanded facilities now under design are tabulated. Construction of facilities is planned to start during 1974 at an estimated cost of approximately $160 million. (Sandoski-Franklin)
W74-07761

CARTMEN DEVISES TECHNIQUE FOR DISPOSING OF 3.5 MILLION GALLONS OF LIQUID DISCARDS ANNUALLY.
Solid Waste Management, Vol 17, No 1, p 12-13, 24, 80, 105, January 1974.

Descriptors: *Waste treatment, *Liquid wastes, *Waste disposal, *Canada, *Incineration, Equipment, Treatment facilities, Storage tanks, Screens, Gages, Measurement, Instrumentation, Sewage.

In order to accommodate the disposal of the vast quantities of liquid and sludge wastes generated by an excess of 6500 containerized commercial and industrial accounts in Canada's Ontario Province, the Superior Sanitation Services, Ltd. installed a modified Garver-Davis incinerator at its plant. Not long after the plant opened, difficulties became evident in the hauling, burning, and handling aspects of the enterprise. As a result of experimentation, watertight modular containers have been constructed and equipped with various systems of pipes, valves, and sieves designed for screening out the foreign solid objects as the unit is either filled or emptied. To compensate for the differences in Btu properties of the various kinds of refuse handled, to reduce the incidence of necessity for supplemental support fuel, and to maintain the more-evenly burning mixture in the combustion chamber, the storage tanks have been equipped with control gages and metering valves for blending appropriate proportions of each type of liquid. (Sandoski-Franklin)
W74-07762

THE DETERMINATION OF HEAVY METALS IN DOMESTIC SEWAGE TREATMENT PLANT WASTES,
Toronto Univ. (Ontario). Dept. of Geology.
For primary bibliographic entry see Field 5A.
W74-07763

EXPERIMENTAL STUDY OF THE PROTECTIVE ABILITY OF WATER-TREATMENT PLANTS WITH RESPECT TO SOME SUBSTANCES OF CAPROLACTAM PRODUCTION (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Gigieny, Moscow (USSR).
K. O. Lastochkina.

Gig Sanit, Vol 37, No 11, p 109-110, 1972.
Identifiers: *Caprolactam production, *Chlorination, Cyclohexanol, Hexanones, Production, Treatment facilities, *Water treatment, *Waste water treatment.

Treatment of water with a coagulant (aluminum sulfate) and subsequent filtration through a sand filter reduces the content of deleterious substances of caprolactam production. Caprolactam is resistant to the action of Cl. Cyclohexanol, cyclohexanone and its oxime probably react with Cl, which lowers their content in water; the formation of Cl derivatives is possible.--Copyright 1973, Biological Abstracts, Inc.
W74-07771

INORGANIC NITROGEN REMOVAL IN A COMBINED TERTIARY TREATMENT-MARINE AQUACULTURE SYSTEM - II. ALGAL BIOASSAYS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5C.
W74-07777

NEW SLUDGE PROCESSING PLANT OF THE BEESTON AND STAPLEFORD URBAN DISTRICT COUNCIL.
Water and Water Engineering, Vol 77, No 931, p 341-343, September 1973.

Descriptors: *Waste water treatment, *Sludge treatment, *Dewatering, Treatment facilities, *Chemicals, Mixing, Separation techniques, Filtration, Equipment, Construction costs.
Identifiers: *United Kingdom(Beeston-Stapleford).

After completing investigations involving pilot plants, long-term analytical work, and negotiations with industrialists, it has been recommended that the installation of a mechanical dewatering plant be undertaken and that provision be made for the tankering of sludge to this central location. In the case of the Beeston installation, a system of chemical conditioning followed by filter pressing was recommended. The chemicals are mixed with the sludge to promote easier separation of water from solid matter. The filter pressing involves straining water under pressure through a fine fabric to leave a cake on the fabric. (Sandoski-Franklin)
W74-07779

A STUDY OF POLLUTANT DISCHARGES FROM REACTOR OPERATIONS UTILIZING ULTRACENTRIFUGATION TECHNIQUES,
Oak Ridge Gaseous Diffusion Plant, Tenn.
For primary bibliographic entry see Field 5A.
W74-07782

TRITIUM DISTRIBUTION IN THE NUCLEAR INDUSTRY - THE REQUIREMENTS FOR CONTROL STRATEGIES,
Allied Chemical Corp., Idaho Falls, Idaho. Idaho Chemical Programs Operations Office.
For primary bibliographic entry see Field 5B.
W74-07784

SOLID FORMS FOR SAVANNAH RIVER PLANT HIGH-LEVEL WASTE,
Du Pont de Nemours (E.I.) and Co., Aiken, S.C. Savannah River Plant.
R. M. Wallace, H. L. Hull, and R. F. Bradley.
Available from NTIS, Springfield, Va., as Rept. No. DP-1335, $4.00 per copy, $1.45 microfiche. Report No DP-1335, December 1973. 38 p, 6 tab, 35 ref, append.

Descriptors: *Radioactive waste disposal, *South Carolina, *Waste storage, *Concretes, *Concrete construction, Waste treatment, Degradation(Decomposition), Safety hazards, Evaluation, Assessment, Chemical analysis, Leaching, Leakage, Toxicity, Asphalt, Cements, Corrosion.
Identifiers: *Retrievable surface storage, Shielding.

One option for long-term management of Savannah River Plant high-activity waste is solidification and storage in a retrievable surface facility to be located on the plantsite. This study was made to evaluate candidate solid waste forms and solidification processes, and to determine their applicability to engineered storage of Savannah River Plant waste. The study included: (1) characteristics of the present tank-stored waste, (2) criteria for acceptable long-term waste storage forms, (3) properties of potentially useful solid forms and the associated processes, and (4) evaluation of the potential product forms for Savannah River Plant waste. A summary of the properties of the various solid waste forms and the evaluation of each are given. (Houser-ORNL)
W74-07787

CHEMICAL ENGINEERING DIVISION, WASTE MANAGEMENT PROGRAMS, QUARTERLY REPORT, JULY-SEPTEMBER 1973,
Argonne National Lab., Ill. Chemical Engineering Div.
M. J. Steindler, N. M. Levitz, L. E. Trevorrow, T. J. Gering, and B. J. Kullen.
Available from NTIS, Springfield, Va., as Rept. No. ANL-8061; $4.00 per copy, $1.45 microfiche. Report No ANL-8061, January 1974. 28 p, 3 fig, 9 tab, 32 ref.

Descriptors: *Radioactive waste disposal, *Waste water treatment, *Waste water disposal, *Water chemistry, Research and development, Hydrogen, *Tritium, Water pollution, Treatment, Water purification, Transportation, Safety, Nuclear physics, Toxicity, Hazards, Public health, Plutonium, Assay, Assessment, Evaluation, Economic evaluation, Waste storage, *Illinois.
Identifiers: *Waste management, Fuel reprocessing.

Quarterly progress is presented on three programs at Argonne National Laboratory for the Division of Waste Management and Transportation of the USAEC. To assess methods for consolidation of fuel-cladding hulls, work to date has been directed toward identifying and evaluating methods for the safe management and consolidation of waste Zircaloy hulls from the chop-leach reprocessing of spent fuel. In a program to identify methods for decontaminating metallic materials and equipment that have been used with plutonium, published decontamination procedures are being reviewed and evaluated. A third program is directed toward evaluation of proposed methods for the storage of tritium and noble-gas fission products. Studies have been directed toward a brief evaluation of the practicability of concentrating the tritium in fuel-reprocessing aqueous waste streams by converting the water to oxygen plus a tritium-hydrogen mixture and subsequently passing this mixture through palladium membranes. The results of a limited cost study showed that the power required to move the large volumes of hydrogen through the membranes is, in itself, prohibitively expensive. (Houser-ORNL)
W74-07788

THE TECHNOLOGY OF TRITIUM FIXATION AND STORAGE,
Battelle-Pacific Northwest Labs., Richland, Wash.
L. L. Burger, and J. L. Ryan.
Available from NTIS, Springfield, Va., as Rept. No. BNWL-1807; $4.00 per copy, $1.45 microfiche. Report No BNWL-1807, January 1974. 36 p, 1 fig, 54 ref.

Descriptors: *Tritium, *Waste storage, *Fuels, *Nuclear wastes, Effluents, Water pollution, Water pollution sources, Atmosphere, Soil contamination, Economic study, Clays, Portland cements, Census, Projections, Forecasting.
Identifiers: *Fixation, *Fuel cycle.

The technology of fixation of tritium in a solid form was examined. The principal emphasis was on the storage in solid form of tritium waste from the nuclear fuel cycle with the aim of preventing its significant entry into the biosphere. The basic chemical and technical aspects of known and potential fixation methods and the applicability of these methods to specific sources or types of tritiated waste with some estimate of economics are given. These fixation methods are compared briefly with some other tritium disposal methods. Recommendations for further studies are made. Clays, Portland cement, and hydrides all appear to have merit, depending on the nature (principally degree of dilution) of the tritium waste. (Houser-ORNL)
W74-07789

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE PROPOSED PERRY NUCLEAR POWER PLANT, UNITS 1 AND 2.
Directorate of Licensing (AEC), Washington D.C.
For primary bibliographic entry see Field 5A.
W74-07793

COAGULANT RECOVERY AND REUSE IN WATER RECLAMATION SYSTEMS,
Virginia Polytechnic Inst. and State Univ. Blacksburg.
P. H. King, and B. H. H. Chen.
Available from the National Technical Information Service as PB-232 257 $4.00 in paper copy $1.45 in microfiche. Completion Report, (1973), 1[illegible] p, 10 fig, 1 tab. OWRR A-040-VA(1).

Descriptors: *Water Reuse, *Waste water treatment, *Coagulation, Sludge treatment, Capital costs, Operating costs.
Identifiers: *Alum recovery, Coagulant reuse, Chemical treatment.

A laboratory investigation was conducted to determine the optimum procedure for economical recovery of hydrolyzed metallic coagulants used in chemical treatment of water and wastewater. Attention was primarily focused on alum. Experiments were aimed at determining the extent of possible coagulant recovery, the best means of separating and dewatering the remaining solids and the effectiveness of the recovered coagulant during reuse. An economic analysis was conducted to estimate the capital cost of the process and the savings in chemical cost in operation. A computerized method was developed for determining the breakeven point in terms of treatment plant capacity.
W74-07844

THE REMOVAL OF SOLUBLE MERCURY FROM WASTE WATER BY COMPLEXING TECHNIQUES,
Virginia Polytechnic Inst. and State Univ. Blacksburg. Dept. of Chemical Engineering.
D. L. Michelsen.
Available from the National Technical Information Service as PB232 256 $7.50 in paper copy $1.45 in microfiche. Completion report, (1973), 8[illegible] p. OWRR A-044-VA(2).

Descriptors: *Mercury, *Heavy metals, *Ion exchange, *Waste water treatment.
Identifiers: Mercury removal, *Tannery hair.

Milk proteins, xanthates, modified rubber products, and keratin in various forms can be used for the removal of ionic mercury from water systems. In particular anionic and cationic ion exchange products made from ground tire cord rubber compete very favorably with classical ion exchange resins with regard to capacity, and rate

of pick-up. Cow and pig hair selectively remove ionic mercury and the performance with tannery hair based on equilibrium capacity, rate of removal and pressure drop was as good as classical ion exchange resins. Regenerative studies of ionic mercury from tannery hair with HCl and NaCl were successful, and a number of scale-up studies including economics were completed to illustrate how tannery hair might be used for the treatment of waste streams containing ionic mercury. The results were very encouraging.
W74-07845

ORGANIC WATER IMPURITIES AND EVALUATION OF METHODS FOR THEIR REMOVAL IN WATER MAINS (IN RUSSIAN),
Kiev Research Inst. of General Communal Hygiene (USSR).
V. N. Kupyrov, N. I. Omel'yanets, G. I. Meleshko, and G. I. Panasenko.
Gig Sanit, Vol 37, No 1, p 105-106, 1972.
Identifiers: *Anion exchange resins, Impurities, *Organic matter, Resins, Rivers, Water mains, Water purification methods, Waste water treatment, Sorbents.

To determine the effectiveness of water purification methods, a comparative study was made of organic impurities of river water and water in mains that received treatment. The impurity content in river water was 1143 micrograms/l and in the water main 450 micrograms/l. Anion-exchange resins had the best sorption properties for removing such impurities.--Copyright 1973, Biological Abstracts, Inc.
W74-07862

MINE DRAINAGE POLLUTION CONTROL VIA REVERSE OSMOSIS,
National Environmental Research Center, Rives, W.V.
R. C. Wilmoth, and R. D. Hill.
Mining Engineering, Vol 25, No 3, p 45-47, March, 1973. 2 fig, 3 tab, 7 ref.

Descriptors: Waste water treatment, *Reverse osmosis, *Mine water, *Mine drainage, *Pollution abatement, Mine wastes, Iron, Manganese, Calcium sulfate, Acid mine water, Neutralization, Membrane processes.
Identifiers: *Neutrolysis, Spiral wound membrane, Tubular membrane, Hollow fine fiber membrane.

Reverse osmosis can be successfully applied to most mine discharge waters. Product quality is directly dependent on concentrations on the brine side of the membrane. Iron and manganese are the most critical constituents of mine drainage waters in treatment to potable standards. Two major causes of membrane fouling are iron and calcium sulfate. Fouling of the membrane surface is held to a minimum by maintaining a brine flow to product flow of 10:1. Design of the complete reverse osmosis system must begin with a definition of the quality of product desired. Post-treatment is necessary for potable water. The 'neutrolysis' process involves neutralizing the brine with lime and returning the neutralized supernatant to the feed of the reverse osmosis unit. The feed had a pH of 4.9 and precipitation of iron was avoided. Up to 99% of the water applied to the unit was recovered as useable water. The neutralized sludge was pumped into abandoned underground mines. Periodic blowdowns to remove manganese is required. Current estimates of cost per thousand gallons of product vary between $0.35 and $1.50, depending on the plant size, water quality, disposal technique, and other factors. (Gray-NWWA)
W74-07881

SUN OIL DEVELOPS WATER REUSE PROGRAM,
Sun Oil Co., Toledo, Ohio.
E. F. Mohler, Jr., and L. T. Clere.
The Oil and Gas Journal, Vol 71, No 37, p 111-116, September 10, 1973. 1 fig, 8 tab.

Descriptors: *Reclaimed water, *Water reuse, *Waste water treatment, Biodegradation, Biochemical oxygen demand, Phenols, Water quality, Water conservation, Sulfur compounds, Biological treatment, Cooling towers, Cooling water, Filters, Chemical oxygen demand.
Identifiers: *API Waste water separator, BOD-TOC ratio, COD-TOC ratio, Refinery effluent water, *Waste reuse.

The water reuse program developed at Sun Oil Company's Toledo refinery has reduced water consumption to about 28 gallons of water per barrel of crude oil refined, as compared to the national average of about 200 gallons of water. A flow sheet shows the waste-water reuse and biooxidation flow. Ballast water from tankers is treated in the same system. The initial step in the process involves removal of sulfur compounds. Induced draft cooling towers are used to effect biooxidation of over 99.9% of the phenolic compounds in the water. Total organic removal performance exceeds 90%. Corrosion rate is monitored and long-term rate on steel is 1.5 mils per year. There is no evidence of increased deterioration of redwood in the cooling towers since reuse of water began. Final treatment of the refinery effluent is by filtration through sand filters. (Campbell-NWWA)
W74-07882

CORROSIVE EFFECTS OF POTABLE WATER,
Denver Water Dept., Colo.
For primary bibliographic entry see Field 8G.
W74-07886

SMELTER GASES YIELD MERCURY,
Outokumpu Oy, Helsinki (Finland).
J. Kangas, E. Nyholm, and J. Rastas.
Chemical Engineering, Vol 78, No 20, p 55-57, September 6, 1971. 2 fig, 3 ref.

Descriptors: *Mercury, *Air pollution, *Separation techniques, *Heavy metals, Zinc, Iron, Industrial wastes, Industrial production, Recycling, Food chains.
Identifiers: *Smelters, Selenium, Finland, Gas purification.

A process has been developed at Outokumpu Oy in Helsinki, Finland, that allows for recovery of mercury during treatment of SO2-rich gases from smelter or roasting operations, before the gas is sent to sulfuric acid production. Mercury is recovered in metallic form; selenium-bearing residue is recovered as well. Mercury-containing gases coming from the electrostatic precipitators at the temperature of 350 C go to the sulfatizing unit. There the gases contact a counter-current flow of strong sulfuric acid. Mercury and selenium are scrubbed from the gas by the acid. The metals are then separated in the clarifiers. The precipitate is washed with water, thus only insoluble metals form the residue. The residue is then passed through a filter press for further purification yielding up to 50% Hg and 10% Se. Separation of the two metals occurs in a 650-700 kiln, where Hg vaporizes to be later condensed at 99.99% or better purity. (Oleszkiewicz-Vanderbilt)
W74-07956

ODORS EMITTED FROM RAW AND DIGESTED SEWAGE SLUDGE,
Saint Louis Metropolitan Sewer District, Mo.
B. A. Rains, M. J. DePrimo, and I. L. Groseclose.
Copy Available from GPO Sup Doc as EP1.23:670/2-73.098, $1.15; microfiche from NTIS as PB-232 369, $1.45. Environmental Protection Agency, Technology Series, Report EPA-670/2-73-098, December 1973. 68 p, 19 fig, 13 tab, 23 ref. EPA Project 11010EZQ. Grant WPD 23-01-68, Program Element 1BB033.

Descriptors: *Waste water treatment, Gas chromatography, Odor, *Sewage sludge, *Pollutant identification, *Sludge treatment, Pollution abatement.
Identifiers: *Odor control, Malodors, Odor abatement.

Odors emitted during thickening of raw and secondary sludge have been responsible for adverse criticism at many sewage treatment plants. This study was undertaken to identify typical odor causing substances and evaluate selected conventional methods for controlling or eliminating these substances. A styrofoam dome covering a sludge thickener was utilized to control atmospheric conditions and concentrate odors. Field collected vapor samples were analyzed using gas chromatography techniques. Analyses using both polar and nonpolar column material indicated that the major odor causing compounds were mercaptans and amines. Other compounds which were minor contributors to odor were aldehydes, alcohols, and organic acids. Odor control methods selected for study included air dilution, activated carbon adsorption, and chlorine oxidation. Air dilution using cyclic operation of an exhaust fan was an effective means of odor control when outside atmospheric conditions were conducive to odor dissipation. Passing vapors through activated carbon filters was not completely effective in odor control since a detectable residual odor remained. A 1.5 mg/l solution of chlorine was effective in removing all odors from vapor samples bubbled through the solution. (EPA)
W74-07960

HYDROBIOCHEMICAL EFFECTS OF SPRAYING WASTE-TREATMENT EFFLUENT IN ST. PETERSBURG, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5C.
W74-07978

WATER TREATMENT SYSTEM,
Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 5F.
W74-07979

INDUSTRIAL LIQUID WASTE SURVEYS: TRAINING MANUAL.
Environmental Protection Agency, Cincinnati, Ohio. Water Quality Office.
For primary bibliographic entry see Field 5G.
W74-07988

OPTIMAL TIMING AND SIZING OF A CONJUNCTIVE URBAN WATER SUPPLY AND WASTE WATER SYSTEM WITH NONLINEAR PROGRAMMING,
Loyola Univ., Los Angeles, Calif.
M. E. Mulvihill, and J. A. Dracup.
Water Resources Research, Vol 10, No 2, p 170-175, April 1974. 6 fig, 1 tab, 16 ref.

Descriptors: Water resources development, *Water supply, Waste water(Pollution), *Water sources, Water treatment, *Waste water treatment, *Recycling, Reclaimed water, Optimization, Timing, Water quantity, Water quality, Effluents, Standards, Constraints, Water users, Capital costs, Decision making, Operating costs, Economies of scale, Planning, Systems analysis, Mathematical models, Water pollution control, *California.
Identifiers: *Nonlinear programming, *Los Angeles(Calif.), *Conjunctive operation, *Cost minimization, Capacity expansion, Urban areas.

A mathematical model of a conjunctively-operated urban water supply and wastewater system is formulated and applied to the city of Los Angeles. The objectives are to: (1) minimize the cost of supplying water from several sources, including the

provision for recycling reclaimed water; and (2) determine the capacity expansion schedule (timing and sizing) of the water and wastewater treatment processes. The water sources vary in quality, quantity and cost. Constraints on both water quantity and quality are included. The model consists of the minimization of a concave objective function subject to linear constraints. Capital and operation and maintenance costs exhibit economies of scale. A multilevel solution technique is developed to determine the minimum cost alternative for a selected planning horizon. The optimal blending of water sources and the optimal capacity expansion of treatment processes are determined such that user quality and quantity requirements are satisfied and effluent standards are met at minimum cost. The model is flexible in that it can be expanded to include additional water quality constituents, advanced wastewater treatment processes, and variations in water quality standards. The improvement over previous studies is that this model combines the water and wastewater subsystems, the major link being the reuse of reclaimed water. This model provides information for decision makers in planning future urban water resources development. (Bell-Cornell)
W74-08010

PROCESS AND APPARATUS FOR THE PURIFICATION OF A NATURAL BODY OF WATER,
W. Whipple, Jr.
U.S. Patent No. 3,755,142, 10 p, 39 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 913, No 4, p 1249, August 28, 1973.

Descriptors: *Patents, *Water purification, *Oxygenation, Pollution abatement, *Water treatment, *Waste water treatment, Water quality control, Water pollution control, Boats, Supersaturation.

Water is agitated by means of the propeller of a moving boat disposed in such a relation with the oxygen diffuser as to disperse the oxygenated water. The oxygenated water is further agitated by the wake of the propeller so as to cause the supersaturated water to be dispersed throughout and mixed with the surrounding mass of untreated water to thereby oxidate the pollutants in the water. On board, the oxygen supply tank, and the heat exchanger as well as the diffuser are arranged so that it will not be necessary to equip the towboat in any way with the necessary oxygenation apparatus. The oxygen which has been volatilized by the heat exchanger is directed through a conduit and into the diffuser so that gaseous oxygen may be emitted in the wake of the propellers and the highly oxygenated water in the vicinity of the diffusers may be agitated by the turbulent flow caused by the propellers and dispersed throughout the surrounding water. (Sinha - OEIS)
W74-08019

PIVOTABLE FLUID DIVERTER FOR RECIRULATION SYSTEM,
Oldham (Robert R.), Inc., Sidney, Ohio. (Assignee)
R. R. Oldham, and J. H. Wooddell.
U. S. Patent No 3,789,986, 5 p, 4 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 919, No 1, p 159, February 5, 1974.

Descriptors: *Waste water treatment, *Patents, *Sewage treatment, *Water purification, Pollution abatement, Water pollution control, Water quality control, Equipment, Effluents, Liquid wastes, *Separation techniques.

The pivotable fluid diverter is rigidly connected to a float device on the surface of the liquid collected in the reservoir where sewage treatment takes place in its final stage. A submersible pump within the liquid recirculates liquid by spraying it through a foraminous header disposed above the liquid level. When the liquid level in the reservoir falls below a predetermined liquid level, the diverter returns sprayed fluid to the reservoir. When the liquid level rises above the predetermined liquid lever, the diverter diverts fluid into the outlet pipe and continues to do so until the predetermined liquid level is restored. (Sinha-OEIS)
W74-08021

APPARATUS FOR AERATING WATER,
R. W. Conway.
U. S. Patent No 3,790,140, 6 p, 4 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 919, No 1, p 198-199, February 5, 1974.

Descriptors: *Patents, *Aeration, *Oxygenation, Waste water treatment, Water treatment, *Pollution abatement, Water quality control, *Water pollution control, Equipment, Water purification.
Identifiers: *Venturi device.

Water flowing in a stream is aerated under the influence of a natural pressure head by providing a venturi device through which the water flows as a result of the natural pressure head. The venturi device has a restricting portion through which the water flows to draw air from the atmosphere into the stream of water. As the water flows through the restricting portion, the velocity of the water increases while the pressure of the water decreases. By connecting the restricting portion to the atmosphere through the conduit, the decreased pressure of the water flowing through the restricting portion draws air from the atmosphere into the stream. This air is entrained by the water and flows with the water through the venturi so that it is constantly dissolved in the water. The venturi includes upper and lower gate members for restricting the flow of water. One of the gate members is movable with respect to the other. A foraminous air diffuser is positioned between the upper and lower gate memebers. A screen is positioned downstream of the upper gate for retarding movement of the air bubble produced to the water surface. (Sinha-OEIS)
W74-08023

PROCESS FOR TREATING WATER CONTAMINATED WITH HEXAVALENT CHROMIUM,
G. J. Nieuwenhuls.
U. S. Patent No 3,791,520, 3 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 919, No 2, p 551, February 12, 1974.

Descriptors: *Patents, Pollution abatement, Water pollution control, *Chromium, *Waste water treatment, *Metals, Water quality control, Lead, Ion exchange, Effluents.
Identifiers: *Metal plating industry, Lead chromate.

Waste water from plating industries is passed either on a continuous or batch basis, upward through a vessel containing one or more trays holding a water insoluble lead compound in conjunction with a particular carrier matrix which prevents channeling and packing of the bed. The lead compound reacts with the chromium in the waste water to form insoluble lead chromate. The lead chromate is caught on a filter which can be removed through the top of the vessel. Since lead chromate is a pigment in the paint industry, there is no disposal problem. The effluent leaving the vessel may contain a very small amount of lead ion. This residual lead may be removed by running the effluent through an ion exchange column containing a cation exchange resin such as Dowex 50-W in the hydrogen form. (Sinha-OEIS)
W74-08024

APPARATUS AND METHOD FOR TREATING WASTE LIQUID,
Hydro-Clear Corp., Avon Lake, Ohio.
D. S. Ross.
U. S. Patent No 3,792,773, 8 p, 7 fig, 10 ref. Official Gazette of the United States Patent Office, Vol 919, No 3, p 867, February 19, 1974

Descriptors: *Patents, *Waste water treatment, Pollution abatement, *Sewage treatment, *Filtration, Water pollution control, Water quality control, *Flocculation, *Coagulation, Effluents, Equipment.

Waste effluent from a sewage treatment plant is treated by using a filter unit having a backwash arrangement. The backwash liquid is subjected to flocculation, coagulation and settlement to produce a supernatant, which is introduced directly into the inlet of the filter without returning the backwash liquid to the sewage treatment plant. The solids in the backwash liquid are concentrated and removed without being reintroduced into the sewage treatment plant. (Sinha-OEIS)
W74-08026

SUBMERGED TURBINE AERATOR,
Westinghouse Electric Crop., Pittsburgh, Pa.
F. J. Sisk, and C. F. Garland.
U. S. Patent No 3,792,840, 3 p, 4 fig, 15 ref; Official Gazette of the United States Patent Office, Vol 919, No 3, p 885, February 19, 1974.

Descriptors: *Patents, *Aeration, *Water treatment, *Waste water treatment, Pollution abatement, Water pollution control, Water quality control, Mass transfer, Equipment, Rotors.
Identifiers: Turbine rotors.

Processes and apparatus are described for enhancing the mass transfer of oxygen from a sparged air system into a liquid medium by use of submerged turbine rotors. Mass transfer driving force is maximized by the provision of a rotor with vanes only on the upper surface of the rotor platform and having vane tips suitably displaced by the edge of the platform or shroud. Air is sparged from a ring onto the shroud at approximately the intersection of the shroud with a conical fairing projecting downward. The conical fairing serves to preserve the uniform azimuthal air distribution created by the sparge ring. The displacement of the vane tips from the shroud edge permits separation of the liquid vortex stream from the vanes before air flow is encountered and thus prohibits air induction into an attached vortex and thus onto the vane trailing face. Air is delivered uniformly off the shroud underside into the underside of the radial liquid jet which is driven by the vanes on the shroud upper side. The air is dispersed by the shear flow which it encounters and is driven radially outward while rising in discrete bubbles through the liquid jet. By the time the air has freed itself from the jet entrainment and is capable of creating an upwelling flow due to its percolation head, it has been radially dispersed. The result is a ring of air insufflated liquid in upwelling flow at a large radial distance from the rotor. The air contacting time with the water is thus maximized for a given rotor power. (Sinha-OEIS)
W74-08027

WASTEWATER TREATMENT USING ELECTROLYSIS WITH ACTIVATED CARBON CATHODE,
M. Kawahata, and K. R. Price.
U. S. Price No 3,793,173, 4 p, 2 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 919, No 3, p 961, February 19, 1974.

Descriptors: *Patents, *Waste water treatment, *Electrolysis, *Activated carbon, Water quality control, Water pollution control, Pollution abatement, *Electrodes, Hydrogen peroxide, Cathodes, Anodes, Electrochemistry, Effluents.
Identifiers: Organic carbon.

Use is made of the cathodic reduction of oxygen to form hydrogen peroxide which reacts with organic contaminants in waste water. A hollow porous ac-

tivated carbon cathode is the means by which oxygen-containing flow is introduced into a system wherein wastewater passes between the cathode and anode surfaces. When a current is passed through the wastewater, oxygen is reduced at the cathode and is converted to hydrogen peroxide in the presence of activated carbon. (Sinha-OEIS)
W74-08028

METHOD OF TREATING WASTE WATER CONTAINING LIGNINSULFONATE,
Mitsui Mining and Smelting Co. Ltd., Tokyo (Japan). (Assignee)
M. Ichiki, and M. Ishii.
U. S. Patent No 3,793,174, 3 p, 1 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 919, No 3, p 961, February 19, 1974.

Descriptors: *Patents, *Waste water treatment, Pollution abatement, Water pollution control, Water quality control, Pulp and paper industry, *Pulp wastes, Flotation, Lignins, Electrolysis, *Flocculation, Anodes, Electrodes.
Identifiers: *Ligninsulfonate.

Electrolysis is used in treating waste water containing ligninsulfonate. The ligninsulfonate is the electrolyte, the anode should consist of iron. As electrolysis proceeds, the ligninsulfonic acid ion loses its charge at or in the vicinity of the anode. The ligninsulfonate is rendered insoluble to form flocs. A matter of importance is to minimize the ferrous ions dissolved in the electrolyte. This is achieved by blowing sufficient air into the electrolytic cell to change divalent ions to trivalent ion. This air-blowing process serves to prevent the cake from adhering to the inside wall of the electrolytic cell and the floc absorbs enough air so it can float. (Sinha-OEIS)
W74-08029

ELECTROLYTIC FLOTATION APPARATUS,
Simon-Hartley Ltd., Straffordshire (England). (Assignee)
E. P. Austin, G. D. Kemp, F. A. F. M. Tonelli, and I. Marshall.
U. S. Patent No 3,793,178, 3 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 919, No 3, p 962, February 19, 1974.

Descriptors: *Patents, *Waste water treatment, Water quality control, Water pollution control, Pollution abatement, *Electrolysis, *Flotation, *Bubbles, Electrodes.
Identifiers: Gas bubbles.

Gas bubbles generated during electrolysis cause suspended materials to be floated to the surface of the tank. Scraper blades are arranged with their lower edges dipping into the surface of the contents of the tank. They are adapted to be driven longitudinally. The liquid to be treated is introduced into the tank by flow through at least one elongated tube of conducting material which defines a cathode with respect to an anode mounted within the tube and which extends substantially over the length thereof. (Sinha-OEIS)
W74-08030

METHOD AND APPARATUS FOR AERATING BODIES OF WATER,
For primary bibliographic entry see Field 5G.
W74-08031

MECHANICAL-BIOLOGICAL WASTE WATER PURIFICATION PLANT,
H. Schnyder.
U. S. Patent No 3,794,176, 4 p, 5 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 919, No 4, p 1217, February 26, 1974.

Descriptors: *Patents, *Waste water treatment, Pollution abatement, Water quality control, Water pollution control, Water treatment, *Sludge digestion, *Activated sludge, Equipment, *Biological treatment.

A pre-clarifying basin is arranged inside the upper part of a tank. The lower part of the tank defines a sludge digestion zone. The upper part of the tank defines a buffer zone open at the botton and limited laterally by the wall of the tank and side walls of the pre-clarifying basin. A post-clarigying plant has a clarification basin linked with the activated sludge zone and provided with a floating weir connected by a flexible or jointed discharge pipe to a clarified water outlet located some distance below the upper end of the post-clarifying basin. Sludge transferred by vacuum from the post-clarifying plant to the pre-clarifying plant is removed from the sludge digestion zone of the latter by a suitable pump. (Sinha-OEIS)
W74-08032

WASTEWATER TREATMENT,
Envirotech Corp., Salt Lake City, Utah. (Assignee)
M. M. Zuckerman, and A. H. Molof.
U. S. Patent No 3,794,581, 6 p, 4 fig, 4 tab, 2 ref; Official Gazette of the United States Patent Office, Vol 919, No 4, p 1314, February 26, 1974.

Descriptors: *Patents, *Waste water treatment, *Biological treatment, Pollution abatement, Water quality control, Water pollution control, *Hydrolysis, *Adsorption, Activated carbon, Industrial wastes, Effluents.

A system is provided for the treatment of raw wastewater which includes a soluble organic component with a high proportion of a poorly sorbable low molecular weight material. The system includes, in order, biological treatment, hydrolysis, and sorption. During biological treatment, one portion of the low molecular weight material is respired while another portion is converted into a high molecular weight material. After biological treatment, the wastewater is hydrolyzed to convert a substantial portion of the high molecular weight material into low molecular weight material having improved sorbability as determined by percentage adsorption on activated carbon. (Sinha-OEIS)
W74-08034

INDUSTRIAL WASTE PROCESSING APPARATUS,
N. E. Wood.
U. S. Patent No 3,795,316, 4 p, 3 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 920, No 1, p 96, March 5, 1974.

Descriptors: *Patents, *Waste treatment, *Industrial wastes, *Waste water treatment, Pollution abatement, Water quality control, Water pollution control, Equipment.

Industrial waste handling apparatus has side by side elongate tanks, one a waste receiving and settling tank, and the other a suspended waste filtration tank, with cross flow below liquid level from the one tank to the other. Each of the tanks has an inclinded end portion extending upward to a discharge placed above the liquid level. A solid apron conveyor is placed in the settling tank extending along near the bottom and the inclined end portion to the discharge. A strainer grid is placed above the bottom of the other tank providing a sump for liquid withdrawal. A drag line conveyor with scraper bars moves over the grid and up the incline and a submerged weir in the settling tank over the cross flow prevents buoyant material from escape to the filtration tank. The apron conveyor skims surface oil and removes heavy waste. Liquid velocity from the receiving end of the settling tank to the cross flow opening is equal to the speed of the apron conveyor. (Sinha-OEIS)
W74-08035

SYSTEM FOR REVERSED OSMOSIS,
Industriele Onderneming Wavin, N.V., Zwolle (Netherlands). (Assignee)
C. Van Zon.
U. S. Patent No 3,795,317, 3 p, 5 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 920, No 1, p 96, March 5, 1974.

Descriptors: *Patents, *Reverse osmosis, *Membranes, Water treatment, *Water purification, Water quality control, Equipment, *Separation techniques, Waste water treatment.

A device for purifying water by reversed osmosis is provided which comprises an auxiliary supporting plastic tube which has on its inner side a layer of resilient fibrous or fabric-like material on which is disposed a membrane. The auxiliary supporting plastic tube is supported on its outer side by a main supporting tube which, at least on its inner side, has discharge channels extending in the longitudinal direction. Due to the use of an auxiliary supporting plastic tube provided with a fibrous or fabric-like material on which is placed a membrane, the thin, easily damaged membranes are protected in transit by the auxiliary supporting plastic tube provided on the outer side. The use of plastic for the auxiliary supporting tubes offers the great advantage that with a very cheap material the membranes can be conveyed without the necessity for pretreatment of the membranes at the location where the inverted osmosis treatment is to be carried out. The device comprises additional main supporting tubes provided with wall apertures, which are enclosed within a closed cylindrical space delimited by plastic closing plates at the two ends, while through apertures in these closing plates the plastic supporting tubes protrude in a perfectly sealing way with respect to the outer side. (Sinha-OEIS)
W74-08037

STORAGE AND DISPENSING APPARATUS FOR A REVERSE OSMOSIS WATER PURIFICATION SYSTEM,
Desalination Systems, Inc., Escondido, Calif. (Assignee)
D. T. Bray.
U. S. Patent No 3,794,172, 4 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 919, No 4, p 1216, February 26, 1974.

Descriptors: *Patents, *Waste water treatment, *Water purification, *Reverse osmosis, Water quality control, Water pollution control, Equipment.

The water storage and dispensing apparatus comprises a closed, pressure resistant container into which purified water from a reverse osmosis water purification unit is delivered and temporarily stored normally under pressure slightly above atmospheric. The pressure in the storage container is maintained by means of releasing a restricted flow of liquid from such container, such as a pressure relief valve or a restricted passageway. Dispensing means for the purified water in the storage container are connected to a dispensing valve. Also connected to the storage container is a supply of impure water, the feed water supplied to the reverse osmosis system. Introduction of this impure water is controlled by a pressure responsive valve which is normally maintained closed by the pressure of the purified water in the storage container through a connection with the purified water supply to the dispensing valve. Opening the dispensing valve causes a reduction of pressure in its purified water supply connection thus opening the pressure responsive valve and allowing introduction of impure water under evaluated pressure into the storage container. This pressurizes the purified water in the storage container so that purified water is supplied on demand at elevated pressure to the piping supplying the dispensing valve. (See also W74-08040) (Sinha-OEIS)
W74-08039

VALVE FOR REVERSE OSMOSIS PURIFICATION AND STORAGE SYSTEM,
Desalination Systems, Inc., Escondido, Calif. (Assignee)
D. T. Bray.
U. S. Patent No 3,794,173, 4 p, 4 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 919, No 4, p 1216, February 26, 1974.

Descriptors: *Patents, *Reverse osmosis, *Waste water treatment, *Water purification, Water quality control, Water pollution control, Equipment.

A valve for a water purification system operating by reverse osmosis combines the functions of a pressure control for the blowdown or brine from the reverse osmosis module, and of a pressure control for a purified water container. The valve also acts as a responsive valve to allow elevated pressure impure water to flow into the purified water container to elevate the pressure of purified water supplied to a dispensing valve when the dispensing valve is opened. (See also W74-08039) (Sinha-OEIS)
W74-08040

REVERSE OSMOSIS-NEUTRALIZATION PROCESS FOR TREATING MINERAL CONTAMINATED WATERS,
Environmental Protection Agency, Washington, D.C. (assignee)
R. D. Hill, R. C. Wilmoth, and R. B. Scott.
U.S. Patent No. 3,795,609, 6 p, 1 fig, 6 tab, 11 ref; Official Gazette of the United States Patent Office, Vol 920, No 1, p 165, March 5, 1974.

Descriptors: *Patents, Water purification, *Waste water treatment, *Reverse osmosis, *Acid mine water, Water quality control, Pollution abatement, *Demineralization, Filtration, *Neutralization, Minerals, Disinfection, Effluents.
Identifiers: Ferrous ion oxidation, pH adjustment.

The method involves reverse osmosis treatment of mineral contaminated water to concentrate the dissolved minerals into a small fraction of the feed stream and concomitantly to separate out at least 50% of the water content of the feed stream as a purified water product stream capable of being safely discharged into the adjoining surface waters. In the instance of acid mine drainage, chemical treatment may be with inexpensive neutralizing agents such as lime, limestone or sodium carbonate. A typical pre-treatment for acid mine drainage is oxidation of ferrous ion, by ozonation, chlorination, or biological processes. Suspended solids may be removed by passage through a filter system. (Sinha-OEIS)
W74-08041

MATHEMATICAL MODEL FOR POST AERATION,
Environmental Protection Agency, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
R. Smith, R. G. Eilers, and E. D. Hall.
Available from NTIS, Springfield, Va. 22151, as PB-222 031, Price $3.75 printed copy; $1.45 microfiche. Environmental Protection Agency, National Environmental Research Center, Report EPA-670/2-73-044, July 1973. 39 p, 6 fig, 2 tab, 7 ref, append. EPA Program Element 1B2043.

Descriptors: *Aeration, *Waste water treatment, *Mathematical models, Costs, Computer programs, Sewage treatment, Activated sludge, *Cost comparisons.
Identifiers: *Post aeration techniques.

Design and cost estimating relationships are given for post aeration after the activated sludge process. Mechanical aerators in completely mixed rectangular basins, air diffusers mounted in the outlet channel for the plant, and air diffusers mounted in rectangular completely mixed concrete basins are considered. The costs of all three types of post aeration are given for 1-, 3-, 10-, 30-, and 100-mgd plants. The cost of the complete plant is compared with the cost of post aeration. (Knapp-USGS)
W74-08045

DESIGN AND SIMULATION OF EQUALIZATION BASINS,
Environmental Protection Agency, Cincinnati, Ohio. Office of Research and Development.
R. Smith, R. G. Eilers, and E. D. Hall.
Available from NTIS, Springfield, Va. 22151, as PB-222 000, Price $4.50 printed copy; $1.45 microfiche. Environmental Protection Agency, National Environment Research Center, Report EPA-670/2-73-046, July 1973. 51 p, 5 fig, 6 tab, 12 ref, 4 append.

Descriptors: *Sewage treatment, Water level fluctuations, *Equalizing reservoirs, *Waste water treatment, Costs, *Aeration, Oxygen demand, Mathematical models, Design, Computer models, Simulation analysis, *Construction costs.
Identifiers: *Equalization basins.

Relationships for sizing equalization basins for smoothing the diurnal variation of dry weather flow into municipal wastewater treatment plants are given. The construction costs for rectangular concrete basins equipped with diffused air and for plastic lined earthen basins equipped with mechanical aerators are estimated. A time dependent digital computer model was developed for simulating biological activity and the consumption of oxygen in equalization basins in which the water level varies diurnally. (Knapp-USGS)
W74-08046

COMMERCIAL DESALTING PLANT DATA AND ANALYSIS, VOLUMES I-VI,
DSS Engineers, Inc., Ft. Lauderdale, Fla.
For primary bibliographic entry see Field 3A.
W74-08061

NITROGEN REMOVAL BY SOIL MECHANISMS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
J. C. Lance.
Journal Water Pollution Control Federation, Vol 44, No 7, p 1352-1361, July, 1972. 3 fig, 32 ref.

Descriptors: *Nutrient removal, *Nitrogen, Leaching, *Dentrification, Sewage treatment, Solid wastes, *Waste water treatment, Soil mechanics.

Nitrogen may be removed from a soil system in gaseous form by volatilization of ammonia or by denitrification. The amount of ammonia volatilized in a land disposal system is small, but large amounts of nitrogen could be removed during travel through a long stream or channel to the disposal area. Denitrification is perhaps the most desirable removal process because large amounts of nitrogen can be removed and transferred to the atmosphere as nitrogen gas. The nitrogen is thus completely removed from the system without causing air pollution. Additional research will be needed to determine whether denitrification can be sustained in a groundwater recharge system without prior oxidation of ammonium and/or additional sources of carbon. (Skogerboe-Colorado State)
W74-08081

LEACHATE TREATMENT BY COAGULATION AND PRECIPITATION,
Camp, Dresser, and McKee, Boston, Mass.
R. J. Thornton, and F. C. Blanc.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 99, No EE4, p 535-544, August, 1973. 2 fig, 5 tab, 9 ref.

Descriptors: *Landfills, *Sanitary engineering, *Leaching, Water quality, *Chemical precipitation, Environmental engineering, *Coagulation, Solid wastes, Waste water treatment.
Identifiers: *Chemical treatment

When sanitary landfills are constructed with provisions for collection and treatment of leachates, chemical treatment may be one of the treatment processes employed. Research was conducted to determine the ability of chemical treatment to remove suspended solids, biochemical oxygen demand, chemical oxygen demand, iron, calcium, and magnesium from leachate. Chemical treatment studies were conducted in the laboratory using alum, lime, and ferric chloride. Preliminary results indicate that lime precipitation was most effective. Additional studies revealed that suspended solids, color, and some multivalent cations can be effectively removed from raw leachate using lime. However, significant removals of soluble biochemical oxygen demand were not observed and extremely high lime concentrations in the 300 mg/l 600 mg/l range were required to obtain a relatively clear supernatant resulting in relatively large amounts of sludge. (Skogerboe-Colorado State)
W74-08091

HEAD DROP ACROSS BAR SCREENS,
West Pakistan Univ. of Engineering and Technology, Lahore.
K. M. Yao.
Journal Water Pollution Control Federation, Vol 44, No 7, p 1448-1452, July, 1972. 4 fig, 3 ref.

Descriptors: *Sewage treatment, *Treatment facilities, *Screens, *Head loss, Hydraulics, *Waste water treatment.

The head drop across screens used in sewage treatment plants is discussed. Various equations are presented along with their limitations. Appropriate times to use each equation are listed. A nomograph for use by plant operators is also developed. (Skogerboe-Colorado State)
W74-08092

5E. Ultimate Disposal Of Wastes

USING SEWAGE EFFLUENT AND LIQUID DIGESTED SLUDGE TO ESTABLISH GRASSES AND LEGUMES ON BITUMINOUS STRIP-MINE SPOILS,
Pennsylvania State Univ., University Park. School of Forest Resources.
For primary bibliographic entry see Field 5D.
W74-07612

CARTMEN DEVISES TECHNIQUE FOR DISPOSING OF 3.5 MILLION GALLONS OF LIQUID DISCARDS ANNUALLY.
For primary bibliographic entry see Field 5D.
W74-07762

SOLID FORMS FOR SAVANNAH RIVER PLANT HIGH-LEVEL WASTE,
Du Pont de Nemours (E.I.) and Co., Aiken, S.C. Savannah River Plant.
For primary bibliographic entry see Field 5D.
W74-07787

CHEMICAL ENGINEERING DIVISION, WASTE MANAGEMENT PROGRAMS, QUARTERLY REPORT, JULY-SEPTEMBER 1973,
Argonne National Lab., Ill. Chemical Engineering Div.
For primary bibliographic entry see Field 5D.
W74-07788

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE PROPOSED PERRY NUCLEAR POWER PLANT, UNITS 1 AND 2.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 5A.
W74-07793

RECONNAISSANCE OF THE WATER RESOURCES IN THE VICINITY OF PROPOSED DEEP-WELL INJECTION SITES IN SOUTHEAST DADE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5B.
W74-07915

GEOHYDROLOGY OF THE BURIED TRIASSIC BASIN AT THE SAVANNAH RIVER PLANT,
DuPont de Nemours(E.I) and Co., Aiken, S.C. Savannah River Lab.
For primary bibliographic entry see Field 5B.
W74-07934

HARBOR POLLUTION FROM LARGE SHIPS,
Naval Undersea Center, San Diego, Calif. Dept. of Fleet Engineering.
For primary bibliographic entry see Field 5B.
W74-08006

INJECTION WELLS POSE A POTENTIAL THREAT.
For primary bibliographic entry see Field 5B.
W74-08072

INFILTRATION AND LANDFILL BEHAVIOR,
Waterloo Univ. (Ontario).
For primary bibliographic entry see Field 5B.
W74-08083

5F. Water Treatment and Quality Alteration

WATER QUALITY AND TREATMENT OF DOMESTIC GROUNDWATER SUPPLIES,
Illinois State Water Survey, Urbana.
J. P. Gibb.
Circular 118, 1973. 17 p, 3 fig, 1 tab, 21 ref, 2 append.

Descriptors: *Water treatment, *Groundwater, *Domestic water, *Illinois, Water wells, Water quality, Hydrogen sulfide, Potable water, Disinfection, Iron, Water softening, Methane.
Identifiers: Iron removal.

Basic information is presented on water quality and treatment of domestic and farm groundwater supplies. Tests and practices that assure a safe sanitary water quality are described, and the common minerals and natural gases that are of concern to home water supplies in Illinois are discussed. Described are water treatment procedures and equipment for disinfection, iron removal, softening, methane and hydrogen sulfide gas removal, and their costs. (Knapp-USGS)
W74-07637

PLANNING A DOMESTIC GROUNDWATER SUPPLY SYSTEM,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W74-07639

THE TREATMENT OF WASTE WATER FROM INDUSTRIES AND COMMERCE IN PUBLIC PURIFICATION PLANTS (IN GERMAN),
Kantonales Amt fuer Gewasserschutz, Sankt Gallen (Switzerland).
For primary bibliographic entry see Field 5D.
W74-07748

PROBLEMS FOR HYDROBIOLOGICAL INVESTIGATION UNDER CONDITIONS OF COMPLEX USE OF WATER RESOURCES (IN RUSSIAN),
Moscow State Univ. (USSR).
M. M. Telitchenko.
Gidrobiol Zh, Vol 8, No 3, p 5-13, 1972. 22 ref.
Identifiers: Eutrophication, *Germany, Hydrobiological studies, Measures, Plankton, Sanitary conditions, *USSR, Water utilization, *United States, *Self-purification, *Hydrobionts, Water treatment.

Problems for the provision of sanitary and biologically pure water in the USSR, USA, East and West Germany are discussed. Studies in self-purification, the role of hydrobionts and their metabolites in the development of organoleptic qualities, the introduction of hydrobionts to promote self-purification and the use of plankton to control eutrophication are considered.--Copyright 1973, Biological Abstracts, Inc.
W74-07765

EXPERIMENTAL STUDY OF THE PROTECTIVE ABILITY OF WATER-TREATMENT PLANTS WITH RESPECT TO SOME SUBSTANCES OF CAPROLACTAM PRODUCTION (IN RUSSIAN),
Nauchno-Issledovatelskii Institut Gigieny, Moscow (USSR).
For primary bibliographic entry see Field 5D.
W74-07771

THE SEVERN SCHEME OF THE BRISTOL WATERWORKS COMPANY.
Water and Water Engineering, Vol 77, No 933, p 431-432, November 1973.

Descriptors: *Water treatment, *Potable water, *Water supply, Water purification, Equipment, *Treatment facilities, Construction materials.
Identifiers: *United Kingdom(Bristol).

The first phase works described herein augment the Bristol Waterworks Company's potable water supply by 24 mgd with provision in phase two for extension to supply a further 12 mgd, thus meeting predicted demands into the 1990's. The aim has been to provide buildings of a functional, industrial style with space to accommodate the additional requirements of the second phase extensions. (Sandoski-Franklin)
W74-07772

DOMESTIC WATER SYSTEMS, NONCHEMICAL FACTORS IN CORROSION CONTROL,
Olin Corp. Stamford, Conn.
For primary bibliographic entry see Field 8G.
W74-07849

DOMESTIC HOT WATER SYSTEMS, SILICATE TREATMENT INHIBITS CORROSION OF GALVANIZED STEEL AND COPPER ALLOYS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 8G.
W74-07850

WATER TREATMENT SYSTEM,
Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Mechanical Engineering.
F. M. Hagan, F. A. Rado, J. A. Rumancik, and A. Savinell.
Report available from NTIS, Springfield, Va 22151, as PB-221 142, Price $5.45 printed copy; $1.45 microfiche. In: Special Topics--Human Powered Transit; Remote Medical Systems; Water Treatment: Carnegie-Mellon University Final Project Report, p 82-124, May 1973. 19 fig.

Descriptors: *Waste water treatment, *Water treatment, *Reverse osmosis, Costs, Equipment, *Water purification.
Identifiers: *Waterborne diseases.

A very inexpensive water treatment system which does not rely on a sophisticated power supply was designed and built using the principle of reverse osmosis. One of the main results expected is reduction of water borne disease. (Knapp-USGS)
W74-07979

WATER TREATMENT MUD DECANTING TANK,
J. V. T. Pool.
U.S. Patent No. 3,795,314, 3 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 920, No 1, p 95, March 5, 1974.

Descriptors: *Patents, *Mud, *Water treatment, *Water quality control, Lime, Equipment.
Identifiers: *Decantation.

The mud decanting tank for water cold treatment with lime consists of a cylindrical tank having a tapered bottom. There is a concentric pipe housing a central vertical shaft driving a stirrer and a coaxial remover driven by means of a suitable prime mover. Manifolds or overflows are located at a determined level for drawing out the processed water. A second eccentric inner pipe also has a central vertical shaft that drives a stirrer and remover. The distribution of the inner piping provides a continuous recycling of the muds and chemicals. The muds are drawn out by suction from the bottom of the tank. (Sinha-OEIS)
W74-08042

5G. Water Quality Control

PART I - A CONCEPTUAL MODEL FOR A TERRESTRIAL ECOSYSTEM PERTURBED WITH SEWAGE EFFLUENT, WITH SPECIAL REFERENCE TO THE MICHIGAN STATE UNIVERSITY WATER QUALITY MANAGEMENT PROJECT; PART II - A PERSONALIZED BIBLIOGRAPHI C RETRIEVAL PACKAGE FOR RESOURCE SCIENTISTS,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5D.
W74-07606

GROUNDWATER POLLUTION FEATURES OF FEDERAL AND STATE SATUTES AND REGULATIONS,
Geraghty and Miller, Port Washington, N.Y.
F. van der Leeden.
Available from the National Technical Information Service as PB-232 116, $4.00 in paper copy, $1.45 in microfiche. Environmental Protection Agency, Monitoring Series, Report No EPA-600/4-73-001a, July 1973, 88 p, 7 fig, 10 tab, 31 ref. EPA Contract 68-01-0759.

Descriptors: *Groundwater, *Water pollution control, *Legislation, *Regulation, State jurisdiction, Federal jurisdiction, Water law, Interstate Commissions, Water needs, Recharge wells, Underground waste disposal, Water permits, Water quality, Waste water disposal, Waste disposal, Waste dumps, Landfills, Solid wastes, Sanitary engineering, Sealants, Monitoring, Aquifer management, Management.

Regulations and requirements are summarized of major public agencies with respect to groundwater pollution. A selective review was made of existing and pending legislation and regulations of Federal, State, and county governments and their agencies. Material was obtained both from central compilations and by direct contact with public agencies. State water laws, water-pollution laws, water-well regulations, and solid-waste regulations were examined; also, Federal laws dealing with pollution of Federal facilities, protecting against radiation and pesticides, and guidelines for waste-water

treatment and solid-waste disposal facilities. Laws and regulations related to groundwater pollution vary widely as to objectives, scope, coverage, detail, and effectiveness. State water laws tend to deal primarily with protection of surface-water resources. Only 13 States were found to have water laws dealing in detail with measures to protect groundwater against pollution. However, numerous other laws and regulations affect groundwater pollution. A more extensive review of policies, rules, regulations, and procedures, with an evaluation of their effectiveness in controlling groundwater pollution, is recommended. (See also W74-07615) (EPA)
W74-07614

POLLUTED GROUNDWATER: SOME CAUSES, EFFECTS, CONTROLS, AND MONITORING.
General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.
For primary bibliographic entry see Field 5B.
W74-07615

ACTIVE RESEARCH TASKS REPORT--FISCAL YEAR 1973.
National Environmental Research Center, Cincinnati, Ohio.
Available from NTIS, Springfield, Va. 22151 as PB-223 567; Price $6.50 printed copy; $1.45 microfiche. 1973, 367 p.

Descriptors: *Water pollution control, *Research and development, Laboratories, Research facilities, Projects, Grants.
Identifiers: *Environmental protection agency.

Information is presented about the research programs conducted and supported by the National Environmental Research Center, Environmental Protection Agency, Cincinnati, during Fiscal Year 1973. The report is organized according to major research program elements, subdivided according to the Center's research objective achievement plans, and each research objective achievement plan is further subdivided into individual research tasks (or projects). The major theme of the Center's research activity is the development of technology and processes for the control of pollutants that degrade the air, water, and land environments. Programs that directly reflect this major theme include: the development of advanced methods for the treatment and control of municipal wastewater streams, in conjunction with the control of pollution resulting from storm and combined sewer overflows; the development of solutions to various specialized water pollution control problems such as oil and hazardous material spills, watercraft wastes, industrial wastes, mine drainage, and recreational wastes; the development or improvement of contaminant removal processes for the purification of the Nation's water supplies and recreational waters; the development of processes for environmentally acceptable treatment of toxic and hazardous solid waste materials; the development of resource recovery systems for the management of municipal and industrial solid waste; and the development of improved methods for the processing and disposal of these solid wastes. Complementary research programs are: the development, refinement and promulgation of improved analytical methods for the measurement and determination of water quality; and the quantification and analysis of radioactive discharges. (Knapp-USGS)
W74-07651

THE CHEMICAL/PHYSICAL AND MICROBIOLOGICAL CHARACTERISTICS OF TYPICAL BATH AND LAUNDRY WASTE WATERS,
National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center.
For primary bibliographic entry see Field 5B.
W74-07663

THE 7-DAY 10-YEAR LOW FLOWS OF ILLINOIS STREAMS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2E.
W74-07677

USGS COMPLETES NATIONWIDE RECONNAISSANCE OF METALS IN STREAMS.
For primary bibliographic entry see Field 5A.
W74-07698

FEDERAL LAWS AND REGULATIONS,
S. S. Ross.
Chemical Engineering/Deskbook Issue, Vol 79, No 10, p 9-12, May 8, 1972. 1 tab.

Descriptors: *Legislation, *Regulation, *Federal Water Pollution Control Act, *Water Quality Act, Air pollution, Water pollution, Public health, Taxes, Environmental effects, Economics, Law enforcement, Toxicity, Wastewater treatment.
Identifiers: *National Environmental Policy Act(NEPA), Refuse act, Environmental protection agency.

Current water pollution legislation is presented, including 1976 'best practicable' control technology as outlined by the Water Quality Act of 1965, 1970, 'best available' control technology, citizen suits, Refuse Act, National Environmental Policy Act, dredging and drilling and interim enforcement. Current EPA policy on Air Act enforcement is outlined, followed by a discussion of the Toxic Substances Control Act of 1972 and the proposed ocean dumping law, as well the impact of Safety and Health Act, pollution taxes and Noise Control Act on environmental policy. (Oleszkiewicz-Vanderbilt)
W74-07703

INNOVATION: A CASE STUDY,
American Society of Civil Engineers, New York.
For primary bibliographic entry see Field 6B.
W74-07720

STATE ORGANIZATION FOR WATER RESOURCES MANAGEMENT,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 6E.
W74-07733

CHARACTERIZATION OF SUSPENDED SEDIMENTS IN WATER FROM SELECTED WATERSHEDS AS RELATED TO CONTROL PROCESSES, NUTRIENT CONTENTS, AND LAKE EUTROPHICATION,
Washington State Univ., Pullman. Dept. of Agronomy and Soils.
For primary bibliographic entry see Field 5B.
W74-07736

OXYGENATION OF AQUEOUS BODIES USING LIQUID OXYGEN-LOXINATION,
Midwest Research Inst., Kansas City, Mo.
For primary bibliographic entry see Field 5D.
W74-07741

REGIONAL WATER AUTHORITIES: ORGANIZATIONAL PATTERNS-PURPOSE OR PROFESSIONAL,
G. Nunn, and R. Hattersley.
Water Pollution Control, Vol 72, No 8, p 675-692, 1973. 3 fig, 7 ref.

Descriptors: Administration, *Water Management(Applied), *Regional development, *Sewage districts, *Planning, *Organizations, Water districts, Regulation, Legislation, Water quality control.
Identifiers: *United Kingdom.

Since 1967 the need to establish single purpose regional authorities for administration of sewage purification services has been evidenced, affirmed and reaffirmed. Considerable attention is given to the ultimate form the reorganization will take, stressing organizational patterns rather than detailed structures. The work of the regional water authorities is discussed function by function, the provisional pattern immediately after reorganization has been considered, and alternatives put forward based on professional grouping. The resultant recommendation is a functional pattern which should ensure that the regional water authorities are largely made up of interdisciplinary groups making their careers in departments having a clear functional purpose. (Sandoski-Franklin)
W74-07754

CONTRIBUTION TO WATER POLLUTION FROM AGRICULTURAL AND URBAN SOURCES IN THE COACHELLA VALLEY,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W74-07757

AUTOMATION OF THE CONTROL AND OPERATION OF WATER POLLUTION CONTROL WORKS,
Norwich Sewage Treatment Works (England).
For primary bibliographic entry see Field 5D.
W74-07758

PROBLEMS FOR HYDROBIOLOGICAL INVESTIGATION UNDER CONDITIONS OF COMPLEX USE OF WATER RESOURCES (IN RUSSIAN),
Moscow State Univ. (USSR).
For primary bibliographic entry see Field 5F.
W74-07765

EFFLUENT STANDARDS STRATEGY: REJUVENATION OF AN OLD GAME PLAN,
Cincinnati Univ., Ohio. Coll. of Medicine.
E. J. Cleary.
Journal Water Pollution Control Federation, Vol 46, No 1, p 9-17, January 1974. 11 ref.

Descriptors: *Effluents, Standards, *Water pollution control, Application methods, Environmental control, *Water quality standards, Legislation, *Federal government, *Regulation.

The events that have contributed to the new federal policy of placing primary reliance on uniform effluent standards for the achievement of clean water goals are traced. Merits and limitations associated with the two regulatory concepts are outlined and earlier applications of effluent standards practice by certain state and interstate regulatory agencies are cited. (Sandoski-Franklin)
W74-07769

LEACHING REQUIREMENT STUDIES: SENSITIVITY OF ALFALFA TO SALINITY OF IRRIGATION AND DRAINAGE WATERS,
Agricultural Research Service, Riverside. Salinity Lab.
For primary bibliographic entry see Field 3C.
W74-07774

ENVIRONMENTAL EFFECTS OF THE CONSTRUCTION AND OPERATION OF A GASEOUS DIFFUSION PLANT.
Goodyear Atomic Corp., Portsmouth, Ohio.
For primary bibliographic entry see Field 5C.
W74-07781

DESIGN DATA AND SAFETY FEATURES OF COMMERCIAL NUCLEAR POWER PLANTS, VOL I,
Oak Ridge National Lab., Tenn. Nuclear Safety Information Center.
F. A. Heddleson.
Available from NTIS, Springfield, Va., as Rept. No. ORNL-NSIC-55, Vol. I; $15.00 per copy, $15.00 microfiche. Report No. ORNL-NSIC-55, Vol I, December 1973. 249 p, 33 fig, 1 glossary.

Descriptors: *Nuclear powerplants, *Design data, *Safety, *Hazards, *Radioactivity, *Sites, *Systems analysis, Rivers, Lakes, Oceans, Nuclear wastes, Radioactive wastes, Radioactive waste disposal, Effluents, Electric power, Ecology, Ecosystems, Environment, Monitoring, Construction, Operation.

Design data, safety features, and site characteristics are summarized for 32 commercial nuclear power plants in the United States. Six pages of data are presented for each plant consisting of thermal-hydraulic and nuclear factors, containment features, emergency core cooling systems, site features, circulating water system data, and miscellaneous factors. An aerial perspective is also presented for each plant. Plants described in this volume are Indian Point No. 1, Docket Number 50-3, and all subsequent plants finishing with Zion, Docket Number 50-295. A glossary of nuclear terms is provided. (See also W74-07795 and W74-07796) (Houser-ORNL)
W74-07794

DESIGN DATA AND SAFETY FEATURES OF COMMERCIAL NUCLEAR POWER PLANTS, VOL. II.
Oak Ridge National Lab., Tenn. Nuclear Safety Information Center.
Available from NTIS, Springfield, Va., as Report No. ORNL-NSIC-55, Vol. II; $15.00 per copy, $15.00 microfiche. Report No ORNL-NSIC-55, Vol II, January 1972. Compiled by F. A. Heddleson, 308 p, 48 fig, 1 glossary.

Descriptors: *Nuclear powerplants, *Design data, *Safety, *Hazards, *Radioactivity, *Sites, Radioisotopes, Systems analysis, Rivers, Lakes, Oceans, Streams, Nuclear wastes, Environment, Radioactive waste disposal, Effluents, Electric power, Ecology, Ecosystems, Monitoring, Construction, Operation.

Design data, safety features, and site characteristics are summarized for 47 commercial nuclear power plants in the United States. Six pages of data are presented for each plant consisting of thermal-hydraulic and nuclear factors, containment features, emergency core cooling systems, site features, circulating water system data, and miscellaneous factors. A small aerial perspective is also presented for each plant site. Plants described in this volume are Browns Ferry, Docket Number 50-296, and all subsequent plants finishing with Virgil C. Summer, Docket Number 50-395. A glossary of nuclear terms is provided. (See also W74-07794) (Houser-ORNL)
W74-07795

DESIGN DATA AND SAFETY FEATURES OF COMMERCIAL NUCLEAR POWER PLANTS, VOL. III,
Oak Ridge National Lab., Tenn. Nuclear Safety Information Center.
F. A. Heddleson.
Available from NTIS, Springfield, Va., as ORNL-NSIC-55, Vol. III; $15.00 per copy, $15.00 microfiche. Report No ORNL-NSIC-55, Vol III, April 1974. 147 p, 18 fig, 1 glossary of terms.

Descriptors: *Nuclear powerplants, *Design data, *Safety, *Hazards, *Radioactivity, *Sites, Systems analysis, Rivers, Lakes, Oceans, Nuclear wastes, Radioactive waste disposal, Effluents, Electric power, Ecology, Ecosystems, Construction, Operations, Monitoring.

Design data, safety features, and site characteristics are summarized for 33 nuclear power units in 17 power stations in the United States. Six pages of data are presented for each plant consisting of thermal-hydraulic and nuclear factors, containment features, emergency core cooling systems, site features, circulating water system data, and miscellaneous factors. An aerial perspective is also presented for each plant. Plants described in this volume are Hanford No. 2, Docket Number 50-397, and all subsequent plants finishing with Douglas Point, Docket Number 50-448, 50-449. A glossary of nuclear terms is provided. (See also W74-07794) (Houser-ORNL)
W74-07796

EFFECTS OF CHROME RADIATION EXPOSURE ON MOSQUITOES (DIPTERA: CULICIDAE). 1. EFFECTS OF REARING IN SR-90 + Y-90 SOLUTIONS,
Atomic Energy of Canada Ltd., Pinawa (Manitoba). Whiteshell Nuclear Research Establishment.
For primary bibliographic entry see Field 5C.
W74-07821

THE EFFECTS OF RIVER FLUCTUATIONS RESULTING FROM HYDROELECTRIC PEAKING ON SELECTED AQUATIC INVERTEBRATES,
Idaho Univ., Moscow. Coll. of Forestry, Wildlife and Range Sciences.
For primary bibliographic entry see Field 2I.
W74-07830

SOCIAL AND ECONOMIC FACTORS IN THE ADOPTION BY INDUSTRY OF WATER POLLUTION CONTROL MEASURES IN MINNESOTA,
Minnesota Univ., St. Paul. Inst. of Agriculture.
R. E. Rickson.
Available from the National Technical Information Service as PB-232 230, $4.00 in paper copy, $1.45 in microfiche. Minnesota Water Resources Research Center, St. Paul, Bulletin 67. February 1974. 67 p, 14 tab, 48 ref. OWRR B-047-MINN(2). 14-31-0001-3294.

Descriptors: *Water pollution control, *Social aspects, *Industrial wastes, *Waste disposal, *Minnesota, Regulation, Legal aspects, Model studies, Attitudes, Organizations, Water policy.

This study is an attempt to further understand the process by which industrial organizations change the way they dispose of waste. Substantively, the relationship of organizational characteristics to rates of change in waste procedures is of interest. A general model of change is envisioned. The two major forces creating change in industrial organizations are the internal pressures within the organization that result from such factors as the complexity of its division of labor and production technology, and the kinds of pressure the organization faces as the result of powerful and aggressive regulatory agencies and other groups. Finally, the nature of dependence the firm has upon water affects change. Overall, executives prefer that State and Federal governments establish policy while local governments enforce such policy. It is clearly in the interest of local business to have city and county officials be responsible for enforcement as business should be able to influence the judgement of these officials more so than representatives of state and Federal bureaus. Companies want regulatory policy to be consistent over time. Since policy developed at the local level can be overturned by State and Federal agencies, company preference for State and, especially, Federal control in policy-formation is logically understandable. Companies will work so that their viewpoints will be represented in policy-formation about water systems, sewer systems, tax rates and long-range planning about community water resources. (Walton-Minnesota)
W74-07834

PROCESS CONTROL MODEL FOR OXYGEN REGENERATION OF POLLUTED RIVERS, PHASES IV AND V, AND SPACIALLY AND TEMPORALLY DISTRIBUTED DISCHARGE OF EFFLUENTS IN ESTUARIES,
Rutgers The State Univ., New Brunswick, N.J. Dept. of Chemical and Biochemical Engineers.
For primary bibliographic entry see Field 5B.
W74-07837

A SUMMARY OF QUANTITY, QUALITY AND ECONOMIC METHODOLOGY FOR ESTABLISHING MINIMUM FLOWS,
Washington Univ., Seattle.
For primary bibliographic entry see Field 6B.
W74-07847

PREVENTION OF CALCIUM CARBONATE SCALE DEPOSITION IN MILL WATER SYSTEMS,
NL Industries, Inc., Houston, Tex. Baroid Div.
For primary bibliographic entry see Field 8G.
W74-07848

GROUNDWATER ISSUE MERITS MORE FEDERAL PROTECTION, GROUNDWATER POLLUTION AND CONSERVATION,
C. K. Lewicke.
Environmental Science and Technology, Vol 6, No 3, p 213-215, March, 1972.

Descriptors: *Groundwater, *Wells, Artificial recharge, Waste injection wells, Pollution, Legislation, Government.
Identifiers: *Water Pollution Control Act.

A general description is provided of the origin, transport, storage, and importance of groundwater. The dependency of much of the country, especially rural areas, on their groundwater resources is emphasized. Artificial recharge is discussed. The contamination of groundwater by surface and subsurface disposal of wastes is examined, and concern for protection of this resource is urged. Federal and state regulation policies are examined. (Staplin-NWWA)
W74-07854

ORGANIC WATER IMPURITIES AND EVALUATION OF METHODS FOR THEIR REMOVAL IN WATER MAINS (IN RUSSIAN),
Kiev Research Inst. of General Communal Hygiene (USSR).
For primary bibliographic entry see Field 5D.
W74-07862

CORROSIVE EFFECTS OF SOUTHERN CALIFORNIA POTABLE WATERS,
Southern California Metropolitan Water District, Los Angeles.
For primary bibliographic entry see Field 8G.
W74-07866

MINE DRAINAGE POLLUTION CONTROL VIA REVERSE OSMOSIS,
National Environmental Research Center, Rives, W.V.
For primary bibliographic entry see Field 5D.
W74-07881

CORROSION RESISTANCE OF PIPING AND CONSTRUCTION MATERIALS,
Engelhard Industries, Inc., Newark, N.J.
For primary bibliographic entry see Field 8G.
W74-07888

CORROSION BY WATERS,
Union Carbide Corp., New York.
For primary bibliographic entry see Field 8G.
W74-07890

ZINC/PHOSPHATE COMBINATIONS CONTROL CORROSION IN POTABLE WATER DISTRIBUTION SYSTEMS,
Virginia Chemicals, Inc., Portsmouth, Va.
For primary bibliographic entry see Field 8G.
W74-07894

PROCESSES, PROCEDURES, AND METHODS TO CONTROL POLLUTION FROM MINING ACTIVITIES.
Skelly and Loy, Harrisburg, Pa.
Available from Sup Doc, GPO, Washington, D.C. 20402 Price $3.40. Environmental Protection Agency Publication 430/9-73-011, October 1973. 390 p, 215 ref. Contract 68-01-1830.

Descriptors: *Water pollution control, *Mine wastes, *Mine water, Coal mine wastes, Strip mine wastes, Acid mine water, Chemical wastes, Water pollution sources.

Pollution control technology applicable to mining activities (including new, currently operating, and abandoned surface and underground mines) is described. Information is provided on techniques of at-source water pollution control applicable to the mining industry. The manual is divided into three major components: (1) surface mining; (2) underground mining; and (3) treatment. The sections describing the various control methods are numbered sequentially through each major component to facilitate use of the manual. Pollution control techniques are described, evaluated, limitations and/or usefulness described, cost data for each technique detailed, where appropriate or possible, and special problems defined. (Knapp-USGS)
W74-07927

METHODS AND PRACTICES FOR CONTROLLING WATER POLLUTION FROM AGRICULTURAL NONPOINT SOURCES.
For primary bibliographic entry see Field 5B.
W74-07941

PROCESSES, PROCEDURES, AND METHODS TO CONTROL POLLUTION RESULTING FROM ALL CONSTRUCTION ACTIVITY.
Hittman Associates, Inc., Columbia, Md.
For primary bibliographic entry see Field 5B.
W74-07942

ORGANO-MERCURY FUNGICIDE TREATMENT OF SUGAR-BEET SEED,
Broom's Barn Experimental Station, Bury St. Edmunds (England).
For primary bibliographic entry see Field 5B.
W74-07951

PETROLEUM SYSTEMS RELIABILITY ANALYSIS, A PROGRAM FOR PREVENTION OF OIL SPILLS USING AN ENGINEERING APPROACH TO A STUDY OF OFFSHORE AND ONSHORE CRUDE OIL PETROLEUM SYSTEMS, VOLUME II - APPENDICES,
J. E. Ritchie, Jr., F. J. Allen, Jr., R. M. Feltes, R. Q. Foote, and W. A. Shortt.
Available from GPO Sup Doc as EP1.23/2:73-280b, $6.90; microfiche from NTIS as PB-232 343, $1.45. Environmental Protection Agency, Report EPA-R2-73-280b, August 1973. 433 p. EPA 15080 HOC. 68-01-0121.

Descriptors: Oil spills, *Oil pollution, Drill holes, *Water quality standards, Data collection, *Well data, *Pollution abatement, Water pollution control.
Identifiers: *Oil spill records.

The analysis examined in detail the causes of polluting spills from selected petroleum systems (onshore and offshore crude oil drilling, production, and gathering/distribution systems). The study included the compilation of data from Federal, State and industrial spill reports, a field survey of the various types of facilities, and an analysis of spill-causing failures. EPA prevention regulations presently under consideration envision the preparation of prevention plans (called Spill Prevention, Control and Countermeasure Plans, or SPCC Plans) by facilities to prevent discharges of oil. This analysis should be invaluable in preparing and evaluating these plans. The results will indicate operating procedures and equipment which are still prone, and failures which can be anticipated and, in many cases, prevented. The application of preventive maintenance, operating procedures and, equipment which have been used effectively by the industry to successfully combat failures are discussed. Volume II contains eleven appendices that provide the detailed information upon which the findings are based. (See also W74-02947)(EPA)
W74-07957

THE STATE OF THE SYSTEM (SOS) MODEL: MEASURING GROWTH LIMITATIONS USING GEOLOGICAL CONCEPTS,
Chase, Rosen and Wallace, Inc. Alexandria, Virginia
For primary bibliographic entry see Field 6G.
W74-07958

CARBONATE BONDING OF TACONITE TAILINGS,
Applied Technology Corp., Pittsburgh, Pa.
P. J. LaRosa, K. A. Ricciardella, and R. J. McGarvey.
Copy Available from GPO Sup Doc as EP1.23:670/2-74-001, $1.00; microfiche from NTIS as PB-232 370, $1.45. Environmental Protection Agency, Technology Series Report EPA-670/2-74-001, January, 1974. 53 p, 22 fig, 12 tab. EPA Program Element 1BB040. 68-01-0195.

Descriptors: *Carbonates, *Bonding, *Road construction, Pollution abatement, Aggregates.
Identifiers: *Carbonate bonding, *Taconite tailings, Brickmaking.

Carbonate bonding consists of mixing and compacting a suitable material with water and lime hydrate, and then reacting it with a carbon dioxide-rich gas to form a coherent structure bonded by a matrix of calcite crystals. Carbonate bonding of mining refuse can minimize the pollution associated with refuse stockpiling and disposal. A laboratory study has indicated that taconite tailings can be carbonate bonded to form an effective road paving or brick-making material. In general, the compressive strength of carbonate bonded taconite tailings increased with increasing lime hydrate content, reaction time, and carbon dioxide concentration in the reaction gas. Air and water permeability, freeze-thaw resistance, and flexural strength of carbonate bonded taconite tailings were found to be comparable to concrete. Scaleup of the laboratory studies to demonstrate paving applications in small plots was hampered by a failure to obtain sufficient compaction. The results, however, did confirm the laboratory study findings. Possible applications of the carbonate bonding process utilizing taconite tailings are road building, formation of aggregate, and brickmaking. An approximate cost comparison suggests that the road construction application is an economical alternative to conventional road building materials and techniques. (EPA)
W74-07959

POLLUTION CONTROL,
New Mexico State Univ., Las Cruces. Water Resources Research Inst.
For primary bibliographic entry see Field 6D.
W74-07970

REGIONAL ENERGY-WATER PROBLEMS--COLORADO RIVER-GREAT BASIN,
Colorado State Univ., Fort Collins. Environmental Resources Center
For primary bibliographic entry see Field 6D.
W74-07977

INDUSTRIAL LIQUID WASTE SURVEYS: TRAINING MANUAL.
Environmental Protection Agency, Cincinnati, Ohio. Water Quality Office
Available from the National Technical Information Service as PB-224 155, $4.75 in paper copy, $1.45 in microfiche. January 1973. 170 p, 37 fig, 23 tab, 116 ref.

Descriptors: *Industrial wastes, *Surveys, *Liquid wastes, *Training, Methodology, Industrial water, Water pollution sources, Water utilization, Thermal pollution, Water temperature, Water pollution effects, Fish, Fish reproduction, Data collections, Effects, Water sampling, Analytical techniques, Waste identification, Chemical analysis, Bioassay, Hydrogen ion concentration, Acidity, Alkalinity, Electrical conductance, Chemical oxygen demand, Suspended solids, Flow measurement, Fluorometry, Tracers, Documentation, Judicial decisions, Laboratory tests, Monitoring.
Identifiers: *In-plant surveys.

The ability to detect potential or actual waste sources expedites all phases of industrial waste surveys, especially selection of sampling points. This ability is largely related to individual familiarity with industrial uses of water. Industry uses water for cooling and a number of process applications including reactant, reaction medium, solvent, cleaning or washing, rinsing, washing of equipment, quenching, scrubbing of gases, and as a transporting, processing, or heat transfer medium. This training manual is designed to facilitate the planning and conduct of in-plant industrial waste surveys and is divided into five outlines including industrial water use, sources of liquid wastes, and effects of different pollutants on aquatic life; survey planning, which discusses the factors to be considered in planning and the conduct of an in-plant survey; analytical procedures outline the physical and chemical properties and bioassay techniques; survey methods in which procedures for sampling and measuring flows are outlined; survey evaluation and reporting survey results, and pertinent features concerning court proceedings dealing with water quality evidence. (Auen-Wisconsin)
W74-07988

RESEARCH TO DETERMINE THE ENVIRONMENTAL RESPONSE TO THE DEPOSITION OF SPOIL ON SALT MARSHES USING DIKED AND UNDIKED TECHNIQUES.
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 6G.
W74-07990

ENVIRONMENTAL FACTORS OF LEUKEMIA MORBIDITY, (IN POLISH),
For primary bibliographic entry see Field 5C.
W74-07999

EFFECTS OF COLORADO RIVER WATER QUALITY AND SUPPLY ON IRRIGATED AGRICULTURE,
Economic Research Service, Davis, Calif.
For primary bibliographic entry see Field 3C.
W74-08014

INDUSTRIAL APPLICATION OF WHITFORD'S DEMAND FORECASTING PROCEDURE,
Southern Methodist Univ., Dallas, Tex. Inst. of Tech.
For primary bibliographic entry see Field 6D.
W74-08015

MULTI-UNIT APPARATUS FOR COLLECTING OIL FROM THE SURFACE OF A BODY OF WATER,
W. H. Daniel.
U.S. Patent No. 3,784,013, 4 p, 8 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 918, No 2, p 680, January 8, 1974.

Descriptors: *Patents, *Oil pollution, *Pollution abatement, *Water quality control, *Water pollution control, Equipment, Water pollution, Separation techniques.

Oil is collected from the surface of the water regardless of the contour or wave motion of the water, not by moving the oil in a horizontal direction relative to the water but rather by moving the oil downward beneath the surface of the water, and then upward. Having regard for the differential specific gravities of oil and water, the downward movement of the oil beneath the surface of the water imparts to the oil the ability to perform the work of raising the separated oil a substantial distance above the surface of the water. A tent-like structure is immersed from a position above the surface of the water to a position below the surface thereby confining and forcing downward an area of the oil. The oil moves to the top of the tent-like structure and the oil thus concentrated is permitted to flow into the lower portion of a vertical conduit, in which it tends to flow upward under hydrostatic pressure. The tent-like structure is repeatedly raised and lowered, thereby repeatedly introducing oil into the conduit, so that the liquid in the conduit rises to a height above the surface of the surrounding water. Oil flowing from the conduit is collected and maintained separate from the body of water. (Sinha - OEIS)
W74-08020

FLOATING BARRIER,
Chevron Research Co., San Francisco, Calif. (Assignee).
J. A. Sayles.
U. S. Patent No 3,792,589, 6 p, 7 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 919, No 3, p 819, February 19, 1974.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Pollution abatement, Water quality control, Water pollution control, Equipment, *Barriers, *Flotsam.

The boom which serves as a floating barrier is constructed of a single sheet of reinforced rubber-like material which is folded along a longitudinal median to form the sides of it. A tensile stress cable, stress plates, ballast weights, and, in one modification, stiffening members and end plates, are placed between the two sides of the boom in appropriate operating relationship and the sides are then joined together. A series of relatively short inflatable chambers are formed along the top edge of the boom. Opposite sides of the boom are vulcanized together between flotation chambers to form the chambers as separate air pockets. This construction gives the boom a degree of stiffness in a lateral direction from the top edge to the bottom edge which will function to hold the top edge of the boom above the surface of the water. (Sinha-OEIS)
W74-08025

METHOD AND APPARATUS FOR AERATING BODIES OF WATER,
B. E. Hirshon.
U. S. Patent No 3,794,303, 8 p, 17 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 919, No 4, p 1251, February 26, 1974.

Descriptors: *Patents, *Aeration, *Aerators, Waste water treatment, *Pollution abatement, *Water pollution control, *Water quality control, Equipment, Effluents.

Unbalanced water columns which are connected at their upper ends are used provide continuous aeration of water at any desired depth. The head on one column is attained by the introduction of air into the other columns which serves both to raise and to aerate the water. Alternately, the water may be circulated by mechanical means and the air introduced at the top of its travel. Undissolved air is permitted to escape as it passes between the columns before it enters the return column. (Sinha-OEIS)
W74-08031

OIL RECOVERY APPARATUS,
J. K. Stewart.
U. S. Patent No 3,794,175, 5 p, 4 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 919, No 4, p 1217, February 26, 1974.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Pollution abatement, Water quality control, *Water pollution control, Equipment, *Separation techniques.

An oil recovery vessel is provided with a receiving chamber having an upstanding side wall high enough to prevent excessive flooding during use in moderately heavy seas. Floating oil is picked up by water jets and carried over the wall into the receiving chamber. The nozzle of each jet is supported by a float operated mechanism adapted to automatically maintain it in a proper discharge attitude with respect to the side wall. The receiving chamber consists of two compartments, both open at their lower ends. During operation a column of recovered oil builds up in the annular outer chamber. As the colum increases in depth its lower level drops until eventually the oil is in communication with aperatures in the sidewall. The oil passes through the aperatures into the inner compartments and rises. An oil pickup pipe draws the oil to a collection receptacle. (Sinha-OEIS)
W74-08033

CONTROL OF WATERBORNE OIL SLICKS,
P. Preus.
U. S. Patent No 3,795,315, 3 p, 6 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 920, No 1, p 96, March 5, 1974.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Pollution abatement, Water pollution control, Water quality control, Equipment, *Barriers.

A segmented floating barrier having a fluid previous skirt is placed to contain an oil slick. An oleophilic-hydrophobic fiberous substance is used to absorb the oil and render it incapable of passing through the skirt. A bottom hem is formed along the lower margin of the skirt and is filled with a heavy material to provide ballast. The skirt is formed of an open mesh fabric reinforced sandwich of sheet plastic. (Sinha-OEIS)
W74-08036

REVERSE OSMOSIS-NEUTRALIZATION PROCESS FOR TREATING MINERAL CONTAMINATED WATERS,
Environmental Protection Agency, Washington, D.C. (assignee)
For primary bibliographic entry see Field 5D.
W74-08041

PRESENT PROBLEMS IN THE STUDY OF SURFACE-WATER QUALITY (AKTUAL'NYYE PROBLEMY ISSLEDOVANIYA KACHESTVA POVERKHNOSTNYKH VOD),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
A. V. Karaushev, and B. G. Skakal'skiy.
Meteorologiya i Gidrologiya, No 10, p 73-81, October 1973. 25 ref.

Descriptors: *Water quality, *Water chemistry, *Water pollution control, *Human population, *Surface waters, Lakes, Reservoirs, Rivers, Waste water(Pollution), Hydrodynamics, Hydrologic aspects.
Identifiers: *USSR.

The present state of research on quality characteristics of surface waters in the USSR and on evaluation of changes in water quality in rivers, lakes, and water bodies as a result of human activity is reviewed. Attention is focused on problems arising in connection with the need to regulate water quality and to control pollution. Problems relating to development of methods of calculating changes in water quality as a function of waste water inflow and of hydrodynamic and hydrologic conditions are discussed. (Josefson-USGS)
W74-08050

SANITARY-HYGIENIC EVALUATION OF THE WATER QUALITY OF THE NURA WATER CONDUIT OF THE TSELINOGRAD DISTRICT (IN RUSSIAN),
Meditsinskii Institut, Tselinograd (USSR).
For primary bibliographic entry see Field 5A.
W74-08052

PROBLEM OF RATIONAL USE AND CONSERVATION OF WATER RESOURCES AND GOALS OF HYDROLOGY (PROBLEMA RATSIONAL'NOGO ISPOL'ZOVANIYA I OKHRANY VODNYKH RESURSOV I ZADACHI GIDROLOGII),
Hydrometeorological Service of the USSR, Moscow.
For primary bibliographic entry see Field 6B.
W74-08055

QUALITY OF DRINKING WATER ON SHIPS IN RELATION TO SAILING CONDITIONS, (IN RUSSIAN),
Black Sea-Azov Watershed Basin Sanitary Epidemiology Station, Odessa (USSR).
For primary bibliographic entry see Field 5B.
W74-08082

DESTRUCTION TRIALS OF THE MUSKRAT, ONDATRA ZIBETHICA L., IN PONDS USING POISONING RAFTS, (IN FRENCH),
Laboratoire des Petits Vertebres, Jouy-en-Josas (France).
J-P. Vincent, and J-P. Quere.
Ann Zool Ecol Anim. Vol 5, No 1, p 119-127. 1973. Illus. (English summary).
Identifiers: *Chlorophacinone, Destruction trials, *France(Loir-et-Cher department), *Muskrat, Ondatra-Zibethicus, Pesticides, *Poisoning rafts, Ponds.

Two muskrat destruction trials using poisoning rafts in ponds in the Loir-et-Cher department (France) were performed. The practical efficiency of this measure was computed. Intake was measured before and after treatment using unpoisoned bait. The original population level was estimated using Lincoln's Index method. Muskrats were captured in traps and labeled by partial shearing of the fur. Labeled animals found among the dead along the shores of the pond and in final trapping were then counted. Various types of activity such as frequentation of different burrows and water surface activity at night were observed. Poisoning was done with carrots cut in rounds and coated with a 0.25% oily solution of chlorophacinone. The dose was 20 cm3/kg of bait, or 0.005% active matter. The results obtained by these different methods agree, and practical efficiency may be estimated at more than 90%. This method seems to offer complete guarantee that secondary poisoning of game does not occur.--Copyright 1973, Biological Abstracts, Inc.
W74-08128

POLLUTION CONTROL AND ERECTION OF SEWAGE PLANTS: TECHNICAL FEASIBILITIES, FUTURE DEMANDS, (IN GERMAN),
Hygiene-Institut, Muenster (West Germany).
H. Reploh.
Zentralbl Bakteriol Parasitenkd Infektionskr Hyg Erste Abt Orig Reihe B Hyg Praev Med. Vol 155, No 3, p 237-247. 1971. Illus. English summary.
Identifiers: Pathogenic organisms, Sewage, *Potable water, *Water pollution control, Treatment facilities, *Water supply, *Feasibility studies.

Problems of water supply and consumption are discussed. The esthetic significance of lakes and rivers and the significance of waters as economic bases of agriculture and certain types of industry and fisheries are surpassed by the importance of the drinking water supply. The water supply is based directly or indirectly on recharge. For reasons of hygiene, efforts to purify lake and river water should not lead to reducing the consumption of drinking water. The quality of drinking water and water used for industrial purposes may be improved by employing expensive conditioning methods. Water purification restricted to the killing of pathogenic organisms is not appropriate. The high water consumption in certain ages of life (e.g., infancy) requires particularly cautious disposal of biocidal, pesticidal and carcinogenic substances. Scientific methods for detecting toxic substances contained in the drinking water need elaboration. Legal aspects are considered.--Copyright 1973, Biological Abstracts, Inc.
W74-08138

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

THE METHODOLOGY OF BAYESIAN INFERENCE AND DECISION MAKING APPLIED TO EXTREME HYDROLOGIC EVENTS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W74-07601

THE ROLE OF PUBLIC INVOLVEMENT IN WATER RESOURCES PLANNING AND DEVELOPMENT, A REPORT WITH READINGS ON RESEARCH AND EXPERIMENTATION IN PUBLIC AFFAIRS EDUCATION.
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 6B.
W74-07610

ECONOMIC OPTIMIZATION AND SIMULATION TECHNIQUES FOR MANAGEMENT OF REGIONAL WATER RESOURCE SYSTEMS,
Texas Water Development Board, Austin.
Available from the National Technical Information Service as PB-232 066; $3.75 in paper copy, $1.45 in microfiche. Completion Report 179, February 1974. 51 p, 31 fig, 7 tab, 27 ref. OWRR C-2070(3360)(2). 14-31-0001-3360.

Descriptors: *Water requirements, *Irrigation systems, *Water allocation, Water resources development, *Optimum development plans, Model studies, Stochastic hydrology, *Economic efficiency, Water quality, Systems analysis, Networks, *Simulation analysis, Optimization, Linear programming, Sampling, Dynamic programming, Texas, Management, *Regional analysis.
Identifiers: *Texas water plan, Irrigated agriculture.

This research represents the final phase of a three-phase research project leading towards the development of a computer-oriented planning system for use in planning large, multibasin systems of reservoirs and connecting river reaches and pump-canals. Specifically, the research defines a methodology for finding an optimal size, operation, and staging of construction of a water resource system with highly variable inflows and demands that are increasing over the planning horizon and assessing the impacts of such a system. The methodology is developed using the Texas Water System as an example. Primarily through the development of a model which simulates the demand for and use of water in an agriculturally oriented area, the third phase of the research builds on progress previously achieved in simulating and optimizing the water capture and transfer system. This model simulates the farmer's rational decision process in maximizing his monetary returns in the face of highly variable hydrology and various physical and institutional restrictions. In effect, this model sizes the agricultural water demand to the available water supply. Additionally, the research presented includes enhancements to the supply simulation models as well as the development of a model to simulate the quality of water in a multibasin system. The computer programs developed during this research are designed to analyze a problem on a monthly basis using historic or stochastic hydrologic input data sequences, a specified demand build-up period, and an economic life as defined by the user.
W74-07714

ANALYTICAL TECHNIQUES FOR PLANNING COMPLEX WATER RESOURCE SYSTEMS.
Texas Water Development Board, Austin. Systems Engineering Div.
Available from the National Technical Information Service as PB-232 158, $3.75, in paper copy, $1.45 in microfiche. Report No 183, April 1974. 59 p, 34 fig, 2 tab, 13 ref. OWRR C-2070(3360)(3).

Descriptors: *Water resources, *Planning, *Systems engineering, Water supply, Water quality, River basin development, Optimization, Stochastic hydrology, *Systems analysis, Economic analysis, Systems models, Operations research, Analytical techniques, Texas.
Identifiers: *Texas Water Plan.

This report summarizes the research experience of the Texas Water Development Board, the constitutional water planning and development agency for the State of Texas, over the period 1965-1972. In this period, the Board initiated and conducted a sustained program of research, supported by the cooperation and financial aid of the Office of Water Resources Research, that has developed techniques useful in decision-making which are believed to be generally applicable to water planning problems elsewhere. The Texas Water Plan, formally adopted and released in 1968, relied upon traditional analytical and planning techniques. This planning effort clearly demonstrated that planning to solve current and future water problems on a statewide basis required new techniques of analysis that would not have been possible, except in a conceptual sense, before the advent of high-speed, large-capacity computers. Therefore, systems analysis techniques were developed to assist in solving some of the long-range water planning problems encountered and identified in the Texas Water Plan and for refining the Texas Water Plan as it was originally conceived. In this report, the conditions dictating the constraints and opportunities of the Texas Water Plan are described. The sequential steps in the research program are outlined, and the proposed facilities of the Texas Water System are used as an example for research and development of new planning techniques.
W74-07722

WATER RESOURCES MANAGEMENT FOR METROPOLITAN WASHINGTON: ANALYSIS OF THE JOINT INTERACTIONS OF WATER AND SEWAGE SERVICE, PUBLIC POLICY AND LAND DEVELOPMENT PATTERNS IN AN EXPANDING METROPOLITAN AREA
Metropolitan Washington Council of Governments, D.C.
For primary bibliographic entry see Field 6B
W74-07723

APPENDICES TO WATER RESOURCES MANAGEMENT FOR METROPOLITAN WASHINGTON: ANALYSIS OF THE JOINT INTERACTIONS OF WATER AND SEWAGE SERVICE, PUBLIC POLICY, AND LAND DEVELOPMENT PATTERNS IN AN EXPANDING METROPOLITAN AREA.
Metropolitan Washington Council of Governments, D.C.
For primary bibliographic entry see Field 6B
W74-07724

THE STATE OF THE SYSTEM (SOS) MODEL: MEASURING GROWTH LIMITATIONS USING GEOLOGICAL CONCEPTS,
Chase, Rosen and Wallace, Inc. Alexandria, Virginia
For primary bibliographic entry see Field 6G.
W74-07958

OPTIMAL TIMING AND SIZING OF A CONJUNCTIVE URBAN WATER SUPPLY AND WASTE WATER SYSTEM WITH NONLINEAR PROGRAMMING,
Loyola Univ., Los Angeles, Calif.
For primary bibliographic entry see Field 5D.
W74-08010

A SYSTEMS APPROACH TO ASSESSMENT OF RURAL WATER SUPPLY PROGRAM EFFECTIVENESS,
Asian Inst. of Tech., Bangkok (Thailand). Dept. of Environmental Engineering.
For primary bibliographic entry see Field 6B
W74-08012

IMPROVED DYNAMIC PROGRAMING PROCEDURES AND THEIR PRACTICAL APPLICATION TO WATER RESOURCE SYSTEMS,
Water Research Association, Marlow (England).
P. A. Mawer, and D. Thorn.
Water Resources Research, Vol 10, No 2, p 183-190, April 1974. 9 fig, 2 tab, 10 ref.

Descriptors: Water resources development, *Dynamic programming, *Simulation analysis, *Reservoirs, *Long-term planning, *Operation, Optimization, Algorithms, Probability, Markov processes, Reliability, Water demand, Water supply, Pumping plants, Inflow, Rivers, Decision making, Operations research, Mathematical models.
Identifiers: *Cost minimization, Value iteration, Penalty costs, Policy making, Transition costs, Computational procedures.

An optimization algorithm is described that uses value iteration dynamic programming and simulation in conjunction with penalty costs to derive long-term operating policies for water resource systems. Feedback from the simulation to the dynamic programming is achieved by means of the penalty costs, which may be interpreted as Lagrangian multipliers. Highly efficient value iteration procedures are developed for two types of problems illustrated by numerical examples: (1) deterministic transition costs--an on-channel reservoir is to be operated in conjunction with a high cost source; and (2) probability transition costs--herein considers the supply of water to a pumped storage reservoir used for amenity purposes and direct regulated water demands. Both problems require finding an operating policy that minimizes long-term running costs and satisfies a reliability objective; the latter problem requires

also fulfilling an amenity objective. An indication is given of how the methods described can be applied to multireservoir systems by using the concept of an equivalent reservoir. It is shown that simplified dynamic programming procedures can be formulated by recognizing the inherent nature of the problem and neglecting such things as the serial correlation of reservoir inputs. These procedures produce substantial savings in computation, enabling a much more thorough appraisal of problems than was hitherto possible. Although slightly suboptimal operating policies are obtained, the practical benefits obtained from the general optimization algorithm outweigh most theoretical objections. (Bell-Cornell)
W74-08013

INDUCED SAFETY ALGORITHM FOR HYDROLOGIC DESIGN UNDER UNCERTAINTY,
Water Resources Center, Budapest (Hungary).
I. Bogardi, and F. Szidarovszky.
Water Resources Research, Vol 10, No 2, p 155-161, April 1974. 5 fig, 3 tab, 12 ref, 2 appen.

Descriptors: *Design, Hydrology, *Structures, Cost-benefit analysis, *Algorithms, *Simulation analysis, *Levees, Rivers, Equations, Optimization, Decision making, Construction costs, Statistical methods, Regulation, Mathematical models, Systems analysis, *Risks.
Identifiers: *Hungary(Tisza River), *Hungary(Lajta River), Finite sample size, Margin of safety, Economic loss.

The induced safety algorithm (ISA) is a method for calculating the margin of safety in the design of hydrologic structures under the uncertainty due to finite sample size. The ISA may be applied to the design of a new structure or the redesign of an existing one; the initial design criterion may be calculated by benefit-cost or be prescribed by regulation. The optimum decision is reached by maximizing the sum of three terms (in case of redesign to a larger value): the discounted economic benefit due to uncertainty reduction, the average loss averted, and the incremental construction cost. The uncertainty on the distribution function of the state variable (yearly peak flow) is encoded by the probability density function of flow pertaining to a fixed return period. Simulation is used to calculate the distribution of the state variable. Two examples of levee design in Hungary illustrate the method. (Bell-Cornell)
W74-08017

EARTHQUAKE DAMAGE COSTS IN THE DESIGN OF WATER RESOURCE SYSTEMS,
California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 4A.
W74-08018

6B. Evaluation Process

SUMMARY REPORT FOR A METHODOLOGY STUDY TO DEVELOP EVALUATION CRITERIA FOR WILD AND SCENIC RIVERS,
Idaho Univ., Moscow. Dept. of Agricultural Economics.
E. L. Michalson, and J. Hamilton.
Available from the National Technical Information Service as PB-232 070, $5.75 in paper copy, $1.45 in microfiche. Completion Report, Idaho Water Resources Research Institute, Moscow, Scenic River Study Report no 10, December 1973. 181 p, 12 fig, 2 tab, 22 ref. OWRR B-014-IDA(16). 14-31-001-3074.

Descriptors: *Methodology, *Cost-benefit ratio, *Evaluation, Water resource development, Hydroelectric power, Irrigation, Agriculture, Archaeology, Commercial fisheries, Flood control, Natural resources, History, Hunting, Navigation, Recreation demand, Water supply, Water quality control, *Idaho, Recreation facilities.
Identifiers: *Salmon River(Idaho), *Wild Rivers, Hydroelectric power.

The general objective was to develop a methodology to evaluate selected rivers to determine if they should be included in the National Wild and Scenic Rivers System as defined in the Wild and Scenic Rivers Act (PL 90-542). Included in the development of the methodology was inventorying resources and resource areas important to wild river states, and evaluating each of these areas in light of river classification. The evaluation process followed the procedures set forth in the Water Resources Council's 'Establishment of Principles and Standards for Planning Water and Related Land Resources' using the alternate cost approach towards establishment of resource values. This approach involves the concept of consumer surplus used to establish net values for alternative resources uses in the Salmon River Basin. These consumer surplus values were then compared to determine which of them provided the largest net benefits. The two competing resource uses identified were hydroelectric power production and recreation. The final step in the proposed methodology determined the trade-offs between outdoor recreation and hydroelectric power production for the Salmon River. The methodology recognizes that the ultimate decision to preserve a wild and scenic river rests largely on a political value judgement. The procedure described permits one to quantify in terms of net benefits measured as consumer surplus values the trade-offs between competing resource uses.
W74-07608

AN ANALYTICAL INTERDISCIPLINARY EVALUATION OF THE UTILIZATION OF THE WATER RESOURCES OF THE RIO GRANDE IN NEW MEXICO: LOWER RIO GRANDE REGION,
New Mexico State Univ., Las Cruces. Dept. of Agricultural Economics.
R. R. Lansford, S. Ben-David, T. G. Gebhard, Jr, W. Brutsaert, and B. J. Creel.
Available from the National Technical Information Service as PB-232 068, $4.50 in paper copy, $1.45 in microfiche. New Mexico Water Resources Research Institute, Las Cruces, Report No 024, May 1974. 109 p, 16 fig, 34 tab, 87 ref. OWRR A-045-NMEX(5) and B-016-NMEX(6). B-019-NMEX(6) and B-026-NMEX(6).

Descriptors: *New Mexico, *Water demand, Economics, *Water resources development, Management, *Economic predictions, *Surface-groundwater relationships, Natural resources, Water requirements, Resource allocation, River basins, Groundwater management, Water law, Interstate compacts, International compacts, Treaties, Litigation, Water quality, Water utilization, Human population, Employment, Industrial water, Recreation, *Rio Grande River.
Identifiers: *Socio-economic model, Interdisciplinary, Groundwater appropriations, Input-output coefficient, Irrigation water diversions.

An interdisciplinary approach to the solution of the water resource problems of the Lower Rio Grande Region in New Mexico was centered around a socio-economic model, with special emphasis placed upon the Rio Grande Region. Inputs into the socio-economic model were obtained from separate studies. Three sets of alternatives were considered: (1) Without a water constraint, in the Rio Grande Region, both production and depletions are expected to exhibit the largest increase (59.7 percent and 47.4 percent, respectively); (2) When a surface water constraint is imposed, the value of production is reduced by $18.1 million in 2020 and water depletions are expected to decrease about 18.1 percent by 2020; (3) When a total water constraint is imposed, the value of production is decreased $4.1 million below that expected when using only a surface water constraint, and water depletions reduced about 8.4 percent. The Lower Rio Grande Region is expected to follow the general trend of the total Rio Grande Region but at a higher growth rate. The expected increase in total value of production from 1970 to 2020 is 62.0 percent, employment 63.5 percent, and water depletions about 61 percent. When a surface-water constraint is imposed, production is expected to be reduced $13.6 million in 2020, employment by 154 employees, and water depletions by 61,404 acre-feet. When an additional constraint is imposed on ground water in the LRGR, production would be decreased $0.4 million in 2020, employment by an additional 15 employees, and water depletions by 5,764 acre-feet. (Hain-New Mexico State)
W74-07609

THE ROLE OF PUBLIC INVOLVEMENT IN WATER RESOURCES PLANNING AND DEVELOPMENT, A REPORT WITH READINGS ON RESEARCH AND EXPERIMENTATION IN PUBLIC AFFAIRS EDUCATION.
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
Available from the National Technical Information Service as PB-232 079, $5.00 in paper copy, $1.45 in microfiche. Technical Completion Report No 79, A.E. Ext 74-3, Cornell University Water Resources and Marine Sciences Center, Ithaca, New York, March 1974. 160 p, 47 ref. (Assembled and edited David J. Allee). OWRR B-017-NY(1).

Descriptors: *Water resources development, *Planning, *Education, *Research, *River basins, *Projects, *New York, *Evaluation, Methodology, Management, Lakes, Watersheds, Political aspects, Social aspects, Systems analysis.
Identifiers: *Public involvement.

Considered is the use of educational techniques to encourage wider and more informed participation in the public aspects of water resources. This report grows out of experimental educational work at the Cornell University Water Resources and Marine Sciences Center between July 1969 and June 1971, discloses objectives, procedures, and details of this research, and consolidates some experience and analysis in the use of such techniques for improving planning and development processes in the water resources field. The Cornell Project stressed the exploration of methods, principles, roles and opportunities for the participation of universities in providing educational inputs into public involvement in water resources planning and development. Alternative techniques were evaluated and a variety of activities were undertaken in a variety of settings; in every case, comprehensive basin planning was actively being pursued under either state or federal leadership. Evaluation procedures included: systematic application of professional judgment as each program succeeded; and regular contact and interaction with a variety of social scientists. Numerous projects are identified and discussed as to objective, situation, activities, and results. (Bell-Cornell)
W74-07610

CAPACITY OF WATER-BASED RECREATION SYSTEMS PART I: THE STATE OF THE ART - A LITERATURE REVIEW,
North Carolina State Univ., Raleigh. Dept. of Recreation Resources Administration.
G. A. Hammon, H. K. Cordell, L. W. Moncrief, M. R. Warren, and R. A. Crysdale.
Available from the National Technical Information Service as PB-232 092; $3.75 in paper copy, $1.45 in microfiche. North Carolina Water Resources Research Institute, Raleigh, Report No 90, (UNC-WRRI-74-90), April 1974. 49 p, 147 ref. OWRR B-013-NC(3). 14-01-0001-1936.

Descriptors: *Recreation, Boating, Swimming, Water skiing, Fishing, *Recreation facilities, Planning, *Bibliographies, *Reviews, Water sports, Methodology, Measurement, Attitudes, Social aspects.

Identifiers: *Recreation capacity.

Recreation capacity is a popular concept, but there is no established rationale or methodology for understanding, measuring, and applying it. This report recognizes the complex and dynamic nature of capacity by reviewing separately the literature which bears on each of five categories of factors which influence capacity: (1) administrative, (2) biological, (3) physical, (4) social, and (5) temporal. The literature is dominated by published reports dealing primarily with the physical factors and secondarily with the social factors. Administrative, biological, and temporal factors have received minor attention in the literature. The applicability of Liebig's law of the minimum (the occurrence and functioning of an organism is limited by that essential environmental factor, or combination of factors, which is present to the least favorable extent) to the concept of capacity is discussed. The final section reviews the empirical research effort which has been applied to capacity conceptualization and measurement. To date, this effort has been meager and fragmented. (McJunkin-North Carolina State)
W74-07719

INNOVATION: A CASE STUDY,
American Society of Civil Engineers, New York.
M. B. McPherson.
Available from the National Technical Information Service as PB-232 166; $3.75 in paper copy, $1.45 in microfiche. ASCE Urban Water Resources Research Program, Technical Memorandum No 21, February, 1974. 59 p, 11 fig, 156 ref. OWRR C-4048(9009)(4).

Descriptors: *Project planning, *Urbanization, *Water quality control, Administrative agencies, Management, Pollution abatement, Underground storage, Sewers.
Identifiers: *Innovation, *Invention, Technology transfer, Public technology, Information dissemination, *Industrial innovation, San Francisco, Chicago area, Land wastewater disposal, Pressure wastewater sewers, Enforcement, Risk taking, Master planning, Combined sewer overflows, Metropolitan studies.

Four urban water resource case studies are employed as a means for elucidating causation inferences on the process of technological innovation: San Francisco Master Plan; Chicago Underflow Plan; Land Disposal of Wastewater; and Pressure Wastewater Sewer Systems. All four are instances where innovation concepts have been successfully applied, and they are all concerned with water quality matters. Consideration is given to industrial parallels, the roles of individuals versus groups in innovation, and certain characteristics of some leading innovative local government administrators. Also taken into account are related subjects of technology transfer and public technology. However, only briefly discussed are mechanisms for translation or diffusion of the concepts used for illustration. While venturesome forefront examples are used, they are in the early stages of their evolution, as plans, process developments or demonstrations. Evident are some of the limitations in knowledge dealing with innovation, information dissemination and technology transfer.
W74-07720

ANALYTICAL TECHNIQUES FOR PLANNING COMPLEX WATER RESOURCE SYSTEMS.
Texas Water Development Board, Austin. Systems Engineering Div.
For primary bibliographic entry see Field 6A.
W74-07722

WATER RESOURCES MANAGEMENT FOR METROPOLITAN WASHINGTON: ANALYSIS OF THE JOINT INTERACTIONS OF WATER AND SEWAGE SERVICE, PUBLIC POLICY AND LAND DEVELOPMENT PATTERNS IN AN EXPANDING METROPOLITAN AREA.
Metropolitan Washington Council of Governments, D.C.
Available from the National Technical Information Service as PB-232 169, $4.00 in paper copy, $1.45 in microfiche. Completion Report, December 1973. 104 p, 18 fig, 4 tab, 82 ref. OWRR C-2128(3400)(1). 14-31-0001-3400.

Descriptors: *Planning, *Land use, Water supply, Water quality, Systems analysis, Decision making, Governments, Computer programs, Regional analysis, *Sewers, Data collections, *District of Columbia, Model studies, Local governments, *Management, *Utilities, Cities, Urbanization.
Identifiers: *Metropolitan Washington, D.C., Public policy, Population distribution, EMPIRIC Activity Allocation model.

One of the means introduced by local governments during the late sixties to slow the rate and control the location of development was the staging and programming of utilities service, particularly sewer facilities. Because of a lack of quantitative analysis on the supposed relationship of water-sewer policy and growth, this study was conducted to: (a) identify and evaluate effects of water and sewage facilities on population and employment; and (b) develop and evaluate methods of expressing relationships between water and sewage service and urban growth in a form useful for urban water resources planning. The qualitative aspect of the study consisted of identifying, through discussions with key officials, the elements of utilities sizing, location and timing policy. The quantitative aspect centered on development of a measure of water or sewer availability that would correlate more highly with actual metropolitan development observed from 1960 to 1968 that the variable specified in the urban growth model, EMPIRIC, currently utilized in the regional planning process for Metropolitan Washington. Statistical analyses performed on a number of hypotheses resulted in improved sewer variables for use in EMPIRIC. (See also W74-07724)
W74-07723

APPENDICES TO WATER RESOURCES MANAGEMENT FOR METROPOLITAN WASHINGTON: ANALYSIS OF THE JOINT INTERACTIONS OF WATER AND SEWAGE SERVICE, PUBLIC POLICY, AND LAND DEVELOPMENT PATTERNS IN AN EXPANDING METROPOLITAN AREA.
Metropolitan Washington Council of Governments, D.C.
Available from the National Technical Information Service as PB-232 170, $3.75 in paper copy, $1.45 in microfiche. Completion Report, December 1973, 50 p. OWRR C-2128(3400)(1) append. 14-31-0001-3400.

Descriptors: *Planning, *Land use, Water supply, Water quality, Systems analysis, Decision making, Governments, Computer programs, *Regional analysis, *Sewers, *Data collections, *District of Columbia, *Model studies, Local governments, *Utilities, Cities, Urbanization, Management.
Identifiers: *Metropolitan Washington, D.C., Public policy, Population distribution, EMPIRIC Activity Allocation Model.

This Appendix presents preliminary analyses which were conducted at the beginning of the study effort, and which served as useful guides for the statistical analyses described in the main report. The Appendix also contains basic information utilized in the statistical analyses. This information and other detailed data are stored in computer files at MWCOG and are available upon request. (See also W74-07723)
W74-07724

MANAGEMENT PRIORITIES: NOW AND THE FUTURE,
T. R. Snape.
Water Pollution Control, Vol 72, No 8, p 666-674, 1973. 4 fig.

Descriptors: *Personnal management, *Water allocation(Policy), *Water management(Applied), Administration, *Management.

Water is a growth industry, and thus has characteristic problems related to the pace of change. These problems of change essentially have to do with people and their attitudes, their adaptability, their ability to grasp and exploit new opportunities, and their ability to plan and control the change. The validity of this contention is explored together with management priorities for the future from the consultant's point of view. (Sanduski-Franklin)
W74-07755

SOCIAL AND ECONOMIC FACTORS IN THE ADOPTION BY INDUSTRY OF WATER POLLUTION CONTROL MEASURES IN MINNESOTA,
Minnesota Univ., St. Paul. Inst. of Agriculture.
For primary bibliographic entry see Field 5G.
W74-07834

AN EVALUATION OF THE NEEDS IN FRESHWATER RESEARCH AND RELATED PUBLIC INFORMATION FACILITIES,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 6G.
W74-07838

A SUMMARY OF QUANTITY, QUALITY AND ECONOMIC METHODOLOGY FOR ESTABLISHING MINIMUM FLOWS,
Washington Univ., Seattle.
J. F. Orsborn, B. W. Mar, J. W. Crosby, III, and J. Crutchfield.
Available from the National Technical Information Service as PB232 254 $4.00 in paper copy, $1.45 in microfiche. State of Washington Water Research Center, Pullman, Completion Report no 13, June 1973. 86 p, 17 fig, 15 tab. OWRR B-037-WASH(1). 14-31-0001-3349.

Descriptors: *Low flow, Water allocation(Policy), Competing uses, Legal aspects, Preferences(Water rights), *Washington, Criteria, *Water quality standards, Planning, Evaluation, Drainage basins, Model studies, *Recreation, *Aesthetics, *Conservation, Methodology, Economics.

The study was undertaken to develop methodologies for establishing the legally prescribed minimum flows and levels in streams and lakes in the State of Washington. As more states attempt to preserve their natural resources through the enactment of legislation, their efforts provide a valuable experience record. But, in establishing 'minimum' or 'base' flows in streams for the protection of natural values the development of methodology to apply the laws has not been accomplished and is of particular concern to both state and federal agencies. The overall objective of this study has been to develop methods for analysis of the quantity, quality and economic factors associated with the establishment of low-flow criteria for conservation, recreation and aesthetic purposes. Results have provided methods for predicting natural low flow-recurrence interval graphs for ungaged drainage basins using only USGS 1:62,500 and 1:24,000 scale maps and correlation graphs. Also, using any desired level of flow, four different water quality parameter models were developed. The models vary in degree of sophistication to meet the degree of complexity of the particular stream involved. Economic criteria have been developed for guiding planners in evaluating the

elative value of fisheries, recreation, and diver-ions. The combining of these three project com-onents; quantity, quality, and economics, pro-ides a sequential evaluation of factors required in atisfying the intent of minimum flow laws. Results are reported in two volumes within the re-ort. Vol. 1: Summary; and Vol. 2: Appendices--Methodology and Data.
W74-07847

RECLAMATION RESEARCH IN THE SEVEN-IES--FIRST PROGRESS REPORT.
Bureau of Reclamation, Denver, Colo.
For primary bibliographic entry see Field 4A.
W74-07922

THE ROLE OF WATER IN THE ENERGY CRI-IS.
Nebraska Univ., Lincoln. Water Resources Research Inst.
For primary bibliographic entry see Field 6D.
W74-07961

THE POLITICAL-SOCIAL ASPECTS OF ENER-GY-WATER RELATIONSHIPS,
California Univ., Los Angeles. Public Administra-ion Program.
For primary bibliographic entry see Field 6D.
W74-07963

ECONOMIC ASPECTS OF RESOURCE USE WITH SPECIAL REFERENCE TO ENERGY AND WATER,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
For primary bibliographic entry see Field 6D.
W74-07964

A SYSTEMS APPROACH TO ASSESSMENT OF RURAL WATER SUPPLY PROGRAM EFFECTIVENESS,
Asian Inst. of Tech., Bangkok (Thailand). Dept. of Environmental Engineering.
R. J. Frankel.
Water Resources Research, Vol 10, No 2, p 163-169, April, 1974. 3 fig, 3 tab, 1 append.

Descriptors: *Potable water, Projects, *Evaluation, *Water supply development, *Developing countries, *Systems analysis, *Surveys, Water utilization, Public health, Social impact, Rural sociology, Community development, Data collections, Research, Methodology, Management, Education.
Identifiers: *Thailand, *Impact analysis, Economic implications, Complementary inputs, Resource constraints, Improvement.

Evaluation research in developing countries has been neglecting the sociopolitical, administrative, psychological, and institutional issues that in practice seem to determine project impact and effectiveness. It appears, for example, that provision of a community potable water system will not produce improvements in village health and sanitation unless it is accompanied by a carefully designed program of health education. Systems analysis was used to improve the methodology of impact evaluation by determining the role of resource constraints and complementary inputs in the development of the rural water supply program in Thailand. An impact evaluation was undertaken to analyze the effectiveness of the National Potable Water Project and to provide feedback for improving the administrative, technical, and operational aspects of the program. Evaluation objectives were to provide: (1) guidelines for design, construction, finance, and administration of these projects; (2) operational guidance for management; (3) information for training plant operators; and (4) feedback on villager attitudes, water habits and use, and village development. Complementary and hidden objectives were enumerated, and several phases were delineated and used to simplify interactions and identify variables affecting program success; a detailed interaction flow chart is provided, as well as results from the collection, analysis, and feedback of field data. The methodology developed measured the social, economic and public health implications of the water projects toward achieving rural community development. Data are being collected from some 165 village projects throughout Northeast Thailand. (Bell-Cornell)
W74-08012

EARTHQUAKE DAMAGE COSTS IN THE DESIGN OF WATER RESOURCE SYSTEMS,
California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 4A.
W74-08018

PROBLEM OF RATIONAL USE AND CONSERVATION OF WATER RESOURCES AND GOALS OF HYDROLOGY (PROBLEMA RATSIONAL'NOGO ISPOL'ZOVANIYA I OKHRANY VODNYKH RESURSOV I ZADACHI GIDROLOGII),
Hydrometeorological Service of the USSR, Moscow.
V. I. Korzun, and A. A. Sokolov.
Meteorologiya i Gidrologiya, No 10, p 9-17, October 1973.

Descriptors: *Water utilization, *Water conservation, *Water resources, *Hydrology, *Planning, Forecasting, Water balance, Water pollution, Water pollution control, Water quality, Irrigation efficiency, Drainage, Erosion.
Identifiers: *USSR.

Problems of Soviet hydrology and basic scientific problems relating to rational use and conservation of water resources in the USSR are discussed. The basic scientific problems on which attention must be focused in the near future include: (1) formulation of scientific principles of redistribution of the country's water resources among excessively wet and dry regions in European Russia, Siberia, Kazakhstan, and Soviet Central Asia, and evaluation of the possible consequences of such redistribution; (2) study of natural water pollution, its effects on water quality and the biological cycle, and development of a scientific base for monitoring and controlling water pollution; (3) realization of a complex of hydrologic studies aimed at improving irrigation and drainage efficiency; (4) study of erosion; (5) improvement of methods of hydrologic calculations and forecasts; and (6) development of theoretical and experimental studies of water balance. A major organizational problem is that of establishing a national system of accountability for all types of natural waters and their usage and of conducting a state water survey on the basis of quantitative and qualitative indices. (Josefson-USGS)
W74-08055

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

REDEVELOPMENT OF HAVEN SEWAGE-TREATMENT WORKS, COLCHESTER,
For primary bibliographic entry see Field 5D.
W74-07759

MAJOR WASTEWATER TREATMENT PLANT TO BE UPGRADED,
Malcolm Pirnie, Inc., White Plains, N.Y.
For primary bibliographic entry see Field 5D.
W74-07761

COAGULANT RECOVERY AND REUSE IN WATER RECLAMATION SYSTEMS,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
For primary bibliographic entry see Field 5D.
W74-07844

PUMP SELECTION,
Brown and Root, Inc., Houston, Tex.
For primary bibliographic entry see Field 8C.
W74-07872

MATHEMATICAL MODEL FOR POST AERATION,
Environmental Protection Agency, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 5D.
W74-08045

6D. Water Demand

SUMMARY REPORT FOR A METHODOLOGY STUDY TO DEVELOP EVALUATION CRITERIA FOR WILD AND SCENIC RIVERS,
Idaho Univ., Moscow. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W74-07608

AN ANALYTICAL INTERDISCIPLINARY EVALUATION OF THE UTILIZATION OF THE WATER RESOURCES OF THE RIO GRANDE IN NEW MEXICO: LOWER RIO GRANDE REGION,
New Mexico State Univ., Las Cruces. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W74-07609

GEOLOGY AND WATER RESOURCES OF THE WHARTON TRACT AND THE MULLICA RIVER BASIN IN SOUTHERN NEW JERSEY,
Geological Survey, Trenton, N. J. Water Resources Div.
For primary bibliographic entry see Field 4B.
W74-07668

WATER RESOURCES OF THE LITTLE RIVER BASIN, LOUISIANA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 4A.
W74-07671

ESTIMATED USE OF WATER IN FLORIDA, 1970,
Geological Survey, Tallahassee, Fla.
R. W. Pride.
Florida Dept. of Natural Resources, Tallahassee, Bureau of Geology Information Circular No 83, 1973. 31 p, 6 fig, 10 tab, 20 ref.

Descriptors: *Water utilization, *Florida, *Consumptive use, *Withdrawal, Municipal water, Irrigation water, Industrial water, *Water supply, Thermal powerplants, Saline water.

Water use in Florida is estimated for 1970. About 15,300 mgd was withdrawn for all purposes, including public supply, rural domestic and livestock, irrigation, and industrial (including thermoelectric power). About 9,500 mgd of the total use was saline water. The remainder, or 5,800 mgd, was freshwater, withdrawn in nearly equal quantities from surface and ground sources. Most of the saline water was used for thermoelectric power generation. The average per capita use of all water in 1970 was 2,250 gpd, an increase from 332 gpd in 1950. Considering freshwater only, the average per capita use was 849 gpd in 1970. The quantity of water consumed was estimated to be

1,930 mgd in 1970, most of which was freshwater. The quantity consumed was about one-third of the total freshwater withdrawn from the source. The largest use of freshwater in Florida in 1970 was for irrigation, 2,070 mgd. The counties in southern Florida, in the Water Resources Council subregion 0309, used 75% of all water used for irrigation. The second largest use of freshwater was by industry, which required 926 mgd of self-supplied water and 166 mgd from public supply systems. The third largest use was for public supplies, 884 mgd. (Knapp-USGS)
W74-07917

THE ROLE OF WATER IN THE ENERGY CRISIS.
Nebraska Univ., Lincoln. Water Resources Research Inst.
Available from the National Technical Information Service as PB-232 404 $5.75 in paper copy, $1.45 in microfiche. Proceedings of a conference, October 23-24, 1973, Lincoln, Nebraska. Edited by K. E. Stork, (1973). 219 p, 27 fig, 21 tab, 66 ref, 2 append. OWRR A-999-NEB(13).

Descriptors: *Energy, *Water management, *Water consumption, *Water resources, *Water demand, *Conferences, Alternative water use, Water pollution, Water rates, Water utilization, Irrigation efficiency, Nuclear energy, Research and development, Technology, Water allocation, Water shortage, Water supply, Water conservation.
Identifiers: *Energy crisis, *Energy-water relationship, *Energy pool, Water resources planning, Solar energy, Geothermal energy.

Ways that the water resources community could help solve national and regional energy problems are presented. Topics discussed include energy-water relationship (economic, environmental, political-social, and technological), the role of water resources in the energy crisis, regional energy problems, and an assessment of research needs. While traditional energy resources have been largely exploited, and technologies associated with their development are established, great potential exists for solar and geothermal energy development. In supplementing the energy pool, however, opportunities for reducing energy requirements should not be overlooked. The water resources field has such potential through improved management, regulation, and application of the best available technology. Energy and water conservation can also be achieved through economic means, through realistic pricing policies. In addition, questions of how and where energy supplies can be conserved with minimal economic and social disruption need to be answered. Uses of energy and water are highly interrelated. Ways must be found to curtail amounts and rates of water and energy consumed through new manufacturing methods, improved irrigation, better management, and other procedures. (See W74-07962 thru W74-07977) (Grden-North Carolina)
W74-07961

THE ROLE OF WATER IN THE ENERGY CRISIS,
Water Resources Council, Washington, D.C.
W. D. Fairchild.
In: The Role of Water in the Energy Crisis; Proceedings of a Conference at Lincoln, Nebr, October 23-24, 1973: Nebraska Water Resources Research Institute Publication, p 10-17, 1973. 6 ref.

Descriptors: *Water demand, *Energy, Powerplants, Water supply, Water utilization, Conferences, Geothermal studies, Water management(Applied), Thermal powerplants.
Identifiers: *Energy crisis, *Energy-water relationships.

Energy is required to produce all water supplies whether it is sun energy necessary for rainfall or electrical or mechanical energy to pump water supplies from lakes, rivers or underground sources. Even the large gravity irrigation projects in the West require energy to construct the works and maintain them. Conversely, water is necessary for man to produce energy. This can range from natural rainfall to produce crops, falling water to produce hydroelectric energy, water required to mine and process coal and other energy fuels, or the large consumptive usage of water for cooling when fossil or nuclear fuel is utilized in steam plants. (See also W74-07961) (Knapp-USGS)
W74-07962

THE POLITICAL-SOCIAL ASPECTS OF ENERGY-WATER RELATIONSHIPS,
California Univ., Los Angeles. Public Administration Program.
E. A. Engelbert.
In: The Role of Water in the Energy Crisis; Proceedings of a Conference at Lincoln, Nebr, October 23-24, 1973: Nebraska Water Resources Research Institute Publication, p 18-37, 1973. 35 ref.

Descriptors: *Energy-water relationships.

The political-social aspects of water-energy relationships have been greatly neglected both in research and development. A review of the literature shows that where nonphysical aspects of energy-water relationships have been analyzed, the focus is limited primarily to functional processes of power generation, pollution or similar interlinking activity. The more pervasive interrelationships of water and energy to society appear to be too ephemeral and complex to warrant penetrating investigation and analysis. The failure to comprehend and project energy-water relationships in broader social settings is producing unfortunate political consequences. Interest groups polarize around specific controversial issues which may be narrowly formulated or wrongly contrived. Amidst the political contentiousness of well-meaning but short-sighted political coalitions, more basic aspects of societal well-being become obscured or lost. New analytical approaches must be fashioned for perceiving and dealing with the social parameters of energy-water relationships. The prevailing system of analysis which rests primarily upon unilateral projections of energy and water requirements to meet the needs of a growing economy will no longer suffice. A system of analysis must show how energy-water interrelationships can be utilized to clarify and shape social goals and developments. (See also W74-07961) (Knapp-USGS)
W74-07963

ECONOMIC ASPECTS OF RESOURCE USE WITH SPECIAL REFERENCE TO ENERGY AND WATER,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
R. K. Davis.
In: The Role of Water in the Energy Crisis; Proceedings of a Conference at Lincoln, Nebr, October 23-24, 1973: Nebraska Water Resources Research Institute Publication, p 39-45, 1973.

Descriptors: *Water demand, *Energy, *Economics, *Political aspects, Regulation, Water utilization, Environment, Legislation, Water management(Applied), Resource allocation, Cost-benefit analysis.
Identifiers: *Energy-water relationships.

Economists believe that optimum social welfare is coincident with best economic use of resources. Best economic use is defined with reference to all benefits and costs. If water is allocated among uses so that the ratio of marginal social benefits to marginal social costs is equal in all uses, the logic involved states that the most efficient use of water is achieved. If, as between two uses of water, the ratio of benefits to costs is unequal at the margin, then it is possible to improve society's welfare be reallocating water from the use with the lower ratio of benefits to costs to the use with the higher ratio of benefits to costs, and to continue shifting the resource from one use to the other until the ratio of benefits to costs of the last increment shifted is equal in both uses. Public decision-making, as it affects the uses of water and energy, is characterized by failures to address a range of alternatives broad enough to give some hope of including superior policies. And the evaluation of alternatives is seriously hampered by cost sharing or subsidies which badly warp choices in favor of uneconomic alternatives. (See also W74-07961) (Knapp-USGS)
W74-07964

ENVIRONMENTAL ASPECTS OF ENERGY-WATER RELATIONSHIPS,
Nebraska Univ., Lincoln. Dept. of Agricultural Economics.
L. K. Fischer.
In: The Role of Water in the Energy Crisis; Proceedings of a Conference at Lincoln, Nebr, October 23-24, 1973: Nebraska Water Resources Research Institute Publication, p 46-59, 1973. 1 tab, 16 ref.

Descriptors: *Water demand, *Energy, *Agriculture, Irrigation water, Environment, Economics, Water utilization, Industrial water.
Identifiers: *Energy-water relationships.

Public policies relative to water development, which have in the past tended to transfer costs away from the principal beneficiaries, have resulted in substantial quantities of water being committed to uses which yield low returns. Increases in the cost of water to users should induce those who hold rights to water to utilize the water more judiciously and thus reduce water requirements. Of equal importance, those who would initiate water-using activities will have incentives to buy out existing water rights as an alternative costly supply augmentation. Furthermore, full-cost pricing for raw water will make more economically attractive the recycling of wastewater. Agriculture in the United States is a major user of water and energy; a use of water which yields on the margin a small value of product per unit of water; a class of use which has historically been favored by both legal preferences and public subsidies; and a use which is more tolerant of low quality than are many competing uses. Consequently, substantial opportunities exist or will arise for reducing the quantity of irrigation water required to produce a given product; irrigating with water which as been modified substantially by previous users thus freeing water of higher quality to less tolerant uses; and providing a source of water for alternative high-value uses by ceasing to irrigate under conditions which yield relatively low returns. (See also W74-07961) (Knapp-USGS)
W74-07965

THE ROLE OF WATER RESOURCES RESEARCH IN THE ENERGY CRISIS,
Office of Water Resources Research, Washington, D.C.
W. A. Hall.
In: The Role of Water in the Energy Crisis; Proceedings of a Conference at Lincoln, Nebr, October 23-24, 1973: Nebraska Water Resources Research Institute Publication, p 60-67, 1973.

Descriptors: *Energy, *Water demand, *Research and development, Water Resources Research Act, Education, Training, Water resources development.
Identifiers: *Energy-water relationships.

Water and water-related research involves transporting this needed and available resource to the places it is needed. For the western fuel sources, water is the controlling factor because it is also the scarce resource. Water will clearly limit what can

be done in production, in conversion, in transportation, and in reclamation and environmental protection. Storage of energy has always been a major problem which has resulted in inefficiencies in its use. Water stored as geothermal energy is a particularly useful substance for efficient energy utilization. The real challenges in water resources research related to the energy crisis are to demonstrate the fallacy of a policy of maintaining ignorance until the crisis stage and demonstrate the capability of the water resources research community to respond to need efficiently and effectively. (See also W74-07961) (Knapp-USGS)
W74-07966

ENERGY PRODUCTION,
Omaha Public Power District, Nebr.
T. P. Harding, and B. E. Dose.
In: The Role of Water in the Energy Crisis; Proceedings of a Conference at Lincoln, Nebr, October 23-24, 1973: Nebraska Water Resources Research Institute Publication, p 71-91, 1973. 15 fig, 8 ref.

Descriptors: *Water demand, *Energy, *Powerplants, Water supply, Water utilization, Conferences, Water management(Applied), Thermal powerplant, *Production.
Identifiers: *Energy-water relationships.

Of all cooling water used in the United States, 81% is used for electric power generation. The cooling method utilized greatly influences the overall efficiency of the power conversion cycle and hence is directly related to the conservation of energy resources. The mode of cooling is of prime importance as it directly affects the fuel cycle efficiency to produce electrical power. Many studies are underway throughout the United States to determine the impact on the ecology by using once-through cooling. Scientific information is needed to put in perspective the possible ecological damage or changes that can be caused by once-through cooling on the Missouri River and other large bodies of water. (See also W74-07961) (Knapp-USGS)
W74-07967

MUNICIPAL AND INDUSTRIAL WATER SUPPLY,
Kansas Univ., Lawrence. Dept. of Civil Engineering.
W. J. O'Brien.
In: The Role of Water in the Energy Crisis; Proceedings of a Conference at Lincoln, Nebr, October 23-24, 1973: Nebraska Water Resources Research Institute Publication, p 92-113, 1973. 3 fig, 9 tab, 6 ref. EPA Grant T-900135.

Descriptors: *Water demand, *Energy, *Electric power demand, Water management(Applied), Municipal water, Industrial water.
Identifiers: *Energy-water relationships.

Approximately 67% of water withdrawn for municipal purposes is obtained from surface sources. About 17% of the water withdrawn in 1970 by industry was from saline sources. Most of this was surface water. Approximately 79% of the freshwater withdrawn by industry was from surface sources. In many instances a reduction in water withdrawal will not result in a significant reduction in energy consumption by the water supply system. Most of the electrical energy used in water treatment and distribution systems is consumed by pumping. A surface water source is therefore inherently more efficient than a groundwater supply. Smaller, more compact distribution systems are also more efficient in that booster pumping is usually reduced. Slightly more than one-third of the electrical power generated in 1970 was used to supply water to municipalities and industry. Because most of this energy is used in pumping, the most effective way to lower this energy requirement is to reduce the quantity of water used. Peak load power demands can be reduced by the use of intermediate treated water storage or by the use of programmed pumping within the existing distribution system. (See also W74-07961) (Knapp-USGS)
W74-07968

AGRICULTURAL WATER SUPPLY,
Nebraska Univ., North Platte. Dept. of Agricultural Engineering.
D. G. Watts.
In: The Role of Water in the Energy Crisis, Proceedings of a Conference at Lincoln, Nebr, October 23-24, 1973: Nebraska Water Resources Research Institute Publication, p 114-127, 1973. 4 fig, 4 tab, 16 ref.

Descriptors: *Irrigation water, *Electric power demand, *Water demand, Water management(Applied), Irrigation efficiency, Irrigation practices.
Identifiers: *Energy-water relationships.

Current technological capability can achieve an overall reduction of 10% to 20% in the energy consumed annually for providing an agricultural water supply. Suggested procedures include increasing irrigation pumping plant efficiency, reducing water application, improved management of electric pumping plants, reuse of irrigation runoff water, and improved irrigation system design. (See also W74-07961) (Knapp-USGS)
W74-07969

POLLUTION CONTROL,
New Mexico State Univ., Las Cruces. Water Resources Research Inst.
J. W. Clark.
In: The Role of Water in the Energy Crisis; Proceedings of a Conference at Lincoln, Nebr, October 23-24, 1973: Nebraska Water Resources Research Institute Publication, p 128-131, 1973. 1 tab, 5 ref.

Descriptors: *Water demand, *Thermal powerplants, *Strip mines, Cooling water, Land reclamation, Water supply, Industrial water, Energy.
Identifiers: *Energy-water relationships.

Thermal generation of electric power produces a significant thermal discharge. A problem of even greater magnitude in relation to water pollution and supply may be developing in the Northern Great Plains and in the Southwestern Deserts. The states of Arizona, New Mexico, Utah, Colorado, Wyoming, Montana, and North and South Dakota contain about 70% of the nation's low-sulfur coal reserves. These reserves lie close to the surface, and strip mining procedures are being used to obtain the coal. Development of this coal resource involves legal mandates to restore the land after the coal has been removed. Water scarcity may limit the use of Western coal. The problem is that in most of the Western watersheds where immense mining, gasification and power generating complexes are envisioned, existing and potential water supplies are heavily committed and in some basins, water resources are over committed. It would require much more water to rehabilitate some of these lands than would be required initially in mining, processing and utilizing the coal. (See also W74-07961) (Knapp-USGS)
W74-07970

REGIONAL ENERGY-WATER PROBLEMS NORTHEAST,
Delaware Univ., Newark. Water Resources Center.
R. D. Varrin.
In: The Role of Water in the Energy Crisis; Proceedings of a Conference at Lincoln, Nebr, October 23-24, 1973: Nebraska Water Resources Research Institute Publication, p 133-140, 1973. 2 fig, 6 ref.

Descriptors: *Delaware River, *Energy, *Water demand, *Thermal powerplants, *Nuclear powerplants, Electric power demand, Streamflow, Dams, Reservoirs, Reservoir yield.
Identifiers: *Energy-water relationships.

In early 1972, 10 power companies serving the Delaware Valley announced plans to construct 11 nuclear power stations. In addition, 6 new conventional generating stations would be built and 10 existing stations would be expanded. These projects were to be completed by 1986 and have a total generating capacity of 87,000 megawatts, nearly three times the present 33,000 megawatts. The estimated future water consumption for power would be 380 million gallons per day, 19 times the present 20 mgd. The Tocks Island project could help provide the necessary low-flow augmentation downstream while allowing New York City to divert its full allocation. In addition, the project would increase the firm water supply and offer significant flood protection. There would also be a pumped storage facility to generate additional power for the basin. The Tocks Island project has been opposed by conservationists for its potential damage to the environment. In addition to the 900 million gallons already authorized for out-of-basin transfer, a downstream flow of at least 3,000 cfs is required to protect the estuary. When the project need for 390 mgd evaporative demand for power is added, there is no way for the total depletive water demand to be met even with Tocks Island and all other developments included. (See also W74-07961) (Knapp-USGS)
W74-07971

REGIONAL ENERGY-WATER PROBLEMS SOUTH ATLANTIC GULF,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
L. D. James.
In: The Role of Water in the Energy Crisis; Proceedings of a Conference at Lincoln, Nebr, October 23-24, 1973: Nebraska Water Resources Research Institute Publication, p 141-149, 1973. 15 ref.

Descriptors: *Water demand, *Energy, *Electric power demand, Water management(Applied), Municipal water, Industrial water.
Identifiers: *Energy-water relationships.

Water provides a convenient sink for disposing of energy that cannot economically be put to beneficial use. Petroleum, nuclear and other energy-oriented wastes are generated during the processes of fuel extraction, transportation, energy conversion, and residuals disposal; these wastes are often directly or indirectly discharged, accidentally spilled, or washed into streams or aquifers. Water can be used to generate electricity and provides, by far, the most economical means for supply of short-term peak demand loads. Energy is required to operate water supply and water treatment systems. Furthermore, excessive energy use tends to aggravate water pollution problems, and excessive water use tends to burden available energy supplies. Thus, technologies for improving the efficiency fo energy generation, transmission, and utilization and economic and social incentives for reducing low value or unnecessary energy use also have water resources management benefits. (See also W74-07961) (Knapp-USGS)
W74-07972

REGIONAL ENERGY-WATER PROBLEMS, OHIO-GREAT LAKES.
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
J. C. Frey.
In: The Role of Wate88in the Energy Crisis; Proceedings of a Conference at Lincoln, Nebr, October 23-24, 1973: Nebraska Water Resources Research Institute Publication, p 150-155, 1973.

Descriptors: *Water demand, *Emergy, *Electric power demand, Water management(Applied), Municipal water, Industrial water, *Great Lakes Region, Ohio.
Identifiers: *Energy-water relationships.

The four major energy-water related problems in the Ohio-Great Lakes Region are: thermal pollution from a shift to nuclear energy; coal mine drainage from an expanded use of coal for energy; nonpoint pollution from an expanded output of energy-producing farm crops; and navigation and other flow resource developments. Shifts from one source of energy to another transfer the burden of pollution from one natural resource to another. Rule out high sulfur coal to protect the air, and the replacement with nuclear fuel becomes an environmental threat to streams and lakes. Switch to the strip mining of low sulfur coal, and the burden of environmental deterioration is transferred to the land. Try geothermal fluids for power and the discharge of brine presents once again a water quality problem. (See also W74-07961) (Knapp-USGS)
W74-07973

REGIONAL ENERGY-WATER PROBLEMS, MISSOURI RIVER,
North Dakota State Univ., Fargo. Water Resources Research Inst.
D. O. Anderson.
In: The Role of Water in the Energy Crisis; Proceedings of a Conference at Lincoln, Nebr, October 23-24, 1973: Nebraska Water Resources Research Institute Publication, p 156-164, 1973. 1 fig, 4 ref.

Descriptors: *Water demand, *Energy, *Electric power demand, Water management(Applied), Municipal water, Industrial water, *Missouri River basin, Water pollution sources.
Identifiers: *Energy-water relationships.

Coal development in the Northern Great Plains during the next 20 years will be extensive. Montana, North Dakota and Wyoming all have extensive coal resources. The Fort Union coal beds which underlie a large area of northeastern Wyoming, southeastern Montana and western North Dakota appear to offer the greatest potential for development. The Fort Union reserves account for 40% of the total United States coal reserves and as much as 90% of the low-sulfur reserves. Total Fort Union reserves have been estimated at 1.3 trillion tons. Given the present state of technology and demand for energy, it is estimated that more than 60 billion tons predicted to be available in the three states are economically strippable. While there is probably sufficient water available in most areas to meet the requirements of mining and reclamation activities, there is insufficient ground and surface water in the major coal rich areas to meet the requirements of large-scale conventional electric generation or coal gasification and liquefaction facilities. Since many coal seams in the West are aquifers, strip mining for coal will inevitably disrupt groundwater patterns in those areas. This will affect the quality and quantity and even availability of water. Mining may also disrupt natural drainage networks, and thereby disrupt downstream water rights. The potential effects of disposing of wastes of coal conversion plants in the ground and surface hydrosphere are shown. (See also W74-07961) (Knapp-USGS)
W74-07974

REGIONAL ENERGY-WATER PROBLEMS, PACIFIC NORTHWEST,
North Dakota State Univ., Fargo. Water Resources Research Inst.
C. C. Warnick.
In: The Role of Water in the Energy Crisis; Proceedings of a Conference at Lincoln, Nebr, October 23-24, 1973: Nebraska Water Resources Research Institute Publication, p 165-178, 1973. 5 fig, 2 tab, 4 ref.

Descriptors: *Water demand, *Energy, *Electric power demand, Water management(Applied), Municipal water, Industrial water, *Pacific Northwest U.S.
Identifiers: *Energy-water relationships.

The hydropower potential of the Northwest U.S. is about exhausted. This has been worsened by the fact that in the Northwest society does not want any more large dams. More critical in the Pacific Northwest is the fact that the region is suffering a record low in streamflow runoff. This comes following some very high years of runoff that conditioned society to not anticipate such a crisis. Contributing to the problem is the fact that nuclear and fossil fuel plants programmed for increased production are behind schedule and have had operating problems. (See also W74-07961) (Knapp-USGS)
W74-07975

REGIONAL ENERGY-WATER PROBLEMS, SOUTHERN PLAINS,
Texas A and M Univ., College Station. Water Resources Inst.
J. R. Runkles.
In: The Role of Water in the Energy Crisis; Proceedings of a Conference at Lincoln, Nebr, October 23-24, 1973: Nebraska Water Resources Research Institute Publication, p 179-191, 1973. 5 tab, 11 ref.

Descriptors: *Water demand, *Energy, *Electric power demand, Water management(Applied), Municipal water, Industrial water, *Great Plains.
Identifiers: *Energy-water relationships, *Southern Great Plains.

The states of the Southern Plains Region play an important role in the nation's energy problems. These states are a major source of the domestic supply of oil and natural gas resources and are a major consumer of electrical energy. Each state in the region is experiencing a rapid growth in the industrial and urban sectors and the associated increased demand for energy. Substantial quantities of water are needed to produce oil and natural gas resources. In the Southern Plains Region, 8,225 million gallons of water per day are used for electric power generation. The Federal Power Commission estimates that to the year 1990, the condenser requirement for water will increase about six times and the consumptive use of water will increase about five times over the period 1965-1990. (See also W74-07961) (Knapp-USGS)
W74-07976

REGIONAL ENERGY-WATER PROBLEMS--COLORADO RIVER-GREAT BASIN,
Colorado State Univ., Fort Collins. Environmental Resources Center.
N. A. Evans.
In: The Role of Water in the Energy Crisis; Proceedings of a Conference at Lincoln, Nebr, October 23-24, 1973: Nebraska Water Resources Research Institute Publication, p 192-194, 1973.

Descriptors: *Water demand, *Energy, *Electric power demand, *Colorado River basin, Water management(Applied), Municipal water, Industrial water.
Identifiers: *Energy-water relationships.

A large portion of the nation's uranium deposits are contained within the Colorado River Basin. Geothermal resources are known but not fully inventoried. It is thought that most of this energy is associated with saline waters which present disposal problems. Power generation by coal requires around 15 acre-feet per megawatt. With 30,000 MW coal generation expected by 1990, the water demand in the Basin for this purpose will be 450,000 acre-feet per year. This amount of water is available within the various state allocations from the Colorado River. An oil shale operation producing one million barrels per day will require 120,000 acre-feet of water per year. To that requirement must be added approximately 4,000 acre-feet per year which will be required to sustain vegetation on reclaimed land and shale residue This amount of water is expected to be available from that reserved by the federal government, although claimed federal rights are in dispute. Nuclear stimulation of natural gas reservoirs has a very small water requirement. The impact of this potential energy source on water supplies can be considered nil. In general, state policies on energy resource development are lacking. The intermingled land ownership creates multi-jurisdictional problems because energy resources do not follow jurisdictional boundaries. The issue is how to obtain harmony in land use regulation. Environmental guidelines are needed which will protect the land and water resources. (See also W74-07961) (Knapp-USGS)
W74-07977

EFFECTS OF COLORADO RIVER WATER QUALITY AND SUPPLY ON IRRIGATED AGRICULTURE,
Economic Research Service, Davis, Calif.
For primary bibliographic entry see Field 3C.
W74-08014

INDUSTRIAL APPLICATION OF WHITFORD'S DEMAND FORECASTING PROCEDURE,
Southern Methodist Univ., Dallas, Tex. Inst. of Tech.
M. A. Collins, and A. H. Plummer, Jr.
Water Resources Research, Vol 10, No 2, p 345-347, April 1974. 2 fig, 15 ref.

Descriptors: *Water demand, *Forecasting, *Probability, *Industrial water, *Water quality, Planning, River basins, Information, Cooling, Electricity, Water utilization, Mathematical models, Systems analysis, *Texas.
Identifiers: *Steam-electric power generation, *Trinity River Basin(Tex.).

A probabilistic method developed by Whitford (1972) for residential water demand forecasting is applied to water demand for steam-electric power generation in the Trinity River basin in Texas in order to reduce reliance upon single isolated estimates of future demand. The forecast of water demand for cooling purposes in the production of electricity has been necessary as part of an overall assessment of the impact of water use on future water quality conditions in the basin. The resulting time-dependent cumulative probability distributions provide useful information for water quality planning in the basin. It is suggested that this probabilistic approach has significant advantages that warrant its further refinement. (Bell-Cornell)
W74-08015

6E. Water Law and Institutions

SURVEY OF OREGON'S WATER LAWS,
Oregon Univ., Eugene. School of Law.
C. D. Clark.
Available from the National Technical Information Service as PB-232 076, $6.00 in paper copy, $1.45 in microfiche. Oregon Water Resources Research Institute, Corvallis, Completion report WRRI-18, March 1974. 217 p. OWRR A-002-ORE(8) and A-008-ORE(2).

Descriptors: *Water law, Legislation, *Oregon, *Water permits, *Riparian rights, Legal aspects, *Prior appropriation, Boundaries(Property).

Legal aspects of the following topics are discussed: Water lands and boundaries; Liability for escaping water; The Riparian Doctrine in Oregon; Classification of waters; The Permit System and the Appropriation Doctrine in Oregon; Diffused surface water and drainage; and Ground waters.
W74-07611

ROUNDWATER POLLUTION FEATURES OF EDERAL AND STATE SATUTES AND REGU-ATIONS,
eraghty and Miller, Port Washington, N.Y.
or primary bibliographic entry see Field 5G.
74-07614

EDERAL LAWS AND REGULATIONS,
or primary bibliographic entry see Field 5G.
74-07703

INOVATION: A CASE STUDY,
merican Society of Civil Engineers, New York.
or primary bibliographic entry see Field 6B.
74-07720

TATE ORGANIZATION FOR WATER ESOURCES MANAGEMENT,
eorgia Inst. of Tech., Atlanta. Environmental esources Center.
. R. Elmore, Jr.
vailable from the National Technical Informa-on Service as PB-232 142, $11.00 in paper copy, .45 in microfiche. Report No ERC-0472, May 72, 143 p, 2 fig, 7 tab, 97 ref, 2 append.

escriptors: Management, *Georgia, Administra-ve agencies, *Institutions, Institutional con-raints, *State governments.
entifiers: *State water agencies, Public adminis-ation, State water program, *Administrative or-nization.

esponsibilities of the states for water resources anagement have been increasing to meet the eeds of the public and the requirements of ederal programs. Georgia is a state with abundant ater resources but the minimum attention it gives water resources management has proven un-tisfactory to those who desire a more com-rehensive and coordinated effort. The organiza-onal structure of resources agencies in Georgia as appeared to impede coordination and com-rehensive management. While reorganization eems necessary for improved State programs, sagreement exists over the appropriate organiza-onal structure and over the importance of or-anizational structure to achieving better water esources management. The natural resources or-anizational structure of Georgia is compared to at of five other states in terms of a research odel from public administration theory. An ideal ate water resources program is outlined, applied Georgia's situation, and used to examine the ef-ct of organizational structure on water resources rograms. Although available techniques of analy-s and data are not sufficient to define organiza-onal structure as cause and program as effect, e structural forms recommended by public ad-inistration theory are regularly associated with ore highly developed programs. Shortcomings of eorgia's water resources programs which appear be related to organization are interagency con-ict, ineffective leadership from the governor, dif-culty in adapting to change, and the omission of rograms for water resources planning, flood pro-ction, dam safety and water rights. Possibilities r improvement are discussed. (See also W69-0331) (James-Georgia Tech)
/74-07733

EGIONAL WATER AUTHORITIES: OR-ANIZATIONAL PATTERNS-PURPOSE OR ROFESSIONAL,
or primary bibliographic entry see Field 5G.
/74-07754

FFLUENT STANDARDS STRATEGY: REJU-ENATION OF AN OLD GAME PLAN,
incinnati Univ., Ohio. Coll. of Medicine.
or primary bibliographic entry see Field 5G.
/74-07769

SOCIAL AND ECONOMIC FACTORS IN THE ADOPTION BY INDUSTRY OF WATER POLLUTION CONTROL MEASURES IN MINNESOTA,
Minnesota Univ., St. Paul. Inst. of Agriculture.
For primary bibliographic entry see Field 5G.
W74-07834

THE COLUMBIA INTERSTATE COMPACT: POLITICS OF WATER RESOURCES IN THE PACIFIC NORTHWEST,
Washington State Univ., Pullman. Dept. of Political Science.
P. Beckett, and H. R. Doerksen.
Available from the National Technical Information Service as PB-232 255 $3.00 in paper copy, $1.45 in microfiche. Completion Report, January 1973. 14 p. OWRR A-055-WASH(3). 14-31-0001-3848.

Descriptors: *Regional development, Administrative agencies, *Columbia River, Intergovernmental relations, *Pacific Northwest U.S., Washington, Water resources development, Interstate compacts, *Political aspects.

The Columbia Interstate Compact represented an attempt to establish a regional institutional mechanism for river basin development. After seven Pacific Northwest states spent 18 years negotiating the Compact, and five attempts were made to ratify the Compact in the state legislatures, Oregon and Washington had not ratified. This study is in essence a history of the Compact negotiations, describing the efforts of the seven states in the context of the political environment in which the Compact was negotiated. Several factors which contributed to the ultimate dissolution of the negotiating effort are analyzed in some depth. First, role perception (sense of negotiating objectives) of Compact commissioners varied substantially from state to state and within states in a period of time when attitudes related to river basin development were typically strong and polarized. Second, the negotiating environment changed in such a way as to reduce the perceived need for a Compact. Finally, financial crisis, after Washington and Oregon discontinued financial support of the effort, forced the Compact Commission to close its office. The most devasting defeat of the Compact attempt came in the Washington Legislature. There the Compact became embroiled in the existing conflict regarding power generation and marketing. Although the Compact effort may be dead, most issues with which it dealt, including allocation of water, reservation of power for states in which a dam is constructed, and out-of-basin diversion, are very much alive.
W74-07846

GROUNDWATER ISSUE MERITS MORE FEDERAL PROTECTION, GROUNDWATER POLLUTION AND CONSERVATION,
For primary bibliographic entry see Field 5G.
W74-07854

PREVENTION OF DAMAGE TO PIPELINES.
National Transportation Safety Board, Washington, D.C.
For primary bibliographic entry see Field 8A.
W74-07923

A BILL TO AUTHORIZE THE SECRETARY OF THE INTERIOR TO ENGAGE IN FEASIBILITY INVESTIGATIONS OF CERTAIN POTENTIAL WATER RESOURCE DEVELOPMENTS.
Senate Bill 3959, 92nd Cong., 2d Sess. (October 1972). 2 p.

Descriptors: *Water resource development, *Legislation, *Potential water supply, *Feasibility studies, Ground water resources, United States, Oklahoma, North Dakota, South Dakota, Montana, Colorado, New Mexico, Optimum development plans, Planning.

This bill passed the Senate after being amended on October 2, 1972. The bill authorizes the Secretary of the Interior to engage in feasibility investigations of certain potential water resource developments. The bill as introduced only included areas in southwestern Oklahoma and central North Dakota. The bill was amended in the Senate to include projects in South Dakota, Montana, Colorado and New Mexico. The bill was referred to the House Committee on Interior and Insular Affairs. (See also W74-07284) (Daniels-Florida)
W74-07943

INTERNATIONAL COOPERATION OF HYDROLOGISTS (MEZHDUNARODNOYE SOTRUDNICHESTVO GIDROLOGOV),
Gosudarstvennyi Gidrologicheski Institut, Leningrad (USSR).
For primary bibliographic entry see Field 7A.
W74-08047

ALL-UNION HYDROLOGIC CONGRESSES (VSESOYUZNYYE GIDROLOGICHESKIYE SYEZDY),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
A. A. Sokolov.
Meteorologiya i Gidrologiya, No 10, p 3-8, October 1973. 2 fig.

Descriptors: *Conferences, *Hydrology, *Water resources, *History, *Planning, Forecasting, Water balance, Water utilization, Water conservation, Water pollution control.
Identifiers: *USSR.

During the first years of growth of the Soviet state, the government devoted its attention to the need for a detailed study of the country's water resources. In 1919 the Russian Hydrologic Institute (renamed the State Hydrologic Institute in 1926) was organized as the central scientific establishment in the field of hydrology. In 1921 preparations began to convene the First All-Russian Hydrologic Congress, which was held May 7-14, 1924. The Second All-Union Hydrologic Congress was held April 20-27, 1928 and the Third Congress, October 7-17, 1957. All of the Congresses were held in Leningrad. The Fourth All-Union Hydrologic Congress was convened in Leningrad in October 1973 to discuss current problems of modern hydrology connected with implementation of measures on rational use of water resources of the USSR and their protection from pollution and depletion. Attention was focused on theoretical and procedural problems of hydrology; experimental investigations and techniques of mathematical simulation of hydrologic processes; requirements for accuracy of measurements; methods of calculation and forecasting of items of the hydrologic regime; estimation of quantitative and qualitative changes in water resources and items of the hydrologic regime under the influence of economic activity. Scientific papers on individual aspects of hydrology were discussed at 9 sessions of the congress: (1) water balance and runoff calculations; (2) hydrologic problems of water management; (3) hydrologic forecasts; (4) surface-groundwater relationships; (5) hydrology of lakes, reservoirs, and estuaries; (6) water quality and scientific principles of water conservation; (7) channel processes; (8) hydrometry and keeping of state records on water; and (9) hydrophysics. At plenary sessions of the congress, general papers were presented on the basic problems of hydrology. (Josefson-USGS)
W74-08056

6F. Nonstructural Alternatives

THE METHODOLOGY OF BAYESIAN INFERENCE AND DECISION MAKING APPLIED TO EXTREME HYDROLOGIC EVENTS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.

For primary bibliographic entry see Field 2A.
W74-07601

6G. Ecologic Impact Of Water Development

ENVIRONMENTAL EFFECTS OF THE CONSTRUCTION AND OPERATION OF A GASEOUS DIFFUSION PLANT.
Goodyear Atomic Corp., Portsmouth, Ohio.
For primary bibliographic entry see Field 5C.
W74-07781

ENVIRONMENTAL STATEMENT RELATED TO CONSTRUCTION AND OPERATION OF BARNWELL NUCLEAR FUEL PLANT.
Directorate of Licensing, Fuels and Materials (AEC), Washington, D.C.
For primary bibliographic entry see Field 5B.
W74-07792

RADIONUCLIDES IN ECOSYSTEMS, VOLUME II.
Oak Ridge National Lab., Tennessee.
For primary bibliographic entry see Field 5C.
W74-07799

THE EFFECTS OF RIVER FLUCTUATIONS RESULTING FROM HYDROELECTRIC PEAKING ON SELECTED AQUATIC INVERTEBRATES,
Idaho Univ., Moscow. Coll. of Forestry, Wildlife and Range Sciences.
For primary bibliographic entry see Field 2I.
W74-07830

AN EVALUATION OF THE NEEDS IN FRESHWATER RESEARCH AND RELATED PUBLIC INFORMATION FACILITIES,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
R. T. Oglesby, and J. D. Parkes.
Available from the National Technical Information Service as PB-232 227, $3.25 in paper copy, $1.45 in microfiche. Technical Report 74, August 1973. 24 p, 9 fig. OWRR A-048-NY(1). 14-31-0001-3832.

Descriptors: *Freshwater, *Research facilities, *Evaluation, *Design, Aquatic environment, Ecology, Planning, Architecture, Information exchange.
Identifiers: *Public information.

The process of designing a research and public information center related to aquatic ecology should involve the following components: (1) The formation of a design 'team' whose key members are an aquatic ecologist and an architect, (2) education of the 'team' and development of communication between the scientist and architect, (3) location of a site, (4) definition of the functional objectives of the facility, and (5) prescription of functional relationships and space needs for the various parts of the facility. An example of the design process is provided and this includes a discussion of planning rationale, sketches of functional relationships, schematic building elevations, cross section and floor plan, and an architectural rendering. The present status of design for freshwater facilities is briefly reviewed and the need for new concepts to meet the present and future requirements of aquatic ecologists emphasized.
W74-07838

THE STATE OF THE SYSTEM (SOS) MODEL: MEASURING GROWTH LIMITATIONS USING GEOLOGICAL CONCEPTS,
Chase, Rosen and Wallace, Inc. Alexandria, Virginia
E. R. Williams, and P. W. House.
Copy Available from GPO Sup Doc as EP1.23:660/5-73-013, $3.45; microfiche from NTIS as PB-232 941 $1.45. Environmental Protection Agency, Environmental Study Series Report EPA-600/5-73-013, February 1974. 344 p, 61 fig, 27 ref, 9 append. EPA Program Element 1HA096. Contract GS-03S-38351.

Descriptors: *Simulation analysis, Regional economics, Ecology, Economics, Input-Output analysis, *Resource allocation, *Carrying capacity, *Model studies, *Ecosystems, Systems analysis, Methodology, Measurement.

The State of the System (SOS) Model is the result of an attempt to develop a methodology that relates ecological concepts including regional carrying capacity to the social scientists' concepts of regional growth and development, and quality of life. SOS should be considered at this time as only a cenceptual research tool. The initial operational model, SOS-1, was developed to investigate details of the results predicted by the theory and to explore data requirements and needs. Therefore, the results of the model runs provided are purely illustrative and should be interpreted using extreme care. The SOS Model began as an attempt to provide an example form a constrictor model of the Decision Analysis System (DAS) to be used in conjunction with the General Environmental Model (GEM). It is intended that the later developments of SOS should complete this development as a constrictor model within DAS as well as continue its refinement as a stand-alone analysis tool. The model, as given in the SOS-1 form, is flexible and new data and algorithms can be substituted with relative ease. In order to maintain this ease in later, more complex versions, segmentation of its procedures into smaller modules would be useful. Such a form will increase the utility of SOS as an educational and research tool. (EPA)
W74-07958

ENVIRONMENTAL ASPECTS OF ENERGY-WATER RELATIONSHIPS,
Nebraska Univ., Lincoln. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6D.
W74-07965

RESEARCH TO DETERMINE THE ENVIRONMENTAL RESPONSE TO THE DEPOSITION OF SPOIL ON SALT MARSHES USING DIKED AND UNDIKED TECHNIQUES.
Skidaway Inst. of Oceanography, Savannah, Ga.
Available from the National Technical Information Service as AD-763 920. Army Corps of Engineers. Report March 1973. 189 p. 25 fig, 46 tab, 9 ref. DACW-21-71-C-0020.

Descriptors: *Sediments, *Environmental effects, *Disposal, *Dredging, *Deposition(Sediments), *Spoil banks, Salt marshes, Dikes, Water quality, Channel improvement, Fish, Invertebrates, Benthic fauna, Hydraulic equipment, Biota, Vegetation regrowth, North Carolina, South Carolina, Georgia, Marsh plants, Nutrients.
Identifiers: *Spoil disposal, Spartina alterniflora, Hydraulic dredges, Brunswick Harbor(Ga.), Terry Creek(Ga.), Little Mud River(Ga.), Cooper River(S.C.), Cape Fear River(N.C.).

Environmental effects of hydraulic pipeline dredging where spoil material is deposited on marsh areas were studied. Some of these areas are diked to confine the spoil material, some are not. Relative merits of these techniques on the basis of ecological and water quality considerations were determined as the biological aspects are significant to any type of dredging. Water quality changes during dredging operations cannot be predicted on the basis of simple bulk chemical analysis of sediments to be dredged. Since ammonia is the constituent released to the greatest extent during dredging, macrophyte succession within spoil areas must be considered. No effect of dredging on standing crops of species composition in areas having undiked spoil banks was observed. In one diked area examined, there was some indication that numbers of individuals and species were reduced following dredging for about two months. Studies concerned with regeneration of Spartina salt marshes dealt with ways of transplanting Spartina springs and with establishing successful methods of seed germination to help accelerate revegetation and lead to utilization of dredge spoil material for new salt marsh areas. (Jones-Wisconsin)
W74-07990

7. RESOURCES DATA

7A. Network Design

A GROUND-WATER MONITORING NETWORK FOR KOOTENAI FLATS, NORTHERN IDAHO,
Geological Survey, Boise, Idaho.
N. P. Dion, and R. L. Whitehead.
Idaho Department of Water Administration Water Information Bulletin No33, December 1973. 41 p, 10 fig, 1 tab, 6 ref, 2 append.

Descriptors: *Water levels, *Reservoirs, *Alluvium, *Idaho, *Surface-groundwater relationships, Observation wells, Water level fluctuations, Instrumentation, Network design, Monitoring.
Identifiers: *Kootenai Flats(Idaho).

To measure the effects of the new river-stage regulation on the groundwater system, a network of 82 shallow and two deep observation wells was established on the Kootenai flats, Idaho, in 1971. The water table in the fine-grained sediments of the Kootenai flats area is very shallow and is influenced in part by the stage of the Kootenai River. The operation of newly built Libby Dam, near Libby, Montana, will change the long established patterns of river-stage and, consequently, of water-table fluctuations. This report also describes the nature and availability of the information that was collected as part of earlier investigations. A comparison of the groundwater levels measured during 1930-54 with the few levels measured in the new observation wells indicates that no significant trends in water levels have occurred in the area between 1954 and 1973. (Knapp-USGS)
W74-07662

INTERDISCIPLINARY MONITORING OF THE NEW YORK BIGHT,
Grumman Aerospace Corp., Bethpage, N.Y.
For primary bibliographic entry see Field 5A.
W74-07764

INTERNATIONAL COOPERATION OF HYDROLOGISTS (MEZHDUNARODNOYE SOTRUDNICHESTVO GIDROLOGOV),
Gosudarstvennyi Gidrologicheski Institut, Leningrad (USSR).
A. G. Kovzel'.
Meteorologiya i Gidrologiya, No 10, p 110-122, October 1973. 18 ref.

Descriptors: *Hydrology, *International Hydrological Decade, *Data collections, Foreign countries, Networks, Stations, Basins, Demonstration watersheds, Water balance, Floods, Conferences, Publications, History.
Identifiers: *USSR, United Nations Educational, Scientific, and Cultural Organization(UNESCO), World Meteorological Organization(WMO).

International cooperation of hydrologists after the framework of the International Hydrological Decade (IHD) is reviewed. Purposes and goals of IHD, the IHD station network of the USSR and of

he world, IHD investigations of water balance nd floods of representative and experimental asins, and the future of the international ydrological program are discussed. The interna- ional network of IHD stations presently consists f 1,493 river hydrometric stations, 263 lake sta- ions, 647 evaporation stations, 132 lysimeter sta- ions, and 204 experimental and 584 representative asins. Groundwater-level observations are being onducted at 1,600 IHD observation wells. IHD iver-station density for the world averages 1 per 00,000 sq km. In individual countries this density aries widely. In Czechoslovakia, station density s 1 per 2,000 sq km; in Rumania, 1 per 10,000 sq m; in Spain, 1 per 30,000 sq km; in the USSR, 1 er 45,000 sq km; in the United States, 1 per 0,000 sq km; and in Brazil, 1 per 140,000 sq km. n countries of Equatorial West Africa, this densi- y ranges from 1 station per 17,000 sq km in Ghana nd Cameroon to 1 station per 100,000 to 200,000 q km in Senegal, the Niger Republic, Nigeria, Mali and Chad, and 1 station per 300,000 sq km in India and Australia. The network of IHD stations n the Soviet Union includes 327 river stations, 30 ake stations, 40 evaporation stations, 59 lysimeter stations, 19 experimental and 188 representative basins, and 400 groundwater observation wells, of which 233 are located in representative and experi- mental basins. Since 1968, annual meetings have been held among representatives of national IHD committees of Bulgaria, Hungary, the GDR, Po- land, Rumania, the USSR, and Czechoslovakia for mutual exchange of information on the course of national IHD programs. (Josefson-USGS)
W74-08047

STATE RECORD KEEPING ON WATER AND ITS USAGE AND HYDROLOGIC CALCULATIONS AND FORECASTS (GOSUDARSTVENNYY UCHET VOD I IKH ISPOL'ZOVANIYA I GIDROLOGICHESKIYE RASCHETY I PROGNOZY),
Hydrometeorological Service of the USSR, Moscow.
S. K. Cherkavskiy.
Meteorologiya i Gidrologiya, No 10, p 18-26, October 1973. 2 fig.

Descriptors: *Data collections, *Hydrologic data, *Water utilization, *Water resources, *Forecasting, Water users, Water consumption(Except consumptive use).
Identifiers: *USSR.

Hydrologic data collection in the USSR is based upon principles established in 1973. It consists of unified systems of gathering and processing information for a USSR state water survey. All water bodies in the USSR constitute a single state water supply consisting of (1) rivers, lakes, reservoirs, other surface bodies of water, and water sources, and waters of canals and ponds; (2) glaciers; (3) groundwater; (4) inland seas and other inland sea waters of the USSR; and (5) territorial waters (territorial seas) of the USSR. This unified system of data collection and its usage is designed to obtain reliable and exhaustive data on quantity and quality of surface waters and groundwater, their regimes, and use. Between 1940 and 1970, total water consumption by main branches of the national economy increased by more than 4 times, industry by more than 8 times and agriculture by almost 3 times. Water consumption in agriculture occupies more than 60% of the total water consumption. According to forecasts by Gidroproyekt (All-Union Experimental Design and Planning Scientific Research Institute im. S. Ya. Zhuk) the volume of water consumed in the USSR will approximately triple by the year 2000. Data flow in the unified state system for record keeping on water and its use, and structure of the USSR state water survey are diagrammed. (Josefson-USGS)
W74-08054

7B. Data Acquition

USE OF FLUORESCENT DYE TRACERS IN MOBILE BAY,
Food and Drug Administration, Dauphin Island, Ala. Gulf Coast Technical Services Unit.
For primary bibliographic entry see Field 5B.
W74-07642

EQUIPMENT AND INSTRUMENTATION,
For primary bibliographic entry see Field 5B.
W74-07660

THE ELECTRICAL RESISTIVITY METHOD (PART I),
Keck Consulting Services, Inc., East Lansing, Mich.
R. C. Minning.
Water Well Journal, Vol 27, No 6, p 17-21, June, 1973. 3 fig. (Technical Memo No 3).

Descriptors: *Electrical resistivity, Porosity, Conductivity, *Rock properties, Exploration, Ground water resources, *Groundwater potential, Equipment, Geophysics, On site investigation, *Subsurface investigations, *Remote sensing.
Identifiers: Clays, Shales, Limestones, Granites, Apparent resistivity.

The electrical resistivity method is rapidly gaining acceptance as a technique for use in the search for ground water supplies. The method offers a faster, more economical means of exploring the subsurface than is generally possible through direct exploration by drilling. Furthermore it is based on sound, well-established physical principles and can be used by anyone. Earth materials all have their own characteristic resistance to the flow of electric current. In general, resistivity decreases as porosity, water content, and water conductivity (salinity) increase. This principle provides a basis for distinguishing between various types of subsurface materials. Fine-grained sediments, such as clays and their bedrock counterpart the shales, have low resistance to current flow. Resistivity values for such materials generally fall in the range of 20 to 200 ohm-ft (ohm-ft being the unit of resistivity). Coarser grained sediments such as sands and gravels have higher resistivities, in the order of 200 to 2,000 ohm-ft. Weathered bedrock surfaces and secondary porosity such as faults, fractures, and solution openings, tend to lower these values. Methods for determination and interpretation of electrical resistivity values are presented. (Hunt-NWWA)
W74-07852

VARIATIONS IN THE DESIGN OF DEPTH SAMPLERS FOR USE IN GROUNDWATER STUDIES,
Institute of Geological Sciences, London (England). Dept. of Hydrogeology.
For primary bibliographic entry see Field 8G.
W74-07865

PLEISTOCENE-HOLOCENE SEDIMENTS INTERPRETED BY SEISMIC REFRACTION AND WASH-BORE SAMPLING, PLUM ISLAND-CASTLE NECK, MASS.,
Army Coastal Engineering Research Center, Fort Belvoir, Va.
For primary bibliographic entry see Field 2L.
W74-07875

RESEARCH - - TARGETS AND DEVELOPMENTS, REGIONAL ASSESSMENTS,
Newcastle Univ. (Australia). Dept. of Physics.
C. D. Ellyett.
Presented at International Groundwater Symposium, November 20-22, 1973, Macquarie University, Sydney, Australia. 5 p.

Descriptors: *Exploration, *Remote sensing, Locating, *Prospecting, Groundwater, Terrain analysis, Subsurface investigations, Evaluation, *Surveys.
Identifiers: *Thermal studies, Heat picture, *Infra-red studies, Thermal variation.

Thermal infra-red studies of ground and water by use of an air-borne scanner produce a heat picture of that area of the earth's surface scanned by the instrument. Tonal patterns depict thermal variations as small as 0.5C, but thermal infrared imagery is effective only at the terrain surface with negligible penetration. This tool is useful in hydrologic studies because of the exceptionally high specific heat of unity for water relative to other materials. Among its numerous applications are the following: surveying for leakage of water from dams and reservoirs; monitoring the flow of water through porous material; detection of subterranean streams and near surface water which may be reflected as cool areas at valley bottoms or topographic lows where there is no visible surface evidence of such phenomena. It is also possible, by studying the geological structures revealed in this way, to determine which areas are more likely to be productive of groundwater. (Campbell-NWWA)
W74-07903

EXPLORATION FOR A BURIED VALLEY BY RESISTIVITY AND THERMAL PROBE SURVEYS,
Harshbarger and Associates, Tucson, Ariz.
For primary bibliographic entry see Field 2F.
W74-07935

APPLICATION OF REMOTE SENSING TO HYDROLOGY--FINAL TECHNICAL REPORT,
IBM Electronics Systems Center, Huntsville, Ala.
For primary bibliographic entry see Field 2A.
W74-07940

THEORY AND APPLICATION OF CONTINUOUS MONITORING FOR CHEMICAL RESEARCH IN NATURAL WATER SYSTEMS,
For primary bibliographic entry see Field 5A.
W74-07985

A DATA ACQUISITION SYSTEM FOR ECOLOGICAL FIELD STUDIES,
Oak Ridge National Lab., Tenn.
C. D. Martin, J. T. Hutton, and R. L. Simpson.
Available from the National Technical Information Service as CONF-730419-1, $3.00 in paper copy, $1.45 in microfiche. Atomic Energy Commission, Oak Ridge, Tenn. (Undated report). 4 p. 2 fig, 3 ref.

Descriptors: *Data collections, *Automation, *Telemetry, Water levels, Stream gages, Computers, Rainfall, Runoff, Tennessee.
Identifiers: Oak Ridge(Tenn.).

In an ecology field study area near the Oak Ridge National Laboratory, rainfall and streamflow are routinely monitored using automatic precipitation recorders and water-level (stage height) recorders. A small computer-based data aquisition system was designed to monitor the field sensors, detect possible sensor failures and produce alarms, record data on magnetic tape for further processing by another computer, and produce daily logs of rainfall and stream runoff. Because of the relative inaccessibility of the field area, located about five miles from the laboratory, the computer was installed inside the plant area, and data are telemetered to the computer. This automated data acquisition system consisting of a minicomputer with standard and custom interfaces, was designed to acquire data remotely. The individual data recorders on the existing sensors were retained to provide redundancy to ensure that data are gathered even if the computer system

should fail due to lightning. The automated system provides oniline data acquisition, allowing current data to be always available to scientific investigators. The system also records data on magnetic tape for daily analysis on a larger computer, prints a daily summary of monitored activity, and prints alarm messages announcing any field system malfunctions. (Jones-Wisconsin)
W74-07989

APPLICATION OF SATELLITE DATA FOR HYDROLOGIC PURPOSES (ISPOL'ZOVANIYE SPUTNIKOVOY INFORMATSII DLYA GIDROLOGICHESKIKH TSELEY),
Gosudarstvennyi Gidrologicheski Institut, Leningrad (USSR).
V. V. Kupriyanov, and V. G. Prokacheva.
Meteorologiya i Gidrologiya, No 10, p 87-93, October 1973. 2 fig, 16 ref.

Descriptors: *Data collections, *Hydrologic data, *Satellites(Artificial), *Remote sensing, *Photography, Mapping, Hydrography, Snow cover, Ice, Water resources, Water quality.
Identifiers: *USSR(Lake Baykal).

Possibilities of utilizing information from artificial earth satellites for hydrologic purposes are examined. TV images from artificial earth satellites are interpreted to study snow cover, ice conditions in lakes, and hydrographic features. Prospects are envisaged for development of methods of interpretation of TV images from artificial earth satellites to solve problems associated with evaluation of water resources, water regime, and water quality. A photograph transmitted from the Apollo-502 spacecraft shows the flood plain of the Senegal River in West Africa (ground resolution is 15-30 m). Ice conditions in Lake Baykal were mapped by the Meteor-10 artificial earth satellite in January 1973. (Josefson-USGS)
W74-08049

AN OSCILLATOR CIRCUIT FOR AUTOMATED SALINITY SENSOR MEASUREMENTS,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
For primary bibliographic entry see Field 2G.
W74-08074

7C. Evaluation, Processing and Publication

PRECIPITATION CHARACTERISTICS OF THE NORTHERN NEW JERSEY, NEW YORK CITY METROPOLITAN AREA,
Rutgers-The State Univ., New Brunswick, N.J.
For primary bibliographic entry see Field 2B.
W74-07607

COASTAL VEGETATION OF DELAWARE,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 2L.
W74-07616

WATER RESOURCES DATA FOR NEBRASKA, 1972: PART I. SURFACE-WATER RECORDS,
Geological Survey, Lincoln, Nebr.
G. G. Jamison.
Basic-Data Report, 1973. 208 p, 2 fig, 3 ref.

Descriptors: *Hydrologic data, *Nebraska, *Surface waters, Streamflow, *Data collections, Stage-discharge relations, Gaging stations, Reservoirs.

The surface-water records for the 1972 water year for gaging stations, partial-record stations, and miscellaneous sites in the State of Nebraska are given. The base data collected at gaging stations consists of records of stage and measurements of discharge of streams or canals, and stage, surface area, and contents of lakes or reservoirs. In addition, observations of factors affecting the stage-discharge relation or the stage-capacity relation, weather records, and other information are used to supplement base data in determining the daily flow or volume of water in storage. At or near some gaging stations, water-quality records are collected. Data are obtained on the chemical quality of the stream water, on water temperature, on suspended-sediment concentration, and on the particle-size distribution of suspended sediment and bed material. (Knapp-USGS)
W74-07647

GROUND-WATER LEVELS IN OBSERVATION WELLS IN KANSAS, 1966-70,
Geological Survey, Lawrence, Kans.
M. E. Broeker, and J. M. McNellis.
Kansas Geological Survey Basic Data Series, Ground-Water Release No 3, 1973. 373 p, 19 fig, 3 tab, 17 ref.

Descriptors: *Water levels, *Kansas, *Water wells, Water table, Groundwater, *Data collections, *Hydrologic data, Water level fluctuations, Observation wells.

Water-level measurements were made in selected wells in 83 counties in Kansas during 1966-70. Water levels in most of Kansas responded primarily to normal seasonal fluctuations in recharge and discharge during 1966-70. However, water levels continued to decline in parts of western Kansas where annual groundwater withdrawals for irrigation plus natural discharge exceed the annual recharge from precipitation. (Knapp-USGS)
W74-07650

DATA MANAGEMENT,
For primary bibliographic entry see Field 5B.
W74-07659

ESTIMATING THE MAGNITUDE OF PEAK DISCHARGES FOR SELECTED FLOOD FREQUENCIES ON SMALL STREAMS IN EAST TEXAS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 2E.
W74-07664

ANNUAL PEAK DISCHARGES FROM SMALL DRAINAGE AREAS IN MONTANA, THROUGH SEPTEMBER 1972,
Geological Survey, Helena, Mont.
For primary bibliographic entry see Field 2E.
W74-07667

QUALITY OF SURFACE WATER IN ILLINOIS, 1966-1971,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 5A.
W74-07678

USGS COMPLETES NATIONWIDE RECONNAISSANCE OF METALS IN STREAMS.
For primary bibliographic entry see Field 5A.
W74-07698

THREE-DIMENSIONAL ZONE MODEL LOG INTERPRETATION,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 8G.
W74-07735

OPTIMIZATION OF STOCHASTIC STORAGE MODELS FORMULATED BY P.A.P. MORAN, AND Z. KACZMAREK (OPTYMALIZAEJA STOCHASTYCZNYCH MODELI RETENCJONWANIA PODANYCH PRZES P.A.P. MORANA I Z. KACZMARKA),
For primary bibliographic entry see Field 4A
W74-07747

DOCUMENTATION OF PROSPER - A MODEL OF ATMOSPHERE-SOIL-PLANT WATER FLOW,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 2A
W74-07785

SPILLWAY WATER-SURFACE PROFILES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab
For primary bibliographic entry see Field 8B.
W74-07913

HYDROLOGIC DATA FOR 1972, BROWARD COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
H. W. Bearden.
Open-file report 74005, 1974. 97 p, 42 fig, 5 tab, 16 ref.

Descriptors: *Hydrologic data, *Surface-groundwater relationships, *Florida, Aquifiers, Canals, Data collections, Recharge, Water management(Applied).
Identifiers: *Broward County(Fla).

This report is the second of an annual series presenting hydrologic data in Boward County, Florida. The hydrologic data for the 1972 water year are compared with long periods of records from rainfall, groundwater, surface-water, and water-quality stations. The canal network plays an important role in water management in the county. Flow in primary canals is regulated daily to maintain groundwater levels and storage and to provide flood protection. During the wet season, water is discharged from the aquifer to the canal system. During the dry season, water is transported through the canal system from the conservation areas for aquifer recharge. Water-level fluctuations in the aquifer are monitored in 79 wells. A continuous record of stage and discharge is obtained from seven stream-gaging stations in canals. Tidal fluctuations are recorded at 4 stations. Samples are collected semiannually at 27 sites in primary canals. The average annual rainfall in Broward County is 58.46 inches. Rainfall was 62.24 inches during the 1972 water year. Water levels in the aquifer were about average. Flow in all the major canals except Middle River, Plantation and Snake Creek during the 1972 water year was far below the average. Total coliforms exceeded the permissible limits for Class III waters and waters for public supply in most canals. All public supplies in Broward County are derived from wells in the Biscayne aquifer. During 1972 the seven largest suppliers pumped 29.157 billion gallons, a decrease of 0.227 billion gallons from 1972. (Knapp-USGS)
W74-07918

DATA ON FRESH-WATER INFLOW, APRIL 14-JULY 28, 1973, FOR ANALOG-MODEL STUDY OF THE HOUSTON SHIP CHANNEL, HOUSTON, TEXAS,
Geological Survey, Houston, Tex.
C. A. Heinrich, and C. E. Ranzau, Jr.
Open-file report, April 1974. 11 p, 2 fig, 4 tab.

Descriptors: *Discharge(Water), *Texas, *Hydrologic data, Data collections, Streamflow, *Model studies, *Analog models.
Identifiers: *Houston Ship Channel(Tex).

Total freshwater inflow from surface channels and from direct precipitation on water surfaces into the Houston Ship Channel and Galveston Bay were determined for a model study of Houston Ship Channel, Houston, Texas. Daily discharges

were computed at 14 model discharge stations for the period April 14 to July 28, 1973. The mouth of each major tributary to the Houston Ship Channel and Galveston Bay was designated as a model discharge station. Streamflow and rainfall on the stream surface was projected to these stations on the basis of nearby gaged streamflow and measured rainfall. (Knapp-USGS)
W74-07921

GROUND-WATER QUALITY MODELS: WHAT THEY CAN AND CANNOT DO,
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 5B.
W74-07933

APPLICATION OF REMOTE SENSING TO HYDROLOGY--FINAL TECHNICAL REPORT,
IBM Electronics Systems Center, Huntsville, Ala.
For primary bibliographic entry see Field 2A.
W74-07940

QUANTITY AND QUALITY OF SURFACE WATER IN MARION COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
W. Anderson, and G. L. Faulkner.
Florida Dept. of Natural Resources, (Tallahassee), Bureau of Geology Map Series No 55, 1973. 1 sheet.

Descriptors: *Streamflow, *Surface waters, *Florida, *Water quality, Water balance, Lakes, Springs, Karst hydrology, Discharge(Water), *Maps.
Identifiers: Marion County(Fla), Oklawaha River(Fla).

Surface water is abundant around much of the periphery of Marion County, Florida, and along the Oklawaha River, which flows from south to north through the east-central part of the county. Surface water is sparse elsewhere in the county because, with a few exceptions, rainfall infiltrates the sandy soils too rapidly to run off or accumulate in depressions. Thus, only about 25% of Marion County is subject to direct surface drainage, and the remainder is drained through the subsurface. The Floridan aquifer stores the water while transporting it to two major discharge points, Silver Springs and Rainbow Springs, and several lesser discharge points within the county. Nearly all the spring flow leaves Marion County by way of the Oklawaha River, Blue Run, Juniper Creek, and Salt Springs Run. The annual rainfall on Marion County averages 53.2 inches, an average of about 4.1 bgd. About 240 mgd enter the county from the south in the Oklawaha River and a net input of about 440 mgd flows into the county in the Floridan aquifer. Most water in streams in Marion County, and to a lesser degree in lakes, is of the calcium and magnesium bicarbonate type, meaning that the principal dissolved solids in the water come from the limestone and dolomite present in many places near the land surface and which make up the Floridan aquifer. The mineral content of streams in Marion County ranges from 20 mg/liter to more than 400 mg/liter. (Knapp-USGS)
W74-08044

STATE RECORD KEEPING ON WATER AND ITS USAGE AND HYDROLOGIC CALCULATIONS AND FORECASTS (GOSUDARSTVENNYY UCHET VOD I IKH ISPOL'ZOVANIYA I GIDROLOGICHESKIYE RASCHETY I PROGNOZY),
Hydrometeorological Service of the USSR, Moscow.
For primary bibliographic entry see Field 7A.
W74-08054

NATIONAL WEATHER SERVICE RIVER FORECASTING SYSTEM,
National Oceanic and Atmospheric Administration, Silver Spring, Md. Office of Hydrology.
For primary bibliographic entry see Field 4A.
W74-08057

8. ENGINEERING WORKS

8A. Structures

THE DESIGN, PLANNING AND CONSTRUCTION OF A 45 INCH DIAMETER WATER MAIN ACROSS A CONGESTED AREA OF WEST BROMWICH,
South Staffordshire Waterworks Co. (England). Distribution Dept.
D. E. Burgess.
Journal of the Institution of Water Engineers, Vol 27, No 7, p 365-376, October, 1973. 3 figs.

Descriptors: *Design criteria, *Project planning, *Sewers, Construction materials, *Steel pipes, Testing.
Identifiers: *Pipe bridges, Thrust bores, *United Kingdom(Bromwich).

Described are the design, planning, and construction of a 1145 mm nominal diameter steel water main laid through the County Borough of West Bromwich. The design of the main, which includes pipe bridges over the river Tame and the Walsall Canal, and two thrust bores, is explained and the problems encountered during construction are described. The main was tested in three sections. On completion, of testing the main was drained down and the end connections were then completed. The main was recharged and brought into commission after samples had been chemically tested. (Sanduski-Franklin)
W74-07751

A SIMPLE METHOD FOR RETENTION BASIN DESIGN,
Oakland County Drain Commissioner's Office, Pontiac, Mich.
For primary bibliographic entry see Field 5D.
W74-07753

SAND CONTROL, (PART 4), COMBINATIONS, COMPARISONS, AND COSTS,
Standard Oil Co. of California, Huntington Beach. Production Office.
E. B. Rogers, Jr.
Oil and Gas Journal, Vol 69, No 47, p 64-65, 68, November, 1971. 2 fig, 5 tab, 36 ref.

Descriptors: *Wells, Sands, Fine aggregates, Well filters, *Screens, Epoxy resins, *Adhesives, Coatings, Binders, Economics, Costs, *Installation costs.
Identifiers: Chemical-consolidation, *Gravel packs, Sand consolidation, *Sand control.

Several variations, innovations, and combinations of gravel-packing and chemical-consolidation methods of sand control are described. Injection-time estimates for consolidation processes and rig-time requirements for installation of sand-control devices are presented. The cost of installing sand control varies with the method, zone length, depth of well, and location of well. Economics of screens, gravel-packing, and sand consolidation are compared, as well as the advantages and disadvantages of each. (Staplin-NWWA)
W74-07851

CAUSES AND PREVENTION OF DRILL PIPE TROUBLES,
Armco Steel Corp., Houston, Tex.
For primary bibliographic entry see Field 8G.
W74-07889

SAND CONTROL IN OIL AND GAS WELLS, PART I,
Standard Oil Co. of California, Huntington Beach. Western Operations Div.
For primary bibliographic entry see Field 8B.
W74-07891

SOUTH DAKOTA STANDARDS FOR CONSTRUCTION OF IRRIGATION WELLS IN SHALLOW UNCONSOLIDATED GLACIAL SEDIMENTS,
South Dakota State Univ., Brookings. Inst. of Irrigation Technology.
F. F. Kerr, J. L. Wiersma, D. L. Moe, and S. W. Black.
Cooperative Extension Service Circular No 675, 1969. 8 p, 2 tab, 2 append.

Descriptors: *Wells, *Groundwater, *Irrigation wells, *Construction, *Construction materials, Concretes, Screens, Casings, Water quality, Test wells, *South Dakota.
Identifiers: Well development, Well abandonment, *Well construction standards, Glacial sediments, Gravel packs.

These irrigation well standards include many accepted practices and techniques presently in use in South Dakota and in other states, and give contractees and contractors standards to gauge quality of irrigation well construction. Topics include: test drilling; drilling the well hole; well casings, both concrete and metal; well screens, concrete and metal; gravel packs; well development; well sealing and abandonment; chlorination of wells; and determination of water quality. Also, sample forms are included for recording well completion and test pumping data. (Staplin-NWWA)
W74-07896

IRRIGATION WELL CONSTRUCTION.
South Dakota State Univ., Brookings. Inst. of Irrigation Technology.
Dept. of Agriculture, Cooperative Extension Service, Publication No FS 411, 1968. 5 p, 3 fig, 2 tab.

Descriptors: Groundwater, Wells, *Construction, *Irrigation wells, *Irrigation design, Casing, Well screens, Water permits, *Well regulations, *Drawdown, Water level, Test wells.
Identifiers: Static water level, Air line, Driller responsibilities, Driller qualifications.

Good irrigation well construction is described. Test hole drilling is necessary to locate a water-bearing formation and to determine the quantity and quality of water available. A gravel-packed well is described and reasons for its use are given. Selecting proper casing and screen diameter is discussed and the use of an air line for measuring static water level and drawdown is described. Legal requirements for drilling, the driller's responsibilities in the design, construction, and development of the well, and the qualifications of a reliable irrigation well driller are also presented. (Staplin-NWWA)
W74-07897

SELECTIVE WITHDRAWAL FROM BEECH FORK LAKE, BEECH FORK RIVER, WEST VIRGINIA,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 8B.
W74-07914

RECLAMATION RESEARCH IN THE SEVENTIES--FIRST PROGRESS REPORT.
Bureau of Reclamation, Denver, Colo.
For primary bibliographic entry see Field 4A.
W74-07922

Field 8—ENGINEERING WORKS

Group 8A—Structures

PREVENTION OF DAMAGE TO PIPELINES.
National Transportation Safety Board, Washington, D.C.
Available from NTIS, Springfield, Va. 22151, as PB-222 014 Price $3.75 printed copy; $1.45 microfiche. Report NTSB-PSS-73-1, June 1973. 32 p, 8 fig, 42 ref, 3 append.

Descriptors: *Pipelines, Damages, *Safety, Construction, *Reviews, Regulation, Legislation.
Identifiers: *Damage control, *Damage prevention.

Prevention of damage to gas and liquid pipelines caused by excavation and construction activities, including blasting, is reviewed. Several recent damage-related pipeline accidents are described, and Federal, State, and industry statistics are provided in order to illustrate the scope of the problem. The damage-prevention responsibilities of excavators, contractors, and pipeline operators are described. Programs, methods, and devices which have proven effective in preventing damage to pipelines are reviewed as are laws and proposed laws in several States and local communities. A model statute issued by the Office of Pipeline Safety of the U.S. Department of Transportation is discussed. (Knapp-USGS)
W74-07923

OUTLET WORKS, STILLING BASIN FOR TALLAHALA DAM, TALLAHALA CREEK, MISSISSIPPI,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W74-07925

OUTLET WORKS STILLING BASINS, CLINTON AND FORT SCOTT DAMS, WAKARUSA AND MARMATON RIVERS, KANSAS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
E. S. Melsheimer.
Available from NTIS, Springfield, Va. 22151, as AD-762 553 Price $3.00 printed copy; $1.45 microfiche. Technical Report H-73-6, June 1973. 19 p, 7 fig, 15 plate, 11 photo.

Descriptors: *Hydraulic models, *Spillways, *Outlets, Outlet works, Drops(Structures), Gates, Hydraulics, Hydraulic jump, *Kansas.
Identifiers: Clinton dam(Kan), Fort Scott dam(Kan).

Model investigations of the outlet works for the Clinton and Fort Scott Dams were used for development of satisfactory stilling basins for a wide range if discharges and tailwater conditions. Of particular interest were low-flow conditions in which the invert of the outlet is submerged by tailwater or in which there is a little drop from the outlet portal invert to tailwater. Both studies were conducted with a 1:16-scale model that reproduced a portion of the outlet conduit, the stilling basin, and about 800 ft of the exit channel. Performances of the original design basins for both projects were unacceptable, as unstable hydraulic action and eddy formation occurred in the basins at or near expected tailwaters with flows less than 1600 cfs. In the case of the Clinton Dam study, decreasing the flare of the outlet transition sidewalls and reducing the elevation of the basin floor (type 15 basin) resulted in adequate, if not ideal, performance. Adequate performance of the Fort Scott basin required a decrease in basin width and a reduction in apron elevation (type 7 basin). This basin barely maintained a jump with the design discharge (7370 cfs). Investigation of the 1:5-scale model of the low-flow outlet for the Fort Scott outlet works revealed that the most satisfactory location of the control gate was within and perpendicular to the conduit. With the control gate located at the conduit entrance, the high-velocity jet under the gate was unstable, tending to seal off the conduit at all openings greater than 1 ft. (Knapp-USGS)
W74-07930

INDUCED SAFETY ALGORITHM FOR HYDROLOGIC DESIGN UNDER UNCERTAINTY,
Water Resources Center, Budapest (Hungary).
For primary bibliographic entry see Field 6A.
W74-08017

DESIGN AND SIMULATION OF EQUALIZATION BASINS,
Environmental Protection Agency, Cincinnati, Ohio. Office of Research and Development.
For primary bibliographic entry see Field 5D.
W74-08046

8B. Hydraulics

A DERIVATION OF THE HYDRAULIC GEOMETRY OF STEADY-STATE CHANNELS FROM CONSERVATION PRINCIPLES AND SEDIMENT TRANSPORT LAWS,
University of Western Ontario, London. Dept. of Geography.
For primary bibliographic entry see Field 2J.
W74-07633

WELLS AND PUMPING SYSTEMS FOR DOMESTIC WATER SUPPLIES,
Illinois State Water Survey, Urbana.
J. P. Gibb.
Circular 117, 1973. 17 p, 8 fig, 1 tab, 10 ref, 2 append.

Descriptors: *Water wells, *Domestic water, *Illinois, *Groundwater, Water supply, Planning, Water yield, Water quality, Water pollution control, Water treatment, Potable water, Disinfection.

Basic information is presented on wells and pumping systems used for farm and domestic groundwater supplies. Types of wells and their construction, development, and costs are described. Discussed are the various types of pumps and pressure tanks, how to select them, and their costs. Suggestions on locating wells to prevent pollution and procedures for disinfecting a home water supply system are included. (Knapp-USGS)
W74-07638

THE NUMERICAL SOLUTION OF TRANSIENT SUPERCRITICAL FLOW BY THE METHOD OF CHARACTERISTICS WITH A TECHNIQUE FOR SIMULATING BORE PROPAGATION,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
J. J. Zovne.
Available from the National Technical Information Service as PB-232 143, $12.50 in paper copy, $1.45 in microfiche. Report No. ERC-0370, May 1970, 165 p, 50 fig, 16 tab, 42 ref, 6 append.

Descriptors: *Supercritical flow, *Unsteady flow, Hydraulic jumps, Open channels, Surges.
Identifiers: *Bore propagation, Method of characteristics.

Two finite-difference schemes for the solution of unsteady, supercritical flow problems are analyzed and the results are used in proposing a method to simulate bore propagation in supercritical flow. Two nonlinear one-dimensional partial-differential equations are written for a rectangular cross section including only the gravity and friction forces. The equations are solved by employing two finite-difference schemes programmed on a digital computer. In the Characteristics Grid scheme, the equations are integrated along curves which results in an uneven distribution of grid points. In the Fixed Grid scheme, the flow quantities at a point on a characteristic are determined by interpolation from a fixed spatial grid. Although the Characteristics Grid method may be more accurate and efficient, the difficulties involved in programming do not recommend its general use, and therefore, the Fixed Grid method is the better method for supercritical flow simulation. A bore may be simulated in supercritical flow by employing in conjunction with Fixed Grid method the well-known sequent depth equation for hydraulic jumps. The numerical scheme adequately simulates the propagation of experimental bores without the necessity of using special finite-difference equations in the vicinity of the bore front. Solution of multi-channel problems in sub- and/or supercritical flow is therefore feasible. (See also W71-10174) (James-Georgia Tech)
W74-07732

HYDRAULICS OF CULVERT OUTLETS,
Auckland Univ., (New Zealand) Dept of Civil Engineering.
R A Callander
New Zealand Engineering, p 261-265, September 15, 1973. 5 fig, 3 ref.

Descriptors. *Jets, *Culverts, Data collections, *Design criteria, Energy dissipation, Settling basins, *Outlets, *Mathematical studies, *Mannings equation.
Identifiers: Jet spreading.

Spreading of a jet from a culvert outlet is analyzed to yield depth, breadth, and velocity in terms of distance from the outlet, with the subsequent solution being presented in the form of design charts. These data facilitate design of a stilling basin to dissipate excess energy, and selection to prevent scour. For the latter purpose, the Manning-Strickler formula is used with the Shields criterion for stability. (Sanduski-Franklin)
W74-07749

TEST RESULTS ON BUOYANT JETS INJECTED HORIZONTALLY IN A CROSS FLOWING STREAM,
American Univ., Beirut (Lebanon). Faculty of Engineering and Architecture.
G. M. Ayoub.
Water, Air, and Soil Pollution, Vol 2, No 4, p 409-426, December 1973. 12 fig, 1 tab, 5 ref.

Descriptors: *Simulation analysis, Investigations, *Turbulent flow, *Currents(Water), *Jets, Distribution patterns, *Mathematical studies.
Identifiers: Concentration distribution, Maximum concentration, Concentration dilution.

The behavior was studied of axi-symmetric turbulent buoyant jets injected horizontally in a cross flowing current. Material concentration profiles were measured across various sections along jets of different parametric values. From these profiles, concentration distribution curves as well as maximum concentration and dilution values and their variation with distance along the jet were determined. Half jet radius values were calculated to study the expansion of the jet. Jet boundaries and trajectories were studied photographically and compared with measured values. The effect of the ambient current on the overall shape of the jet was established by the study of the measured complete concentration section across the jet. (Sandoski-Franklin)
W74-07766

HYDROLOGY AND STRUCTURAL DESIGN (IN RUSSIAN),
A. I. Chebotaryov, and B. I. Serpik.
Meteorologiya i Gidrologiya, No 10, p 45-54, 1973. 3 fig, 5 ref. English summary.

Descriptors: Reviews, Documentation, *Hydrologic aspects, *Structural design, *Design criteria, *Mathematical studies, *River flow, *Standards.
Identifiers: Errors.

A summary of the Guide to Determination of Design Hydrological Characteristics is given. Errors made in the preparation of certain normative documents are mentioned and immediate tasks are shown, the solution of which should improve technical norms in the field of calculations of river flow as applied to the requirements of structural design. (Sandoski-Franklin)
W74-07767

THE DISPERSION OF CONTINUOUSLY INJECTED EFFLUENTS IN OPEN CHANNELS,
Louisiana State Univ., Baton Rouge. Water Resources Research Inst.
For primary bibliographic entry see Field 5B.
W74-07833

SAND CONTROL, (PART 4), COMBINATIONS, COMPARISONS, AND COSTS,
Standard Oil Co. of California, Huntington Beach. Production Office.
For primary bibliographic entry see Field 8A.
W74-07851

RECENT ADVANCES IN LOG EVALUATION,
Schlumberger, Well Surveying Corp., Paris (France).
For primary bibliographic entry see Field 8G.
W74-07853

TRACERS IN MUD IMPROVE DST, WIRELINE TEST ACCURACY,
Chevron Oil Co., Denver, Colo.
For primary bibliographic entry see Field 8G.
W74-07856

LOCATION AND CHARACTERISTICS OF THE INTERFACE BETWEEN BRINE AND FRESH WATER FROM GEOPHYSICAL LOGS OF BOREHOLES IN THE UPPER BRAZOS RIVER BASIN, TEXAS,
Geological Survey, Denver, Colo.
W. S. Keys, and L. M. MacCary.
Professional Paper 809-B, 1973. 23 p, 13 fig, 1 tab, 11 ref.

Descriptors: Wells, *Test wells, *Groundwater, *Borehole geophysics, *Logging(Recording), Resistivity, Electrical well logging, Radioactive well logging, Geology, Water quality, *Salinity, *Texas.
Identifiers: Neutron logs, Natural-gamma logs, Caliper logs, Brazos River Basin(Tex), Brine seeps.

Borehole geophysics was used during a test-drilling program in the upper Brazos River basin to determine the location, characteristics, and relation to lithology of an interface between brine and overlying fresh to slightly saline water. The analysis of several different types of geophysical well logs enabled the accurate location of the interface, proved that it was quite sharp, and showed that the interface was not related to lithology in most places. Single-point-resistance and spontaneous-potential logs were responsive to the interface in many open holes, whereas the neutron-epithermal-neutron and neutron-gamma log combination could be used to find the interface behind well casing. Caliper logs were used to locate fracture zones, which contained brine in some areas and gas in others. All of these logs along with the natural gamma were used to identify and correlate the lithologic units penetrated by the test holes. (Staplin-NWWA)
W74-07859

DISSOLUTION OF A POROUS MATRIX BY A SLOWLY REACTING ACID,
Fluor Corp. Ltd., Houston, Tex.
W. E. Sinex, Jr., R. S. Schechter, and I. H. Silberberg.
Industrial Engineering Chemical Fundamentals, Vol 11, No 2, p 205-209, May, 1972. 4 fig, 10 ref.

Descriptors: *Wells, *Productivity, *Acids, Chemical reactions, Porous media, Porosity, Permeability.
Identifiers: *Well stimulation, *Acidization, Hydrochloric acid, Hydrofluoric acid, Slow reactions.

The acid treatment of a well to increase its productivity is commonly practiced; however, at the present time there is no proven method to guide the design of such a process. This research examines the ability of a previously proposed model to predict the changes in a porous matrix when invaded by a slowly reactive fluid which dissolves a portion of the solid. The model is shown to predict a relationship between the increase in porosity and the permeability which is not precisely unique, as it depends to some extent on the initial pore size distribution, but for the initial distributions tested the permeabilities were found to lie in a narrow band. These results are independent of any parameters defining the kinetics except that the reaction be slow. It is shown experimentally that the reaction of ferric citrate in the presence of citric acid with porous bronze disks satisfies the condition of being a slow reaction. The permeability change of the porous bronze disks is found to agree closely with the theoretical predictions. (Staplin-NWWA)
W74-07860

DRILL PIPE FAILURES: WHERE DO WE GO FROM HERE,
Continental Oil Co., Ponca City, Okla.
For primary bibliographic entry see Field 8G.
W74-07869

37 WAYS TO IMPROVE YOUR WELL COMPLETIONS,
Institut Francais du Petrole, Rueil-Malmaison (France).
For primary bibliographic entry see Field 8G.
W74-07870

EFFECT OF BENTONITIC FLUID PROPERTIES ON DRILLING RATE,
Texas Univ., Austin.
B. Evans, and K. E. Gray.
Journal of Petroleum Technology, Vol 24, No 6, p 657-662, June 1972. 8 fig, 13 ref.

Descriptors: *Drilling, *Bentonite, *Drilling fluids, Mud, Viscosity, Permeability, Filtration, Laboratory tests, Pressure, Slurries, Sandstone, Limestone.
Identifiers: *Drilling rate, *Microbit drilling, Differential pressure, Kinematic viscosity, Berea sandstone, Lueders limestone.

Bentonite suspensions and water were used in a laboratory study of the effect on drilling rate of kinematic viscosity, filtration rate, pressure gradient, permeability reduction beneath the bit, solids concentration and sensitivity of the formation to water. Berea sandstone and Lueders limestone were drilled with a two-cone 1 1/4-inch diameter bit under controlled conditions. Drilling rates in both Berea sandstone and Lueders limestone decreased as bentonite concentration increased from 0.5 to 4.0% by weight, except at 1% concentration. Drilling rate with 1% bentonite suspension was higher than with water alone. Pressure gradients immediately beneath the bit increased as bentonite concentration increased, except for the 1% suspension. Filtration rate and kinematic viscosity were found to have effects on drilling rate but did not independently control it. (Gray-NWWA)
W74-07879

WATER JET CUTTING OF SEDIMENTARY ROCK,
Missouri Univ., Rolla.
D. A. Summers, and R. L. Henry.
Journal of Petroleum Technology, Vol 24, No 7, p 797-802, July, 1972. 9 fig, 3 tab, 11 ref.

Descriptors: *Jets, *Drilling, *Sedimentary rocks, Rock excavation, Drilling equipment, *Sandstone, *Limestone, Rock properties, Statistical methods, Nozzles.
Identifiers: *Water jets, Specific energy of cutting, Rock cutting, Berea sandstone, Indiana limestone, Jet kinetic energy.

A laboratory study was made of the cutting of Berea sandstone and Indiana limestone by a water jet at various traverse speeds at jet pressures of 5000 to 30,000 psi. The specific energy of breakage was calculated. Results showed that at slower traverse speeds the cutting efficiency dropped sharply as jet pressure increased but as the traverse speed increased the efficiency rose and in some instances the high-pressure jets became more efficient than the lower pressure jets. Two concepts in water-jet tools are: (1) rotating jets to remove all of the rock at the face, or (2) cutting slots with the water jet and then removing the ribs of rock by mechanical means. Calculations showed that there was a fifteen-fold gain in efficiency of cutting by the use of the second method. Pump size could be reduced by employing mechanical breakers to remove the ribs remaining after slots had been cut by the water jet. (Campbell-NWWA)
W74-07883

SAND CONTROL IN OIL AND GAS WELLS, PART I,
Standard Oil Co. of California, Huntington Beach. Western Operations Div.
E. B. Rogers, Jr.
Oil and Gas Journal, Vol 69, No 44, p 54-60, November, 1971. 9 fig, 2 tab, 36 ref.

Descriptors: *Wells, *Ground water, *Sand, Well filters, Fine aggregates, Particle size, *Well screens.
Identifiers: Wentworth scale, *Gravel packs, *Sand control.

Operating costs multiply when sand production wears out equipment and forces expensive workovers. A series of laboratory experiments shows: sand breaks away from an unsupported formation face either as individual particles, as sloughing masses, or in a fluidized state; interfacial tension acts as a strong cohesive force between sand grains if two phases are present around grain contacts; introducing water into a rising column of oil and suspended sand grains causes the sand grains to form aggregates (bound by a film of water) that drop cut of the flow stream. Sand-control methods divide into two main categories -- bridging of the sand, and consideration of the sand in place. The bridging methods for sand control use either screens or gravel packs, and require a knowledge of the formation size distribution. Sieve analysis is necessary to obtain this information, and precedes specification of the size and nature of material to be included in the gravel pack. (Staplin-NWWA)
W74-07891

SOLVING DRILLING PROBLEMS UTILIZING WELL LOGS - A CASE HISTORY,
Continental Oil Co., Houston, Tex.
For primary bibliographic entry see Field 8G.
W74-07898

SPILLWAY WATER-SURFACE PROFILES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
R. G. Cox.
Available from NTIS, Springfield, Va. 22151, AD-762 128, Price $3.00 printed copy; $1.45

microfiche. Miscellaneous Paper H-73-4, June 1973. 7 p, 13 plate, 4 tab.

Descriptors: *Spillways, *Computer programs, *Stage discharge relations, *Profiles, Hydraulics, Spillway crests, Discharge(Water), Outlet works.

A computer program transfers Bureau of Reclamation upper wateh-surface profile coordinates into terms required for Corps of Engineers design practices. Equations were developed to show the relation between WES profiles for heads of 0.5, 1.0, and 1.33 times the design head. The procedure for design neads is applicable to spillways of varying heights and upstream face slopes. (Knapp-USGS)
W74-07913

SELECTIVE WITHDRAWAL FROM BEECH FORK LAKE, BEECH FORK RIVER, WEST VIRGINIA,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
T. L. Gloriod, and J. P. Bohan.
Available from NTIS, Springfield, Va. 22151, AD-768 777, Price $3.00 printed copy; $1.45 microfiche. Technical Report H-73-14, September 1973. 14 p, 8 fig, 19 plate, 1 tab, 7 ref.

Descriptors: *Stratified flow, *Density currents, *Hydraulic models, Reservoir operation, *Reservoir releases, *West Virginia, Stratification, Density stratification, *Withdrawal.
Identifiers: Beech Fork Lake(W Va).

Tests were conducted on a 1:36-scale model of a portion of the proposed Beech Fork Lake and multilevel intake structure to determine the effects of the upstream topography and the geometry in the vicinity of the intake structure on the selective withdrawal capability of the structure. Density stratification caused by differentials in temperature in the prototype was simulated in the model by using saline and fresh waters. Density profiles, appropriate discharges, and other required data were used as input to a computer program based on the selective withdrawal techniques developed in previous investigations to predict the withdrawal-zone limits. Based on selective withdrawal performance, there appeared to be no distinct difference in the three locations tested. One test was conducted with a dyed, dense inflow. An equal rate of withdrawal was released through the lowest level intake to determine the path of the inflow through the lake. The flow followed the sinuous river channel from the point of entry to the intake structure. The dyed inflow then remained in the river channel until there was enough buildup for it to enter the approach channel. Density currents were not affected by either the topography of the reservoir and approach channel or the geometry in the immediate vicinity of the intake structure. (Knapp-USGS)
W74-07914

OUTLET WORKS, STILLING BASIN FOR TALLAHALA DAM, TALLAHALA CREEK, MISSISSIPPI,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
N. R. Oswalt.
Available from NTIS, Springfield, Va 22151, as AD-759 905, Price $3.00 printed copy; $1.45 microfiche. Technical Report H-73-5, April 1973. 21 p, 2 fig, 5 plate, 4 photo, 1 tab.

Descriptors: *Spillways, *Outlet works, Settling basins, Eddies, Turbulence, Drops(Structures), *Mississippi, Hydraulic structures.
Identifiers: *Stilling basins, Tallahala Dam(Miss).

Tests were conducted on a 1:16.6-scale model of the Tallahala Creek, Mississippi, outlet works stilling basin to determine if eddies or other undesirable flow conditions would exist in the stilling basin. The basin consisted of a horizontal apron 90 ft long and 22 ft wide and was connected to the 10-ft-diam outlet by a 56-ft-long transition with sidewalls flared 8.67 on 1. Eddies occurred in the original design basin with discharges of 800 cfs or less and the expected tailwater elevations. The eddies were eliminated by revising the floor and walls of the flared transition. The sidewall flare was changed from 8.67 on 1 to 11.83 on 1 and the IV-on-8H downsloping floor was changed to a IV-on-6H upslope for a rise of 4 ft and then a downslope. The floor was sloped down laterally 1 ft from the transition center line to each wall. Spray off of the baffle blocks occurred with the design discharge and minimum tailwater with the stilling basin as originally designed. The height of the baffle blocks was increased and an additional row of blocks was added to prevent this type of action. (Knapp-USGS)
W74-07925

OUTLET WORKS STILLING BASINS, CLINTON AND FORT SCOTT DAMS, WAKARUSA AND MARMATON RIVERS, KANSAS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 8A.
W74-07930

TWO NEW DRILLING SYSTEMS PASS INITIAL FIELD TESTS, DC ELECTRIC POWER SWIVEL CAN SAVE TIME AND MONEY; HYDRAULIC SNUBBER BUILT TO OPERATE IN RUGGED TERRAIN.
For primary bibliographic entry see Field 8G.
W74-07980

FLOATING BREAKWATER FOR ATTENUATING SEAS,
Debero Kogyo Co. Ltd., Mito (Japan). (assignee)
M. Tachii.
U.S. Patent No. 3,791,150, 3 p, 5 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 919, No 2, p 459, February 12, 1974.

Descriptors: *Patents, *Shore protection, *Ocean waves, *Breakwaters, Barriers, Equipment, Floats.

The floating breakwater has two or more expanding portions which are enlarged in turn from the front to the rear of the body. The portions are continuously engaged through concave portions in a sine wave shape in such a manner that not only the heights of the waves but the wavelengths of the expanded portions are in turn enlarged from the front to the rear of the body. The outer layers may preferably be formed of synthetic resin. Floating material such as foam synthetic resin is filled into the floated portion, and liquid such as sea water is filled into the bottom side under water through a supply port. (Sinha-OEIS)
W74-08043

FLOW-INDUCED VIBRATION OF VERTICAL-LIFT GATE,
Imperial Coll. of Science and Technology, London (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8C.
W74-08058

8C. Hydraulic Machinery

THE SNODLAND-IGHTHAM REGIONAL DRAINAGE SCHEME: DESIGN AND OPERATION,
For primary bibliographic entry see Field 5D.
W74-07752

AUTOMATION OF THE CONTROL AND OPERATION OF WATER POLLUTION CONTROL WORKS,
Norwich Sewage Treatment Works (England).
For primary bibliographic entry see Field 5D
W74-07758

DESIGN DATA AND SAFETY FEATURES O COMMERCIAL NUCLEAR POWER PLANTS VOL I,
Oak Ridge National Lab , Tenn Nuclear Safet Information Center
For primary bibliographic entry see Field 5G
W74-07794

DESIGN DATA AND SAFETY FEATURES O COMMERCIAL NUCLEAR POWER PLANTS VOL. II.
Oak Ridge National Lab., Tenn. Nuclear Safet Information Center
For primary bibliographic entry see Field 5G
W74-07795

DESIGN DATA AND SAFETY FEATURES O COMMERCIAL NUCLEAR POWER PLANTS VOL. III,
Oak Ridge National Lab., Tenn. Nuclear Safet Information Center.
For primary bibliographic entry see Field 5G.
W74-07796

AUTOMATIC PUMPING INSTALLATIONS FOI LIVESTOCK SECTIONS,
Y. Y. Goryacheva, and S. V. Ryzhov.
Typescript 17 p. (Translating agency not cited Translated from Gidrotekhnika i melioratsia, No 10, October 1972.

Descriptors: Groundwater, *Wells, *Pumps, Jets Turbines, Economics, Irrigation, *Livestock Stock water, *Automatic control, *Water supply Automation, Costs.
Identifiers: *USSR, Submersible pumps Peripheral turbines, Regenerative turbines.

The technical and economic characteristics o livestock water supply systems incorporating au tomatic water-lifting installations in the U.S.S.R are discussed. The various components of the in stallations are described: water lifter, hydropneu matic tank, pressure relay, electrical control box safety valve, and pressure gauge. These installa tions are of three general types: those with jet pump lifters, those with peripheral -- or regenera tive -- turbine pumps, and those with submersibl electric pumps. Systems design and operation ar emphasized. (Campbell-NWWA)
W74-07864

VALVE INSTALLATION, OPERATION ANI MAINTENANCE,
H. C. Templeton.
Chemical Engineering, Vol 78, No 23, p 141-149 October 1971. 10 fig, 1 tab, 3 ref.

Descriptors: *Valves, *Operation and main tenance, *Maintenance costs, *Installation.
Identifiers: Ball valves, Plug valves, Globe valves Gate valves, Check valves, Butterfly valves, O rings, Gaskets, Seals, Liners PTFE materials.

Valve repairs are best done out of the pipeline although in-line replacement of PTFE parts an some metal parts will produce satisfactory result on some valve types. The remachining necessar on metal globe, gate and check valves require adequate equipment and know-how on the part o the shop personnel. Most operating plants woul not be justified in attempting such repairs them selves, and specialists should be considered fo this type of work. Installation of seat seals, nev metal parts, liners and other miscellaneous part might be done either in-plant, or in a valve repai shop. Valve repair is generally considere economic if the unit can be reconditioned for n more than 65% of the replacement cost. Repai costs average close to 50% of the replacemen

cost; however, many valves are not repairable because of exceeding the cost criterion above. Generally a valve is not repairable if the body cannot be reused, as cost of repair will exceed the value recoverable. (Campbell-NWWA)
W74-07867

PUMP SELECTION,
Brown and Root, Inc., Houston, Tex.
W. H. Stindt.
Chemical Engineering, Vol 78, No 23, p 43-49, October 1971. 9 fig, 7 ref.

Descriptors: *Pumps, Hydraulics, *Head loss, *Pressure head, Costs, *Capital costs, *Operating costs.
Identifiers: Positive-displacement pumps, Reciprocating pumps, Static head, Velocity head, Suction lift, Net positive suction head.

Pump selection requires a careful analysis of the hydraulic system and the pump's location and function within the system. Hydraulic factors discussed include pressure, head, static head, velocity head, suction lift, total discharge head, total head, head losses, and NPSH (net positive suction head). Means of calculating head curves and NPSH requirements are given. Handling of entrained gases, viscous fluids, and slurries is also discussed. Pump classifications and questions of pump function and installation relevant to pump selection are discussed. Positive-displacement pumps and reciprocating pumps are considered in some detail. Finally, economic factors including capital and operating costs are considered as a part of final pump evaluation procedures. (Staplin-NWWA)
W74-07872

PUMP INSTALLATION AND MAINTENANCE,
Union Carbide Corp., South Charleston, W. Va. Chemicals and Plastics.
J. A. Reynolds.
Chemical Engineering, Vol 78, No 23, p 67-76, October 1971. 8 fig, 2 tab, 2 ref.

Descriptors: *Pumps, *Maintenance, Operations, *Installation, Pipes.
Identifiers: *Pulsation dampeners, Suction piping, Pipe loading, *Pressure relief, Trouble shooting.

Much of the effort devoted to careful selection and sizing of a process pump may be wasted if the unit is not installed and maintained properly. A pump installation check list prescribes a substantial foundation for pump support, a level base plate, proper coupling alignment, even flow through suction piping, little pipe loading, checking direction of rotation, and final alignment after pump has run long enough for temperatures to stabilize. Also discussed are pressure relief devices, vents and drains, pulsation dampeners, catch basins and shield, and startup and trouble shooting procedures. (Campbell-NWWA)
W74-07873

POSITIVE DISPLACEMENT PUMPS,
Dynamic Technology, Inc.
M. Glickman.
Chemical Engineering, Vol 78, No 23, p 37-42, October 1971. 11 fig, 7 ref.

Descriptors: *Pumps, Operations, Flow, *Flow characteristics.
Identifiers: *Positive-displacement pumps, *Volumetric efficiency, Metering pumps, Vacuum pumps, Vane pumps, Rotary pumps, Diaphragm pumps.

The primary characteristic of positive displacement pumps is that they exhibit a direct relationship between the motion of the pumping elements and the quantity of liquid moved. Positive displacement pumps have a dynamic seal (sliding or rotating) that separates the discharge fluid from the inlet or suction side. Liquid displacement is theoretically equal to the swept volume of the pumping element. Flow rate is determined by the speed of the pumping element and is independent of pressure. In actual practice, however, pressure does influence capacity because of leakage through the dynamic seals, which is proportional to the pressure gradient. Actual flow divided by ideal flow is volumetric efficiency, a basic characteristic of positive displacement pumps. Volumetric efficiency can range from less than 50% up to 98%. Metering pumps, vacuum pumps, vane pumps, rotary pumps, and diaphragm pumps are discussed; their specific applications and operating characteristics are identified. (Staplin-NWWA)
W74-07874

DOWN-HOLE MOTORS FOR IMPROVED DRILLING,
Dyna-Drill Co., Houston, Tex.
B. J. Roberts, and C. H. Mohr.
Journal of Petroleum Technology, Vol 24, No 12, p 1484-1490, December 1972. 3 tab, 5 ref.

Descriptors: *Turbines, *Drilling, *Drilling equipment, Drilling fluids, Boreholes, Wells, Temperature, Hydraulics, Pumps, Drilling fluid, Mud, *Texas.
Identifiers: *Down-hole motors, *Diamond bits, Drill-string stabilization, Drilling cost.

The performance record for a down-hole motor and diamond bit in drilling the Wolfcamp formation in West Texas is given. From this study, conclusions are drawn as to the applicability of the down-hole motor in straight-hole drilling. The formation to be drilled must be suitable to the use of diamond bits. Shales (free of chert, pyrite and quartzite), dolomites, some limestones and some sandstones are 'diamond drillable.' The hydraulic system of the drilling rig must provide flow and pressure characteristics that will permit optimum performance of the motor. The pressure drops needed to operate various down-hole motors range from 250 to 1000 psi. The circulating rate necessary to power the bit depends on the size of the tool. For positive displacement motors the range is 160 to 450 gal. per min. A pressure drop of about 400 psi across the bit is a practical value. The down-hole environment must be such as to permit the economical operation of the down-hole motor. Temperature must be less than 300 degrees F. Rubber components of the down-hole motor may be adversely affected by certain oils in the drilling fluid, by abrasive substances, and by high pressure gas. Lost-circulation materials may plug the tool. Diamond bits used with down-hole motors should be specifically designed for this purpose. Stabilization of the string is a key requirement in the economic use of down-hole motors. Intangible savings result from slower rotation and fewer trips when using down-hole motors and diamond bits. (Gray-NWWA)
W74-07880

WATER JET CUTTING OF SEDIMENTARY ROCK,
Missouri Univ., Rolla.
For primary bibliographic entry see Field 8B.
W74-07883

SOUTH DAKOTA STANDARDS FOR IRRIGATION PUMPS AND POWER UNITS,
South Dakota State Univ., Brookings. Inst. of Irrigation Technology.
S. W. Black, and W. H. Peterson.
Cooperative Extension Service Circular No 676, 1969. 12 p, 6 fig, 1 tab.

Descriptors: *Pumps, *Electric motors, *Centrifugal pumps, *Turbines, Hydraulic equipment, *Safety, *South Dakota.
Identifiers: Propeller pumps, Pump standards, *Power unit standards, Internal combustion engine, Net positive suction head, Total dynamic suction lift.

These pump and power unit standards as set forth include many accepted practices and techniques presently used in South Dakota and in other states where irrigation is practiced extensively. Topics include: turbine pumps, centrifugal pumps, propeller pumps; electric motors and internal combustion engines as power unit alternatives; installation standards, including preliminary operation and adjustment, information from suppliers, general provisions for all installations, and special provisions for electrical installations; and safety guidelines. A table of definitions of hydraulic terms and devices is included. (Staplin-NWWA)
W74-07895

IMPROVED DRILLING RATES AT LOWER COSTS,
New South Wales Univ., Broken Hill (Australia).
V. S. Vutukuri.
Mining Magazine, Vol 125, No 4, p 324, 327, October, 1971. 1 tab, 19 ref.

Descriptors: *Rotary drilling, *Drilling fluids, *Surfactants, *Cost analysis, Electrolytes, Drilling, Rock properties.
Identifiers: Specific energy, Drilling rate, Sodium carbonate, Rock carbonate, Rock hardness, Bit wear, Rock strength.

Several publications on the subject of the effect of some electrolytes and surfaceactive agents on the drilling strength of rock are reviewed. Cost of drilling, the ultimate measure of efficiency, depends upon the energy required to break a unit volume of rock, the speed of drilling, and the bit wear. Reduction in rock strength lowers the energy requirement, or, if power applied is kept constant increases the rate of penetration. A decrease or an increase in the hardness of the bit may occur. Depending upon the predominating factors, the total effect of additives on drilling costs may be positive or negative. A decrease of about 10% in the compressive and the tensile strengths of sandstone and limestone was observed when specimens were saturated with a solution of 8% sodium carbonate as compared to water-saturated samples. Improvement in drilling rate can be brought about by the addition to water of small amounts of electrolytes, polar liquids, and soaps. (Gray-NWWA)
W74-07901

APPLICATION OF ELECTRICAL ENERGY TO CULVERT ICING PROBLEMS--A LABORATORY STUDY,
Cold Regions Research and Engineering Lab., Hanover, N.H.
D. A. Gaskin, and L. E. Stanley.
Technical Report 248, March 1974. 43 p, 17 fig, 7 tab, 6 ref, 7 append.

Descriptors: *Ice, *Melting, *Culverts, *Deicers, Heating, Thawing, Snow removal, Highways.
Identifiers: *Culvert deicing.

The use of electric heat cables to counteract culvert icing was tested. An 80-in-long, 1-ft-diam culvert with a 10-ft copper sheath heating cable modeled a typical Alaskan installation. Tests were made to evaluate several continuous power levels, a short-term percentage timer, and the automatic system. Maximum efficiency (cross section produced per unit energy input) occurred when the cable was operated continuously at its maximum permissible power level. The short-term timer system was less efficient than applying the same amount of energy continuously. The automatic system performed well in the laboratory, but may need additional design work to ensure reliability in field applications. The major heat transfer mechanism is convection. Marked constrictions in tunnel size were observed at the ice/air interfaces. These observations imply that the cable should be installed near the bottom of the culvert and the end risers doubled or tripled. The continuous operation mode is the most reliable, but the most expensive

of the systems tested. The pulsed system was less expensive. The automatic system was the least expensive. (Knapp-USGS)
W74-07909

ENERGY PRODUCTION,
Omaha Public Power District, Nebr.
For primary bibliographic entry see Field 6D.
W74-07967

REGIONAL ENERGY-WATER PROBLEMS NORTHEAST,
Delaware Univ., Newark. Water Resources Center.
For primary bibliographic entry see Field 6D.
W74-07971

REGIONAL ENERGY-WATER PROBLEMS, PACIFIC NORTHWEST,
North Dakota State Univ., Fargo. Water Resources Research Inst.
For primary bibliographic entry see Field 6D.
W74-07975

FLOW-INDUCED VIBRATION OF VERTICAL-LIFT GATE,
Imperial Coll. of Science and Technology, London (England). Dept. of Civil Engineering.
J. D. Hardwick.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY5, Paper 10546, p 631-644, May 1974. 17 fig, 18 ref.

Descriptors: *Gates, *Hydraulics, *Vibrations, Jets, Hydraulic models, Hydraulic design, Hydrodynamics, Turbulence.

The vibration of a vertical-lift gate with a flat bottom and a single vertical degree-of-freedom was studied experimentally in a scale model. The vibration is due to a periodic reattachment of the jet to the bottom of the gate. The exciting force and the unsteady flow pattern was correlated. Negative damping was measured directly and is a function of flow velocity and vibration amplitude. The nonlinear response of the system is related to interactions between the exciting force and the motion of the gate. (Knapp-USGS)
W74-08058

8D. Soil Mechanics

LIME GROUT PENETRATION AND ASSOCIATED MOISTURE MOVEMENTS IN SOIL,
Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia). Div. of Applied Geomechanics.
O. G. Ingles, and R. C. Neil.
In: Proceedings of the Symposium on Soils and Earth Structures in Arid Climates, May 21-22, 1970, Adelaide, Australia, p 37-41, (1970). 1 fig, 2 tab, 13 ref.

Descriptors: *Grouting, Soil properties, Soil types, Soil moisture, Permeability, *Soil stabilization, *Stabilization, Soil mechanics, *Soil physical properties.
Identifiers: *Lime grout penetration, Depth of stabilization, Drill-lime, Deep stabilization.

The use of lime, placed or injected, for deep soil stabilization has been a matter of controversy. To permit a rational assessment of this process for design purposes, a series of field experiments were made. These experiments were chosen to determine whether diverse soils subject to intermittent severe drying and occasional flooding might be stabilized by a lime grouting process, and if so, what design procedures would be required. The results show that fissuring of the soil and the moisture associated with the grout are major parameters for practical purposes, and their implications for practical application of drill-lime and lime grout injection processes have been critically evaluated. (Martino-NWWA)
W74-07871

THE SIGNIFICANCE OF MOISTURE FLOW AND EQUILIBRIA IN UNSATURATED SOILS IN RELATION TO THE DESIGN OF ENGINEERING STRUCTURES BUILT ON SHALLOW FOUNDATIONS IN AUSTRALIA,
Commonwealth Scientific Industrial Research Organization, Syndal (Australia). Soil Mechanics Section.
B. G. Richards.
Presented at Symposium on Permeability and Capillarity, American Society for Testing and Materials, June 26-July 1, 1966, Atlantic City, New Jersey, 28 p, 13 fig, 2 tab, 40 ref

Descriptors: *Soil water movement, Moisture, *Soil moisture, Permeability, Soil stability, Foundation, *Foundation investigations, *Australia, Structural design.
Identifiers: *Moisture flow, *Moisture equilibrium, Foundation design, Undersaturated soil, Moisture retention.

A broad-scale investigation of moisture conditions in pavement subgrades in Australia was undertaken to define the moisture movement and equilibria in undersaturated clay soil. Concurrently, a number of investigations were carried out on moisture equilibria under houses and slab floors of large industrial buildings. The results of these investigations were used to produce a design technique for the foundation of structures founded at shallow depths. This technique has been used as a guide in the design of buildings on flat slabs in the vicinity of Melbourne, but it has not been tested adequately at this time. Techniques for measuring the necessary soil properties are given. (Martino-NWWA)
W74-07899

SUBSURFACE EXPLORATION AND SAMPLING OF SOILS FOR CIVIL ENGINEERING PURPOSES,
Army Engineers, Waterways Experiment Station, Vicksburg, Miss.
M. J. Hvorslev.
Report on a Research Project of the Committee on Sampling and Testing, Soil Mechanics and Foundations Division, American Society of Civil Engineers, 1948. 465 p, 357 fig, 13 tab, 986 ref, 1 append.

Descriptors: *Soil types, Soil structure, *Soil surveys, Soil properties, *Soil mechanics, Soil analysis, *Subsurface investigations, *Sampling, Civil engineering, *Reviews.
Identifiers: Ocean-bottom exploration, Mineral exploration, Piston samplers, Open drive samplers, Penetration resistance drive samplers.

A review is presented of the requirements, general procedures, and various methods of subsurface exploration and sampling. A series of summary directions for the design of sampling equipment and for sampling operations and handling of samples has been formulated, including a fairly detailed description of the equipment and methods used in obtaining samples of subsurface materials and in the preservation and handling of these samples. Also presented is a review of the principal sampling methods and equipment used in ocean-bottom exploration and in search for oil and minerals. The advantages and disadvantages of the various methods and types of equipment for boring and sampling are discussed in relation to the soil conditions. (Campbell-NWWA)
W74-07905

8E. Rock Mechanics and Geology

THE SIGNIFICANCE OF MOISTURE FLOW AND EQUILIBRIA IN UNSATURATED SOILS IN RELATION TO THE DESIGN OF ENGINEERING STRUCTURES BUILT ON SHALLOW FOUNDATIONS IN AUSTRALIA,
Commonwealth Scientific Industrial Research Organization, Syndal (Australia). Soil Mechanics Section
For primary bibliographic entry see Field 8D.
W74-07899

POROSITY-RESISTIVITY CROSS-PLOTTING,
Union Oil Co. of California, Los Angeles.
For primary bibliographic entry see Field 8G.
W74-07900

IMPROVED DRILLING RATES AT LOWER COSTS,
New South Wales Univ., Broken Hill (Australia).
For primary bibliographic entry see Field 8C.
W74-07901

ELECTRIC AND THERMAL PROPERTIES OF ROCKS,
U. I. Moiseyenko, L. S. Sokolova, and V. Ye. Istomin
Available from the National Technical Information Service as NASA TT F-671 $3.00 in paper copy, $1.45 in microfiche. NASA Technical Translation, NASA TT F-671, February, 1972. 59 p, 17 fig, 10 tab, 70 ref. Translated from Elektricheskiye i Teplovyye Svoystva Gornykh Porod v Usloviyakh Normalnykh i Vysokikh Temperatur i Davleniy, Nauka Press, Siberian Dept., Novosibirsk, 1970.

Descriptors: *Boreholes, *Resistivity, *Electrical studies, Geology, Physics, *Geothermal studies, Electrical conductance, Conductivity, *Thermal conductivity, Heat, Sedimentary rocks, Igneous rocks.
Identifiers: Lattice heat conductivity, Electron heat conductivity, Olivinite, Eclogite, Diorite, Aleurolite, Argillite.

Results are presented of a study of the electric conductivity of rocks under different thermodynamic conditions. The apparatus and methods used in measuring these parameters are described. Experiments for studying the effect of temperature, pressure, and the joint effect of these factors on rock resistivity are discussed, as well as the results of a study of the thermal properties of sedimentary and igneous rocks at temperatures from room temperature to 1,200-1,400C. The dependence of electric conductivity is given for unilateral pressures and with simultaneous heating to 600C and pressures greater than 30 kbar. The results of a study of the dependence of heat conductivity on temperature are discussed. Conclusions are drawn concerning the mechanism of electric and heat conductivity of rocks at high temperatures. (Staplin-NWWA)
W74-07906

8F. Concrete

SOLID FORMS FOR SAVANNAH RIVER PLANT HIGH-LEVEL WASTE,
Du Pont de Nemours (E.I.) and Co., Aiken, S.C. Savannah River Plant.
For primary bibliographic entry see Field 5D.
W74-07787

THE TECHNOLOGY OF TRITIUM FIXATION AND STORAGE,
Battelle-Pacific Northwest Labs., Richland, Wash.

For primary bibliographic entry see Field 5D.
W74-07789

LIME GROUT PENETRATION AND ASSOCIATED MOISTURE MOVEMENTS IN SOIL,
Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia). Div. of Applied Geomechanics.
For primary bibliographic entry see Field 8D.
W74-07871

COMPENSATED GAMMA RAY DENSIMETER MEASURES SLURRY DENSITIES IN FLOW,
Halliburton Services, Duncan, Okla.
For primary bibliographic entry see Field 8G.
W74-07877

USING IMPROVED TECHNOLOGY TO OBTAIN BETTER CEMENT JOBS ON DEEP, HOT LINERS,
Western Co., Dallas, Tex.
A. Tragesser, and P. N. Parker.
Journal of Petroleum Technology, Vol 24, No 11, p 1307-1313, November 1972. 3 fig, 8 tab, 9 ref.

Descriptors: *Cements, *Cement grouting, *Well casings, *Thermocline, Temperature, Compressive strength, Pressure, Oil wells, Drilling fluids, Slurries, Mud, Viscosity.
Identifiers: *Cement thickening time, *Spacers, API thickening time test, Curing pressure, Liners.

Performance requirements of cementing slurries for liner casings in deep, hot wells are even more critical than for full strings of casing. A laboratory and field study was made of factors affecting the success of cementing liners in Southwest Texas areas where previous experience was unsatisfactory. Cement slurries designed for deep wells are very sensitive to temperature. Accurate information is needed to obtain proper performance. The API schedule for testing oil-well cements is based on a measured static temperature and the calculated circulating temperature may differ substantially from the actual temperature. Significant variations exist between the bottom-hole circulating temperatures of oil-base and water-base drilling fluids. Certain oil muds cause severe gelation of cement slurries and can shorten thickening time. A spacer composition should be used that is compatible with both mud and cement. Standard laboratory tests on compressive strength made after short curing times at 3000 psi do not adequately represent compressive strength development under bottom-hole conditions of extreme pressure and temperature. Improved mud displacement can be achieved by maintaining viscosity of the cement slurry greater than that of the drilling fluid and by rotating the liner when cement slurry is being pumped up the annulus. (Gray-NWWA)
W74-07878

GYPSUM-CEMENT BLEND WORKS WELL IN PERMAFROST AREAS,
Imperial Oil Ltd., Calgary (Alberta).
N. M. Kljucec, A. S. Telford, and C. C. Bombardieri.
World Oil, Vol 176, No 4, p 49-52, March, 1973. 6 fig, 2 tab, 6 ref.

Descriptors: Cements, *Cement grouting, *Permafrost, *Arctic, *Gypsum, *Canada, Cold regions, Ice, Frozen ground, Heat transfer, Thawing, Compressive strength, Shear strength.
Identifiers: *Gypsum-cement blend, Bond strength, Arctic Islands, MacKenzie Delta, API Class B cement, High-alumina cement.

Thermal behavior, compressive strength and the shear-bond strength against simulated permafrost were investigated for conventional oil-well cements and for high-alumina and gypsum-cement blends. Class B cement slurry at 50 degrees F. placed in contact with simulated permafrost formations maintained at 24 degrees F. quickly cooled and froze before hydration took place. When the Class B cement slurry was held at 50 degrees F. (by heaters) the sample set. Bonding to the formation was observed only against gravel. High-alumina cement generated enough heat in setting to sustain the setting reaction when the sample was placed in air at 20 degrees F. in 3 to 4 hours. Gypsum-cement blend mixed at 50 degrees F. and placed in frozen sand at 23 degrees F. set without significant change in temperature of the permafrost. Shear-bond strengths between cement and frozen gravel and sand formations were satisfactory but bond was poor or lacking between cement and ice. Thermistor cables were strapped to the outside of surface casing strings on several wells in the Canadian Arctic. Temperatures measured during the waiting-on-cement period of surface casing indicated satisfactory setting of gypsum-cement blend. Conventional oil-field cement maintained at about 45 degrees by circulating warm fluid in the casing set in the normal time. (Campbell-NWWA)
W74-07884

CORROSION RESISTANT CEMENTS,
Prodorite Ltd., Surrey (England).
V. Evans.
Anti-Corrosion, Vol 18, No 12, p 15-17, December, 1971. 3 fig, 1 tab.

Descriptors: *Cements, *Corrosion, *Chemical properties, *Compressive strength, *Tensile strength, Solvents, *Adhesion.
Identifiers: Ceramics, Resin-base cement, Hydraulic cement, Latex cement, Silicate cement, Sulphur cement.

Different types of corrosion-resistant cements are reviewed, including hydraulic cements, latex cements, silicate cements, sulphur cements, and resinous cements. The resin-based varieties are evaluated most extensively, according to the following parameters: compressive strength, tensile strength, adhesion to ceramic ware, temperature range, resistance to sulphuric acid, resistance to hydrochloric acid, resistance to nitric acid, resistance to hydrofluoric acid, resistance to alkalis, and resistance to solvents. The products discussed are those most suitable for use in the bedding and jointing of ceramic units in floors, gutters, channels, chimneys, tank and vessel linings of all types, walls, and similar construction. (Staplin-NWWA)
W74-07887

8G. Materials

THREE-DIMENSIONAL ZONE MODEL LOG INTERPRETATION,
Hawaii Univ., Honolulu. Water Resources Research Center.
L. J. Shamey, and W. M. Adams.
Available from the National Technical Information Service as PB-232 157, $3.00 in paper copy, $1.45 in microfiche. Technical Report No 69, September 1973. 20 p, 1 fig, 2 tab, 4 ref. OWRR A-032-HI(1). 14-31-0001-3511.

Descriptors: *Resistivity, *Boundary conditions, Equations, Mud, Drilling fluids, *Electrical well logging, Logging(Recording), *Model studies, *Boreholes geophysics, Rock properties.
Identifiers: Cylindrical zones.

To facilitate the interpretation of geophysical electrical well-logging data, the apparent resistivity has been calculated in a model in which the experimental situation is approximated by three coaxial cylindrical zones containing the drilling mud, flushed rock, and surrounding rock matrix, respectively. This three-zone model is shown to yield results that differ by as much as 25 percent from the earlier two-zone model calculations.
W74-07735

PROJECT RIO BLANCO SPALL MEASUREMENTS DATA REPORT,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 4B.
W74-07797

PREVENTION OF CALCIUM CARBONATE SCALE DEPOSITION IN MILL WATER SYSTEMS,
NL Industries, Inc., Houston, Tex. Baroid Div.
A. E. Beasley, and I. McKinney.
Mining Engineering, Vol 25, No 3, p 32-37, March, 1973. 7 fig, 2 tab, 4 ref.

Descriptors: *Scaling, *Calcium carbonate, *Scale prevention, Water quality, Water reuse, Water softening, Quality control, Recirculated water, Sodium compounds, Treatment facilities, Copper.
Identifiers: Sodium tripolyphosphate, Sodium hexametaphosphate, Lignosulfonates, Organic phosphonate, Pentasodium aminotrimethylenephosphonate, *Mill water systems.

Scale deposition can cause severe operational problems in copper concentrator water systems. A thorough investigation of the mill water system makes practical a chemical treatment to minimize the formation of calcium carbonate scale. Molecularly dehydrated phosphates, lignosulfonates, and, more recently, organic phosphonates can be used to achieve an effective scale control program at a reasonable cost. Co-mingling of various process waters is an important consideration in scale inhibition. Routine analyses of the waters and monitoring of scale formation on test coupons are essential to a satisfactory program. (Gray-NWWA)
W74-07848

DOMESTIC WATER SYSTEMS, NONCHEMICAL FACTORS IN CORROSION CONTROL,
Olin Corp. Stamford, Conn.
S. Sussman.
Materials Protection and Performance, Vol 12, No 4, p 38-42, April, 1973. 4 fig, 5 ref.

Descriptors: *Corrosion, *Corrosion control, *Potable water, Hardness(Water), Water softening, Ion exchange, Zeolites, Impaired water quality.
Identifiers: Water system design, *Water system operation, Hydraulic feeder.

Corrosion control in the domestic water systems of buildings has two major nonchemical constraints: (1) The water must remain suitable for drinking, and (2) limitations are imposed by the design, construction, and operation of large, urban buildings. The building operator usually has no control over the composition of the entering water but control can be exercised over water-softening treatment practices to avoid creation of corrosive water by over-treatment. Such nonchemical factors in water system design as the choice of piping material, pipe sizing, hot water temperature controls, and maintenance facilities can have an important effect on corrosion. Unless the water system is properly operated and maintained, efforts to minimize corrosion may fail, even though the system is adequately designed. Maintenance personnel should be made aware of how their actions influence the development of corrosion in domestic water systems and they should be trained to take the steps necessary to minimize corrosion. (Gray-NWWA)
W74-07849

DOMESTIC HOT WATER SYSTEMS, SILICATE TREATMENT INHIBITS CORROSION OF GALVANIZED STEEL AND COPPER ALLOYS,
Illinois State Water Survey, Urbana.
R. W. Lane, T. E. Larson, C. H. Neff, and S. W. Schilsky.

Materials Protection and Performance, Vol 12, No 4, p 32-37, April, 1973. 1 fig, 12 tab, 7 ref.

Descriptors: *Corrosion, *Corrosion control, *Potable water, *Silicates, Copper, Copper alloys, Stainless steel, Inorganic compounds, Phosphates, Zinc, Hardness(Water), Alkalinity, Temperature, Distribution systems, Laboratory tests, Hydrogen ion concentration.
Identifiers: Galvanized steel, Zinc pyrosilicate, Zinc carbonate.

Laboratory test circuits were constructed on the basis of the design of the central domestic hot water systems in Illinois state institutions and produced approximately the same corrosive conditions that were found in tests on the larger systems. Corrosion tests were continued for 120 days. Results were evaluated in terms of the weight loss method, both 'descaled metal loss' and 'weight change' being examined. Types of waters studied were: (1) low hardness and alkalinity and low mineral content; (2) medium hardness and alkalinity and medium mineral content, and (3) blended hardness, high alkalinity and high mineral content. Based on the test results, a table was prepared as a guide to recommended treatment to inhibit corrosion of metals in domestic hot water at 140 degrees F and 180 degrees F. Silicate treatment generally was the most effective in inhibiting corrosion of galvanized steel and copper base metals. Zinc-phosphate formulations were considered acceptable inhibitors of copper bearing metals. The 90-10 copper nickel was much more resistant to corrosion than was copper. Stainless steel grade 409 was not sufficiently resistant to corrosion, because of seam and crevice corrosion, to be considered acceptable in domestic hot water systems. (Gray-NWWA)
W74-07850

THE ELECTRICAL RESISTIVITY METHOD (PART I),
Keck Consulting Services, Inc., East Lansing, Mich.
For primary bibliographic entry see Field 7B.
W74-07852

RECENT ADVANCES IN LOG EVALUATION,
Schlumberger, Well Surveying Corp., Paris (France).
R. L. Campbell, Jr.
World Petroleum, Vol 43, No 2, p 22-30, February, 1972. 9 fig, 16 ref.

Descriptors: *Borehole geophysics, *Logging(Recording), *Well logging, Lithologic logs, Subsurface investigations, *Well data, Computers, *Remote sensing.
Identifiers: Crossplots, Quantitative log interpretation, Moveable hydrocarbons.

Crossplotting of borehole geophysical data with the aid of large computers can be effective in determining reservoir properties such as lithology, clay content, effective porosity, water saturation, and the volume of movable hydrocarbons. The technique involves integrating the responses from neutron formation density, sonic, and resistivity logs to give an analog display of the lithology and reservoir parameters of the zone of interest. The data obtained can be used to develop optimum casing and perforation programs that will maximize production rates. A disadvantage of the technique is that the large computers required to integrate the data are not available at the well site. However 'quick-look' schemes have been developed that allow rapid and accurate detection of water saturation, movable hydrocarbons, porosity, and lithology at the well-site. (Hunt-NWWA)
W74-07853

PERFORMANCE AND SELECTION OF MATERIALS FOR POTABLE HOT WATER SERVICE,
Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
J. R. Myers, and M. F. Obrecht.
Materials Protection and Performance, Vol 12, No 4, p 17-23, April, 1973. 19 fig, 1 tab, 11 ref.

Descriptors: *Corrosion, *Corrosion control, Copper, *Copper alloys, *Potable water, Hardness(Water), Water softening, Carbon dioxide, Oxygen, Temperature, Zeolites, Stainless steel.
Identifiers: *Thermoplastic pipe.

Premature erosion-corrosion failures have occurred in copper tubes of circulating, potable hot water systems of large buildings, especially when the waters were 'soft' and contained dissolved oxygen and carbon dioxide. An extensive test program assessed erosion-corrosion damage from micrometric wall-thickness measurement, weight loss, and radiographic studies. Results are presented graphically in a form to allow the design/corrosion engineer to select materials and operating conditions which will provide erosion-corrosion free systems for conveying most potable cold and hot water supplies in buildings. General recommendations are offered. Copper tube should be used to convey potable waters at temperatures to 140 degrees F and velocities to 4 feet per second. Above 140 degrees F, 90-10 cupro-nickel should be used. Admiralty brass can also be used to convey corrosive waters in the temperature range of 140 to 170 degrees F. Tanks for potable hot water should be glass lined. Carefully controlled chemical treatment of the water may be useful. (Gray-NWWA)
W74-07855

TRACERS IN MUD IMPROVE DST, WIRELINE TEST ACCURACY,
Chevron Oil Co., Denver, Colo.
B. B. Cooley.
World Oil, Vol 175, No 2, p 40-44, August 1, 1972. 1 fig, 1 ref.

Descriptors: *Tracers, *Nitrates, *Drilling fluids, Nitrogen compounds, Salts, Water analysis, Colorimetry, Mud.
Identifiers: *Drillstem tests, *Wireline tests, Sodium nitrate, Ammonium nitrate, Potassium nitrate.

Field examples are cited to illustrate the use of nitrate ion as a tracer of filtrate from the drilling fluid in order to determine the source and type of water recovered on drill stem and wireline tests. Because nitrate ion is rarely present in saline formation waters, the presence of even a few parts per million in water recovered on a formation test indicates contamination by nitrate from the nitrate-treated drilling mud. The usual treatment consists of adding five pounds of ammonium, sodium or potassium nitrate to each 100 barrels (4200 gallons) of drilling mud. A simple colorimetric test is made on the mud filtrate. Subsequently nitrate analysis of water recovered on tests will indicate the extent of contamination by mud filtrate. Major mud suppliers have been licensed by Chevron Oil Co. to offer the service. (Gray-NWWA)
W74-07856

COUPON CORROSION RATES VERSUS HYDROGEN PROBE ACTIVITY,
Fincher Engineering Co., Houston, Tex.
D. R. Fincher, A. C. Nestle, and J. J. Marr.
Presented at The International Corrosion Forum Devoted Exclusively to the Protection and Performance of Materials, March 4-8, 1974, Chicago, Illinois, 19 p, 6 fig, 4 tab.

Descriptors: Corrosion, *Corrosion control, Wells, Monitoring.
Identifiers: *Corrosion rates, Corrosion monitoring, *Hydrogen probe activity, *Coupon corrosion rates.

Methods of corrosion rate measurement, corrosion detection, and corrosion control monitoring are discussed. These methods are categorized into the following general groups: (1) the study of equipment performance records (2) visual inspection of shut down equipment (3) non-destructive testing (4) analysis of corrodents and corrosion products samples (5) use of sentinel holes and (6) corroding specimens. These techniques have proven to be of relative value only because they depend upon a weight/surface area/time rate which often assumes uniform rather than local corrosion. Variables such as velocity, pressure, temperature, exposure time and location are known to directly control corrosion rate but their effect has not been quantitatively defined by these methods. Three gas wells were monitored for corrosion and data were gathered pertaining to coupon corrosion rates, iron content of the produced water, and hydrogen probe activity. A strong correlation was found between the corrosion rates in each of the three wells and the hydrogen probe activity. (Martino-NWWA)
W74-07857

NEW BROMIDE PACKER FLUID CUTS CORROSION PROBLEMS,
Dow Chemical Co., Midland, Mich. Halogens Research Lab.
J. H. Plonka.
World Oil, Vol 174, No 5, p 88-89, April, 1972. 4 fig.

Descriptors: Corrosion, Chemical properties, *Corrosion control, Solutes, *Calcium chloride.
Identifiers: *Calcium bromide, *Packer fluids, Completion fluids

A new low corrosion, solids-free calcium bromide-calcium chloride brine solution can be mixed to weights of 12-15 ppg for use as a fluid behind packers or as a completion fluid. Other substances previously used for these purposes have serious drawbacks: mud suspensions can be weighted sufficiently, but their high solids content can cause major problems; zinc chloride brine, the only other solids-free fluid used above 11.6 ppg, is corrosive in high density ranges. In addition, the calcium bromide-calcium chloride solution is not damaging to the ecology, and it is compatible with other additives. (Campbell-NWWA)
W74-07858

DISSOLUTION OF A POROUS MATRIX BY A SLOWLY REACTING ACID,
Fluor Corp. Ltd., Houston, Tex.
For primary bibliographic entry see Field 8B.
W74-07860

FINDING ANSWERS TO CORROSION PROBLEMS,
Carpenter Technology Corp., San Diego, Calif.
M. Henthorne.
Chemical Engineering, Vol 79, No 7, p 97-100, April 1972. 1 fig, 3 tab, 21 ref.

Descriptors: *Corrosion, Deterioration, *Corrosion control, Coatings, Paints, Metallurgy, Materials, On-site investigations.
Identifiers: *Inspection, *Early detection, Laboratory investigations, Unexpected failures.

Early detection of corrosion through scheduled inspections is very effective in averting costly failures and loss of production. Unexpected failures that do occur are commonly the result of one or more of the following: poor choice of materials, operating conditions different than those anticipated, defective fabrication, improper design, inadequate maintenance, or defective materials. The importance of onsite and laboratory investigations of unexpected failures is emphasized. Checklists are given that outline the procedures to be followed for each of these investigations. Corrosion data for material selection

an be obtained from such sources as textbooks, ournals, metals producers, company files, techni- al societies, and consultants. Future trends in corrosion control will be directed toward improv- ng material and fabrication techniques and im- proving protection techniques. (Martino-NWWA) W74-07863

VARIATIONS IN THE DESIGN OF DEPTH SAMPLERS FOR USE IN GROUNDWATER STUDIES,
nstitute of Geological Sciences, London England). Dept. of Hydrogeology.
. K. Tate.
Water and Water Engineering, Vol 77, No 928, p 23, June 1973. 2 fig.

Descriptors: *Wells, *Water wells, *Groundwater, Sampling, Water analysis, Quality control, Chemical analysis, Remote control.
dentifiers: *Depth samplers.

Depth samplers permit sampling of groundwater, particularly from water supply boreholes at predetermined depths below the surface of the water. This approach to sampling is especially im- portant when chemical variation occurs in the column of water in the borehole, rendering a pumped sample unrepresentative. Sampling in production boreholes often presents difficulties of limited access, due to the presence in the borehole of the pump and rising main, together with cables to the pump and ancillary equipment. Small diame- ter samplers with a smooth outline are thus needed. Different varieties of this type of water sampler and their methods of use are reviewed. (Campbell-NWWA) W74-07865

CORROSIVE EFFECTS OF SOUTHERN CALIFORNIA POTABLE WATERS,
Southern California Metropolitan Water District, Los Angeles
D. R. Reed
Materials Protection and Performance, Vol 12, No , p 43-48, April 1973. 7 fig, 3 tab, 4 ref.

Descriptors: Corrosion, *Corrosion control, Potable water, Stainless steel, Copper, Copper alloys, Colorado River, *Colorado River Aqueduct, Zinc, Laboratory tests, *California, Water supply.
dentifiers: *Corrosometers, *Sacramento Delta(Calif), Monel.

Two surface water supplies furnish about 40% of he total quantity used in southern California: (1) he Colorado River and (2) the Sacramento Delta. Normal water treatment includes clarification, fil- ration, and chlorination, although partial soften- ng is applied to portions of the Colorado River vater. The corrosion rates of these waters were neasured by the 'electric coupon' method on the netal alloys commonly used in plumbing materi- ls. Corrosion rates in the range of 9 to 21 mils per ear were found on 1010 carbon steel and zinc. Corrosion rates for copper, low zinc brasses, and ronzes are in the range of 2 to 3 m.p.y. Monel and tainless steel are virtually corrosion resistant in hese potable waters. The corrosion rates may ecrease somewhat when the lower mineralized vater from the California aqueduct system is elivered. (Campbell-NWWA) W74-07866

CASING POTENTIAL LOGGING RELATED TO VERTILOG CORROSION LOGGING,
AMF Tuboscope, Inc., Grand Rapids, Mich.
. A. Lindsey.
Presented at The International Corrosion Forum Devoted Exclusively to the Protection and Per- ormance of Materials, March 4-8, 1974, Chicago, llinois. 6 p, 4 fig.

Descriptors: *Borehole geophysics, *Logging(Recording), *Corrosion, *Pitting(Corrosion), *Well casings.
Identifiers: Casing potential logging, Vertilog, *Corrosion logging, Electromagnetic flux leakage.

A new wire line technique used to detect corrosion pitting damage to downhole tubular steel is discussed. This technique, called electromagnetic flux leakage, utilizes the fact that any pipe wall anomaly causes the lines of magnetic flux being conducted through the pipe to be interrupted. Cor- responding interruptions occur in the electrical field associated with the magnetic flux, and these electrical signals are sent to the surface and later interpreted. Drastic changes in current patterns are shown to be related to pipe wall anomalies. (Martino-NWWA) W74-07868

DRILL PIPE FAILURES: WHERE DO WE GO FROM HERE,
Continental Oil Co., Ponca City, Okla.
P. Mehdizadeh.
Petroleum Engineer, Vol 45, No 10, p 52-70, Sep- tember 1973. 6 fig, 2 tab.

Descriptors: *Fatigue(Mechanics), *Failure(Mechanics), *Corrosion, Rotary drilling, Drilling equipment, Drilling, Drilling fluids, Mud, Wells, Tensile stress, Washouts, Corrosion con- trol.
Identifiers: *Drill pipe, *Tool joints, Notch fatigue, American Petroleum Institute RP7G.

Service problems of drill pipe and tool joints are tabulated and discussed briefly according to mode of failure, causes, and preventive measures to be taken. Problems caused by inadequate design or improper downhole operations nowadays are rela- tively rare as compared with problems resulting from mishandling prior to entering the hole. Problems arising from fatigue and corrosion fatigue account for about 90% of drill string failures. Corrosive agents that may enter the drilling fluid are oxygen, hydrogen sulfide and car- bon dioxide. Sources, estimated reduction in fatigue strength of pipe, and approaches to mitiga- tion of corrosion of these substances are tabu- lated. Suggestions are offered on the care and maintenance of drill strings. (Campbell-NWWA) W74-07869

37 WAYS TO IMPROVE YOUR WELL COMPLETIONS,
Institut Francais du Petrole, Rueil-Malmaison (France).
R. Desbrandes.
World Oil, Vol 174, No 5, p 71-74, April 1972. 2 fig, 41 ref.

Descriptors: *Logging(Recording), *Borehole geophysics, *Electrical well logging, *Radioactive well logging, *Borehole cameras, *Lithologic logs, Subsurface investigations.
Identifiers: Well completion, CORIBAND, Acoustic logs, Borehole television.

Improved formation evaluation, more efficient perforating jobs and higher well productivities are resulting from recent advances in wireline tools. New engineering methods now being applied in the field include: logging methods for controlling sand production; techniques for evaluating elements such as carbon, aluminum and silica in borehole rocks; detection of casing tension failures in steam injection wells; through-tubing formation logs and production tools; and techniques for obtaining cleaner, deeper perforations for higher well flow. Specialty devices discussed include radar logging tools, sidewall acoustic logging devices, magnetic casing logging tools, a 1 3/4-inch borehole televiewer, an electromagnetic perforator orienta- tion device, and CORIBAND analysis units. (Staplin-NWWA) W74-07870

INFLUENCE OF WATER QUALITY ON THE CORROSION AND ELECTROCHEMICAL BEHAVIOR OF MILD STEEL IN SYNTHETIC ACID MINE WATERS,
Department of Energy, Mines and Resources, Ot- tawa (Ontario).
D. V. Subrahmanyam, and G. R. Hoey.
Presented at The International Corrosion Forum Devoted Exclusively to the Protection and Per- formance of Materials, March 4-8, 1974, Chicago, Illinois. 17 p, 8 fig, 3 tab, 20 ref.

Descriptors: *Corrosion, *Corrosion control, *Acid mine water, *Electrolysis, Physicochemical properties, Mining, Metallurgy, Water quality.
Identifiers: *Mild steel, Corrosion rates, *Ionic species, Electrochemical behavior, Type 1010 mild steel.

The results of investigations on the influence of ionic species on the corrosion and electrochemical behavior of Type 1010 mild steel in synthetic acid mine waters are presented. These results show that: (1) in synthetic acid mine waters, the corro- sion rates are increased significantly by ferric and cupric ions; (2) the corrosion rate is directly pro- portional to the ferric ion reduction rate; (3) the corrosion of mild steel is predominantly under the control of diffusion controlled cathodic reduction steps, (4) the weight loss and Tofel extrapolation methods of determining corrosion rates of mild steel in various waters agrees within 30%, (5) polarizing the mild steel to a potential of -1000 mpy to 30 mpy in solutions containing ferric ions, and (6) copper complexing did not inhibit copper deposition or minimize the corrosion rate. (Martino-NWWA) W74-07876

COMPENSATED GAMMA RAY DENSIMETER MEASURES SLURRY DENSITIES IN FLOW,
Halliburton Services, Duncan, Okla.
R. J. Guest, and C. W. Zimmerman.
Petroleum Engineer, Vol 45, No 10, p 80-87, Sep- tember 1973. 5 fig, 6 ref.

Descriptors: *Density, *Slurries, *Cements, *Drilling fluids, *Gamma rays, Radiation, Well drilling, Grouting.
Identifiers: *Gamma ray densimeter, Compen- sated densimeter, Mass absorption coefficient, Photon energy, Hydraulic fracturing, Scintillation counter.

A gamma radiation detector consisting of a scintil- lation crystal, a photomultiplier tube, and ap- propriately designed shielding, makes practical a compensated densimeter that is but little in- fluenced by the constituents of the slurry. The density indication for the full range of slurry con- stituents normally pumped in oilfield service is within plus or minus 0.25 pound per gallon of true density. If the constituents are limited to those normally used in drilling muds, density indications are made to within plus or minus 0.1 pound per gal- lon of true density. Measurement of the density of the slurry under pressure eliminates uncertainties caused by entrained air. In drilling operations, the densimeter transducer inserted in the standpipe is capable of sustained operation at 4000 psi. The returns densimeter transducer is mounted on a skid with a pump to circulate the mud. The instru- ment package is installed near the driller's console and displays and records the densities. The stand- pipe and returns density readouts can be corre- lated with pressure and other data to interpret a wide range of well bore conditions. In cementing operations the densimeter instrument package is installed near the cementing operator to provide a continuous visual indication of density. A per- manent record is provided also. Tests are in progress on the use of the densimeter in hydraulic fracturing to measure sand concentration. (Campbell-NWWA) W74-07877

CORROSIVE EFFECTS OF POTABLE WATER,
Denver Water Dept., Colo.
R. C. Randolph, and D. A. Lincoln.
Materials Protection and Performance, Vol 12, No 4, p 25-27, April 1973. 1 fig, 1 tab.

Descriptors: *Corrosion, *Corrosion control, *Potable water, *Stainless steel, *Filters, Copper alloys, Screens, Pitting(Corrosion), Filtration, Sands, Screens, Treatment facilities.
Identifiers: *Microstrainers, Rapid sand filters.

Two examples are cited of corrosion by potable water in the Marston Treatment Plant of the Denver Water Department: (1) Type 304 stainless steel microstrainer screens, and (2) galvanized steel piping in a rapid sand filtration system. The first major installation in the United States of stainless steel microstrainer screens was made in 1961. Installation cost was about $845,000. Operation cost is estimated at $3.58 per million gallons. After seven years of operation, pinholes were noted in the microstrainer fabric. The following year, algae and turbidity appeared in the finished water and several of the microstrainer drums were judged to be inoperable. A study of the cause of failure showed that the major source of trouble was crevice corrosion initiated by oxygen starvation and depassivation of the Type 304 stainless steel. The badly corroded panels were replaced by Type 316 steel. Alcoholic phosphoric acid was used in cleaning and washwater flow was increased. The treatment appears to be successful after three years. The rapid sand filtration unit was installed in 1964. Although provision had been made to insulate between the red bronze and the galvanized steel segments of the system, serious corrosion of the galvanized steel occurred. Coating with mastic and replacement by red brass are the treatments in progress. (Gray-NWWA)
W74-07886

CORROSION RESISTANT CEMENTS,
Prodorite Ltd., Surrey (England).
For primary bibliographic entry see Field 8F.
W74-07887

CORROSION RESISTANCE OF PIPING AND CONSTRUCTION MATERIALS,
Engelhard Industries, Inc., Newark, N.J.
P. N. Cheremisinoff, I. Fideli, and N. P. Cheremisinoff.
Pollution Engineering, Vol 5, No 8, p 23-26, August, 1973.

Descriptors: *Corrosion, Pitting, Cavitation, Fatigue, *Corrosion control, *Materials, Specifications, Design, Metals, *Alloys, Chemicals.
Identifiers: Clarkson, *Acidic solutions, Metallic corrosion, Non-metallic corrosion.

Corrosion is deterioration or decay occurring when a material reacts with its surroundings or the fluid being transported or contained. It may be either uniform, where the material corrodes at the same rate over the entire surface, or localized with only small portions affected. Twelve types of corrosion are described. Most construction materials are expected to undergo some type of corrosion. Therefore, it becomes important to determine what effects chemicals in an environmental system will have on materials. Careful analysis must be made of effluents, and existing piping and construction materials should also be examined and compared. The following factors influencing the extent of corrosion should be considered: (1) concentration of major constituents being handled; (2) pH of effluent; (3) temperature of effluent; (4) degree of aeration (limited aeration may enhance certain types of corrosion); (5) velocity of the fluid stream in the transport system; (6) inhibitors; and (7) startup and downtime procedures. Numerous construction materials, metallic and non-metallic are available for pipe and tanks. Physical properties should be thoughfully examined before any final selection is made. Tables are presented as a general guide to proper selection. (Hunt-NWWA)
W74-07888

CAUSES AND PREVENTION OF DRILL PIPE TROUBLES,
Armco Steel Corp., Houston, Tex.
R. L. Vingoe.
Drilling, Vol 33, No 6, p 22-24, April, 1972. 10 fig.

Descriptors: Rotary drilling, Drilling fluids, *Failure(Mechanics), *Buckling, *Cracks, *Fatigue(Mechanics), *Pitting(Corrosion), Hydrogen ion concentration, *Corrosion control.
Identifiers: Internal corrosion fatigue, *Corrosion fatigue, Yield point, Critical rotary speeds, Fatigue cracks, *Pipe bending, Nodal vibration, Pendulum vibration.

Corrosion fatigue and the bending of drilling pipe are the two major problems that drilling contractors face. Corrosion fatigue begins with pitting of the pipe surface and progresses to fatigue cracking in the final stages, where each crack roots along the former pits. This process is accelerated by (1) exceeding a stress level of 90,000 psi during drilling, (2) drilling in corrosive formations, and (3) allowing the pH of the drilling fluid to drop below 9.5. Four performance guidelines for preventing corrosion fatigue are given: (1) plastic coating of inside and outside walls of pipe, (2) keeping pipe under tension during service, (3) minimizing slip damage or other notch and gouge markings, (4) maintaining the pH of the drilling mud at 10.5 or higher. Bends in drill pipe occur when the critical rotary speed is exceeded for a given drilling depth. The relationships of critical rotary speeds with pipe size and hole depth for the two types of vibrations responsible for pipe bending, i.e. nodal and pendulum vibrations, are described. The use of stronger drill pipe with a higher yield point can reduce the amount of pipe bending due to drill pipe whipping. (Martino-NWWA)
W74-07889

CORROSION BY WATERS,
Union Carbide Corp., New York.
C. P. Dillon.
Materials Protection and Performance, Vol 12, No 4, p 49, April, 1973.

Descriptors: *Corrosion, *Corrosion control, *Boiler feedwater, Water quality, Stainless steel, Carbon dioxide, Oxygen, Metal pipes.
Identifiers: *Sodium sulfite.

Untreated aerated water is corrosive to steel, and more resistant materials of construction are required in industrial service. Most industrial problems arise from inadequate attention or downright abuse of the utilities. Improperly deaerated boiler feedwater, for example, may result from substitution of ordinary sodium sulfite for catalyzed sodium sulfite in a steam plant designed for the latter product. Piping design should prevent the inadvertent introduction of untreated makeup water. Adequate control of water chemistry sometimes is neglected when steam is generated from boiler feedwater in converters or waste heat boilers. Low carbon dioxide content and absence of oxygen is required if stream condensate is to be handled in steel pipes. Stainless steel is needed for badly contaminated condensate. Wrought iron, or a high-strength, low alloy steel may be adequate for condensate of intermediate quality. (Gray-NWWA)
W74-07890

LEARN THE BASICS OF CORROSION CONTROL,
J. D. Palmer.
Canadian Chemical Processing, Vol 56, No 1, p 45-48, January, 1972.

Descriptors: *Corrosion control, *Deterioration, Electrolysis, Metallurgy, Rusting, Saline water, Stainless steel, Control.
Identifiers: *Corrosion engineering, *Materials engineer, Corrosion characteristics, Material selection.

The application of modern corrosion engineering principles that rely heavily on material science represents the most efficient means of combating corrosion. Classically, the term corrosion has been restricted to the deterioration of metals by electrochemical reactions. Modern corrosion engineering involves a detailed analysis of the types of corrosion that can occur in virtually every natural and artificial environment, as well as an understanding of the corrosion characteristics of all metallic and non-metallic materials. In designing a successful corrosion control program the corrosion engineer must consider the following parameters: cost, corrosion behavior, weldability and solderability, forming characteristics, mechanical properties, availability, compatability, thermal and electrical characteristics, and magnetic characteristics. (Staplin-NWWA)
W74-07892

EVALUATION OF SCALING TENDENCIES,
G. B. Hatch.
Materials Protection and Performance, Vol 12, No 4, p 49-50, April, 1973. 4 ref.

Descriptors: *Scaling, *Calcium carbonate, *Hardness(Water), Calcium sulfate, Solubility, Saturation, Crystallization, Cooling water, Supersaturation, Heat exchangers, Carbon dioxide.
Identifiers: *Metastable solutions, *Thermal precipitation.

Calcium carbonate, as calcite or aragonite, is the scale most commonly found in water systems. Several factors should be considered before undertaking the operation of cooling water systems in the metastable solution range of calcium carbonate. Metastable limits are poorly defined. Moderately supersaturated solutions will remain stable indefinitely in the absence of solid surfaces that can serve as nuclei for crystalization. Relief of supersaturation can be quite slow even in the presence of the solid phase. The solubility of calcium carbonate decreases in the temperature range of cooling waters (25-95C). Thermal precipitation of calcium carbonate generally is the result of the retrograde solubility-temperature behavior. Loss of carbon dioxide from bicarbonate waters is not an essential factor in precipitation. Numerous solid surfaces, such as ferric oxide, accelerate the deposition of calcium carbonate from supersaturated solutions. Flow rate is another factor. Control tests must be made to determine the degree of saturation of calcium carbonate and deposition tests can be made through test heat exchangers. (Gray-NWWA)
W74-07893

ZINC/PHOSPHATE COMBINATIONS CONTROL CORROSION IN POTABLE WATER DISTRIBUTION SYSTEMS,
Virginia Chemicals, Inc., Portsmouth, Va.
T. E. Kelly, M. A. Kise, and F. B. Steketee.
Materials Protection and Performance, Vol 12, No 4, p 28-31, April 1973. 14 tab.

Descriptors: *Corrosion, *Corrosion control, *Potable water, Hydrogen ion concentration, Inorganic compounds, *Phosphates, Sulfur compounds, Distribution systems, Laboratory tests, *Zinc, Water quality, Pitting(Corrosion).
Identifiers: Zinc sulfate, Sodium dihydrogen phosphate, Sulfamic acid, 1010 steel.

Laboratory and field experience indicated that corrosion inhibitors based on zinc salts and orthophosphate salts reduced corrosion of 10 steel coupons about 85% in waters from Virginia, New Jersey, New York and a New England area.

he usual concentration in the treated water was 1 pm of zinc (Zn) and 0.88 ppm of phosphate (PO_4). inc sulfate, sulfamic acid and sodium dihydrogen nosphate were generally used. Sulfuric acid can e substituted for sulfamic acid, and other salts of nc can be used. Inhibitor concentrations are verned by the corrosivity of the water involved. ood results have been obtained at a cost of $1.80 er million gallons but in very corrosive waters sts may range as high as $7.20 per million gal-ns. Treatment costs may be offset by reduction chemical costs for post-coagulation pH adjust-ents because the zinc/phosphate inhibitor func-ons over a wide range in pH. A commercial reparation of suitable composition has been ap-oved for drinking water, provided that the con-ntrations of selected ions do not exceed the nits published in U.S. Drinking Water Standards. Gray-NWWA)
74-07894

OLVING DRILLING PROBLEMS UTILIZING ELL LOGS - A CASE HISTORY,
ontinental Oil Co., Houston, Tex.
. M. Zanier, D. J. Timku, and T. L. Myers.
: 13th Annaul Logging Symposium Transac-ons, Society of Professional Well Log Analysts, 10 May, 1972, Tulsa, Oklahoma, paper W, 9 p, fig, 1 ref.

escriptors: Geophysics, *Borehole geophysics, Logging(Recording), *Wells, Oil wells, Drilling uids, Drilling equipment, Subsurface investiga-ons, *Remote sensing, *Oklahoma.
dentifiers: Differential pressure sticking, Forma-on pressure, Formation damage.

evere drilling problems have been encountered in ilburton Field, Oklahoma. Some of these roblems are related to variations in formation essures throughout the area. Well logs can be sed effectively to determine pressure profiles. In is field, overpressures and underpressures are resent. Correct mud weights and casing point lections are vital to drilling the wells efficiently nd economically. Drilling rate varies depending n the degree of differential pressure of the illing fluid to the formation pressure. Such dif-erential pressure can cause pipe stricking, circula-on losses and formation damage. Also, negative fferential pressure creates potential blowout onditions. Techniques were developed using logs o determine fluid pressures in the Spiro producing terval and overpressured adjacent shale interval. harts have been designed and are presented to be sed for the pressure calculations. (Hunt-NWWA)
74-07898

OROSITY-RESISTIVITY CROSS-PLOTTING,
nion Oil Co. of California, Los Angeles.
. H. Lang, Jr.
: 13th Annual Logging Symposium Transac-ons, Society of Professional Well Log Analysts, lay 7-10, 1972, Tulsa, Oklahoma, paper F, 10 p, 972), 10 fig, 5 ref.

escriptors: *Aquifer characteristics, Porosity, Resistivity, Mathematics, *Graphical methods, lectric logs, *Hydrologic data, Equations.
dentifiers: Formation evaluation, *Formation actors, Water saturation.

uantitative formation evaluation has depended n the Humble or modified Archie equations as ie generally accepted Formation factor-porosity elations. Recent work by others indicates that dif-erent average relations may be more applicable. It ppears, however, that no worldwide average rela-on accurately fits a specific reservoir rock. The orosity-resistivity cross-plotting technique is in-ependent of a, m, Rw and other formation con-tants. If a statistically significant number of oints of a given rock type with a constant Rw can e plotted, it becomes possible to accurately ob-in a quantitative evaluation of that rock. Further, ie correct formation constants for that particular formation in that part of a particular geologic basin can be derived from the finished porosity-resistivity plot. As in any method formation evaluation, the analysis of a single log in any 'unexplored' basin may lead to errors which are not readily apparent to the inexperienced log analyst. As evidence is gathered in a geologic sequence in a basin, or, ideally, in a single formation in a field, the Formation factor-porosity equation can be determined that most accurately fits the rocks in question. (Hunt-NWWA)
W74-07900

THE SULFATE-REDUCING BACTERIA AND OILFIELD BACTERIAL CORROSION - A REVIEW OF THE CURRENT STATE-OF-THE-ART,
Superior Oil Co., Houston, Tex.
G. B. Farquhar.
Presented at The International Corrosion Forum Devoted Exclusively to the Protection and Performance of Materials, March 4-8, 1974, Chicago, Illinois, 13 p, 2 fig, 1 tab, 49 ref.

Descriptors: *Corrosion, *Anaerobic bacteria, *Sulfate-reducing bacteria, Bacteria, Microorganisms, *Reviews.
Identifiers: *Oilfield bacterial corrosion, Desulfovibrios, Hydrogenose, Cathodic hydrogen.

The role of sulfate-reducing bacteria in the corrosion of mild steel is discussed. Early investigators attributed anaerobic corrosion to: (1) bacterial utilization of the cathodic hydrogen by the enzyme hydrogenose, (2) the formation of concentration cells, and (3) anodic stimulation by the ferrous sulfide formed by the bacteria. More recent work has shown quite conclusively that: (1) the corrosivity of sulfate-reducing bacteria is principally due to their ability to produce iron sulfide, (2) the soluble iron content of the growth media is the most important factor controlling their rate of corrosion, and (3) the bacterial utilization of the cathodic hydrogen does not contribute significantly to the corrosion process. (Martino-NWWA)
W74-07902

RESEARCH - - TARGETS AND DEVELOPMENTS, REGIONAL ASSESSMENTS,
Newcastle Univ. (Australia). Dept. of Physics.
For primary bibliographic entry see Field 7B.
W74-07903

GALVANIC EFFECTS INCREASE CORROSION, PART 2,
J. D. Palmer.
Canadian Chemical Processing, Vol 56, No 2, p 36, 38-39, February, 1972. 5 fig, 3 tab.

Descriptors: *Corrosion, Pitting, Anodes, Cathodes, Chemical reactions, *Cathodic protection, Films, Stainless steel, *Electrochemistry.
Identifiers: *Galvanic effects, *Galvanic series, Electrochemical cell, Cell potential, Standard potential.

An understanding of relative electrochemical potentials is vital in minimizing corrosion wherever two or more different metals come into contact with one another. Describes are the characteristics of the electrochemical cell, and the cell action that takes place either locally on the surface of a single piece of metal, or between electrically interconnected pieces of different metals. The role of dissolved oxygen in solution is explored. Measuring cell potential is explained, and the role of the sacrificial anode to save steel from corroding is emphasized. Only corrosion at approximately ambient temperatures is discussed. (Campbell-NWWA)
W74-07904

THE HYDROGEOLOGY AND UTILIZATION OF BRINES IN EL SALADO, CHILE,
Birmingham Univ. (England). Dept. of Geology.
For primary bibliographic entry see Field 4A.
W74-07936

TWO NEW DRILLING SYSTEMS PASS INITIAL FIELD TESTS, DC ELECTRIC POWER SWIVEL CAN SAVE TIME AND MONEY; HYDRAULIC SNUBBER BUILT TO OPERATE IN RUGGED TERRAIN.
World Oil, Vol 174, No 1, p 35-43, January, 1972. 9 fig.

Descriptors: Wells, *Drilling, *Drilling equipment, Well drilling, Offshore platforms, *Oil industry, Casings.
Identifiers: *Hydraulic snubber unit, *Electric powered swivel, Automatic pipe racking system, Wireline retrievable bit.

Two new concepts in drilling equipment have been built and are designed to operate with maximum personnel safety and well control, using only three-man crews. Main components of the systems are a 750 continuous hp DC electric powered swivel and a hydraulically powered snubber unit capable of handling drill pipe and casing. An automatic pipe racking system that will handle from one joint to one stand of pipe at a time can be used with either method. Also, a wireline retrievable bit will allow either system to drill with casing. The DC powered swivel will be especially applicable for use on many current electrically powered rigs. Large land units and many offshore rigs already are equipped with adequate generator and switchgear capacity to operate the unit. The drilling snubber unit is a specialty tool designed for use on remote locations. Because of its light overall weight and design, the snubber can be disassembled into small loads, comparable to mast, prime mover, BOP and mud system components, for complete transportation by helicopter. (Campbell-NWWA)
W74-07980

8H. Rapid Excavation

PROJECT RIO BLANCO SPALL MEASUREMENTS DATA REPORT,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 4B.
W74-07797

PREVENTION OF DAMAGE TO PIPELINES.
National Transportation Safety Board, Washington, D.C.
For primary bibliographic entry see Field 8A.
W74-07923

8I. Fisheries Engineering

LABORATORY REARING EXPERIMENTS ON ARTIFICALLY PROPAGATED INCONNU (STENODUS LEUCICHTHYS),
Alaska Univ., College. Dept. of Biology.
J. D. LaPerriere.
Available from the National Technical Information Service as PB-232 141, $4.50 in paper copy, $1.45 in microfiche. Alaska Institute of Water Resources, Fairbanks, Report No IWR-40. June, 1973, 25 p, 7 fig, 4 ref. OWRR A-041-ALAS(2). 14-31-0001-3802.

Descriptors: *Fish hatcheries, Arctic, *Alaska, Photoperiodism, Daphnia, Shellfish, Algae, Brine shrimp, *Fish farming, Fish food organisms, *Fish diets.
Identifiers: *Inconnu, Oregon mash, Stenodus leucichthys, Selenastrum sp.

During the period of ice cover 1972-1973 the grayling thermal tolerance experiments in Interior Alaska were interrupted by the unavailability of

these fish. In collaboration with the Alaska Department of Fish and Game it was decided to use the experimental set-up to attempt to rear Inconnu (Stenodus leucichthys) in controlled conditions. Two temperatures (5C and 8C) and four feeds (freeze dried Daphnia, freeze dried brine shrimp nauplii, Oregon mash, and cultured algae, mainly Selenastrum sp.) were used as treatments. No significant difference was found between treatments due to heavy mortality. Papers by a Russian worker Karzinkin and Chilikov seemed to explain our heavy mortality. A photoperiod of 24 hours of light has been found necessary for successful rearing of Inconnu young.
W74-07725

EXPERIMENTS TO RE-ESTABLISH HISTORICAL OYSTER SEED GROUNDS AND TO CONTROL THE SOUTHERN OYSTER DRILL,
Louisiana Wild Life and Fisheries Commission, New Orleans. Div. of Oysters, Water Bottoms and Seafoods.
J. F. Pollard.
Available from the National Technical Information Service as COM-73-11171. Technical Bulletin No 6, January 1973. 82 p. 29 fig, 8 tab, 33 ref. 2-90-R. PL 88-309.

Descriptors: *Commercial shellfish, *Oysters, *Aquiculture, *Louisiana, Monitoring, Management, Marshes, Saline water intrusion, Parasitism, Planting management, Salinity, Water temperature, Water chemistry, Spawning, Estuaries, Economics, Deltas, Hydrologic properties.
Identifiers: *Oyster seed grounds, Southern oyster drill, Cultch plantings, Spatfall.

Cultch planting programs and fresh water diversion activities were studied in order to enhance production of oysters, Crassostrea virginica, in Louisiana. Various materials were screened for oyster cultch with clamshell found to be the most suitable. Two methods of planting cultch were evaluated and the preferable conditions are outlined. Plankton sampling to monitor oyster larvae in the water column and the use of spat-catching devices to monitor spatset were employed to determine periods and peaks of oyster spawning activity. The delineation of the infestation by the Southern oyster drill and its historical movement were discovered and methods for its control are discussed. Plankton sampling revealed the seasonal distribution of drill larvae in the water column, which extended from May through September and peaked in July or August. Trawl and dredge sampling gauged the effects of or compiled base line data on existing and proposed fresh water diversions intended to depress the salinity regimen of the area, and also project probable alterations in the area. Salinity and water temperatures were intensively monitored to outline the seasonal regimens of both parameters and a less intensive study of additional water chemistry parameters was accomplished. (Auen-Wisconsin)
W74-07982

A WATER QUALITY PROBLEM IN LOBSTER HOLDING TANKS,
Rhode Island Univ., Kingston. Marine Advisory Service.
T. L. Meade.
Available from the National Technical Information Service as COM-73-11886, $2.75 in paper copy, $1.45 in microfiche. Marine Memorandum Series No 31 (undated). 3 p. 1 ref.

Descriptors: *Storage tanks, *Water quality, *Lobsters, Water temperature, Mortality, Ammonia, Toxicity, Nitrates, Dissolved oxygen, Nitrification.
Identifiers: *Lobster holding tanks.

While refrigeration is used to maintain desirable temperatures in lobster holding tanks, nevertheless high mortalities occurred from midsummer to early autumn in some shore holding facilities coinciding with maximum surface water temperatures and relatively high percentages of newly moulted lobsters in the catch which are under greater stress than their heavily shelled counterparts and require more oxygen. Water quality was implicated as a possible cause of the high mortality. Water is sometimes recirculated longer than desirable with the result that weak and dead lobsters remain in some tanks for excessive periods. Water samples were analyzed for ammonia five hours after introduction of fresh seawater. The following morning samples averaged 3.7 ppm ammonia and from the same tanks six hours later, 4.8 ppm. Forty-two hours later ammonia ranged from 9.2 to 14 ppm; concentrations greater than 10 ppm probably are unsafe. The apparent solution was the installation of additional refrigeration tonnage and, possibly, insulation of the holding tanks. An alternative was to encourage the development of marine nitrifying microorganisms that would convert the toxic ammonia to less toxic nitrate. (Jones-Wisconsin)
W74-07983

THE BIOLOGY AND ECOLOGY OF RIVER CARPSUCKER, CARPIODES CARPIO (RAFINESQUE), IN THE LITTLE MISSOURI ARM OF LAKE SAKAKAWEA, NORTH DAKOTA,
North Dakota Univ., Grand Forks.
For primary bibliographic entry see Field 2H.
W74-07991

ECOLOGICAL FACTORS AFFECTING ANADROMOUS FISHES OF LAKE PONCHARTRAIN AND ITS TRIBUTARIES,
Louisiana Wild Life and Fisheries Commission, New Orleans.
For primary bibliographic entry see Field 2H.
W74-07993

THE EFFECTS OF THE MARYLAND HYDRAULIC CLAM DREDGE ON POPULATIONS OF THE SOFT-SHELL CLAM, 'MYA ARENARIA,'
Maryland Dept. of Research and Education, Solomons. Chesapeake Biological Lab.
H. T. Pfitzenmeyer.
Available from the National Technical Information Service as COM-73-11006, $6.00 in paper copy, $1.45 in microfiche. National Marine Fisheries Service Report No. NOAA-73052501, April 1972. 77 p. 22 fig, 21 tab. 3-93-R. PL 88-309.

Descriptors: *Harvesting, *Chesapeake Bay, *Clams, *Dredging, Reproduction, Particle size, Juvenile growth stage, Shellfish, Estuarine fisheries, Spawning, Commercial fishing, Mortality, Sediments, Growth rates, Potomac River.
Identifiers: *Mya arenaria.

Effects of seasonal and intermittent hydraulic clam dredging upon survival and growth of remaining populations and annual recruitment of juvenile soft-shell clams were determined in Chesapeake Bay and the Potomac River. Physical and chemical changes in substrates altered by dredging were evaluated. Population densities of sub-legal soft-shell clams were not significantly reduced by dredge harvesting legal-sized clams. Populations of legal-sized clams sampled four months after the March or June dredging were not significantly different from densities in undredged areas. August dredging resulted in significantly different population densities until 8-12 months later. Initial setting was not greater in dredged areas, but recruitment of young clams increased where adult populations were reduced. No differences in survival or recruitment were observed in plots dredged daily and weekly. Growth rates did not appear to vary in dredged and undredged plots. No major changes in sediment grain size were detected after dredging. The marketable population of soft-shell clams in dredged plots averaged 5 clams per square foot at the beginning of the June 1969 experiment; at the termination of the investigation in December 1971, average density was .05 clams. (Jones-Wisconsin)
W74-07994

MOLLUSCAN MORTALITY STUDIES,
Maryland Dept. of Natural Resources, Annapolis.
S. V. Otto.
Available from the National Technical Information Service as COM-73-11891/1, $5.50 in paper copy, $1.45 in microfiche. National Marine Fisheries Service Report NOAA-73101017, August 1973. 68 p. 5 append. 3-131-R. PL 88-309.

Descriptors: *Animal diseases, *Molluscs, *Mortality, *Chesapeake Bay, Oysters, Animal parasites, Clams, Commercial shellfish, Protozoa, Distribution, Aquiculture, Breeding, Reproduction.
Identifiers: Minchinia nelsoni, Dermocystidium marinum, Manokin River(Md.), Ciliated thigmotrichs, Amoebiasis, Ovacystis, Neoplasia, Tagelus plebius, Vibrio anguillarum.

Determination was made of the ranges, prevalence, and intensities of the major economically deleterious parasites and diseases affecting the several species of molluscan shellfish found in Chesapeake Bay and its tributaries. Oyster samples were collected and examined quarterly from the eight natural bars and four raft-caught spat planted bars in the Manokin River. Hard clams were sampled monthly, soft clam sampling was conducted during May-October 1971, and razor clams were examined on an irregular basis. Manokin River field work in spatfall monitoring and off-bottom spat capture studied economically feasible methods of development and management of the oyster resource in mass seed capture and transplantings. In setting areas, off-bottom cultch is far superior to on-bottom cultch as far as density is concerned. Gill infections caused by the probably commensal organism, ciliated thigmotrichs, were found in 461 oysters. Amoebiasis was found in 15 oysters in the April 1970 sample. Excluding the Manokin River, 22 oysters were found with ovacystis, and 11 cases of neoplasias. Hard clam and soft clam parasite distribution studies were made. Mortality and infection rates of oyster stock in a non-enzootic area was compared with stock from an enzootic area. (Jones-Wisconsin)
W74-07995

THE APPLICATION OF 'ROTENONE' FOR THE EXTERMINATION OF THE INDIGENOUS FISH STOCK IN WATERS WHERE INTENSIVE FISH FARMING IS TO BE INTRODUCED,
I. Mihajlovic, and V. Rajevski.
Available from the National Technical Information Service as TT 72-56039, $3.00 in paper copy, $1.45 in microfiche. Bureau of Sport Fisheries and Wildlife Translation TT 72-56039, 1973, 7 p. Translated from Ribarstvo, Vol 6, 1960.

Descriptors: *Fish control agents, *Rotenone, *Fish stocking, Fish farming, Piscicides, Application methods, Aquatic life, Toxicity.
Identifiers: Serbia.

National economic considerations offer a primary rationale for the introduction of fish farming into appropriate bodies of water, including all types of reservoirs and drainage networks. Fish farming requires a radical clearing of existing indigenous fish and the introduction of those fish species best suited to the hydrochemical and hydrobiological conditions of a specific location. Rotenone is a specific fish poison if used in prescribed concentrations, and fish poisoned with Rotenone may be safely eaten. Fisheries research stations of the PR of Serbia carried out experiments in the application of so-called semi-pond farming on the Opovacki Dunavac at Pancevacki Rit. Rotenone was chosen as a means of clearing the location both for practical and experimental purposes. Tests were performed of the effects of Rotenone on carp in aquaria. It was decided to clear one-half acre of water and up to 2 m deep with Rotenone as a test of its efficiency. A concentration of 0.025 mg/l of pure Rotenone proved to be quite sufficient. Biological analysis carried out early in the

ring did not reveal any harmful effects to quatic organisms. (Jones-Wisconsin)
74-08001

FFECT OF ORGANIC AND INORGANIC FER-ILIZERS ON THE GROWTH AND DEVELOP-ENT OF JUVENILE CARP IN SPAWNING ONDS, (IN RUSSIAN),
or primary bibliographic entry see Field 5C.
74-08124

TUDY OF MESH FISH BARRIERS IN THE OLDER SYSTEMS OF THE NEMUNAS RIVER ELTA, (IN RUSSIAN),
kademiya Nauk Litovskoi SSR, Vilnius. Institut oologii i Parazitologii.
. P. Rimidis, and K. S. Gaigalas.
ybn Khoz. 9, p 29-31, 1972.
entifiers: Deltas, *Fish barriers(Mesh), Polder stems, Rivers, *USSR(Nemunas River delta), Fish migration.

he design, operating properties, and retaining apacity of semimechanized mesh fish barriers onstructed in 1969 near the water-pumping plant the polder system of the Nemunas delta (USSR) e presented. With the existing stream velocities e use of the barrier with 6 x 6-mm mesh makes it ossible to avoid the mass annihilation by the mps of not only the downstream-migrating ocks of valuable fish species from the embanked eas but also a considerable number of juveniles.-Copyright 1973, Biological Abstracts, Inc.
74-08125

CCLIMATIZATION OF INTRODUCED FISH PECIES IN THE ERAVNINSK LAKES URYAT ASSR), (IN RUSSIAN),
. I. Demin.
v Biol-Geogr Nauchno-Issled Inst Irkutsk Univ. , p 181-192, 1971.
entifiers: Acclimatization(Fish), *Bream, Bu-at-Assr, *Carp(Amur), Coregonus-Albula-adogensis, Fish species, Lakes, *Ripus, USSR(Buryat ASSR), *Walleye.

ream from Lake Ubinskoe, the Amur common rp, and the Ural 'ripus' (Coregonus albula dogensis) and European walleye were in-oduced in the Eravinsk lakes (USSR). The sults of the establishment of these species are esented. The bream, 'ripus', carp, and walleye rvived under local water conditions. To increase eir populations it is necessary to provide a nser stocking, to conduct complex reclamation the bodies of water, and to accelerate the con-ruction of a spawning-rearing farm. Copyright 73, Biological Abstracts, Inc.
74-08129

ESULTS AND PROSPECTS OF INVESTIGAT-NG FISHES AND THEIR FOOD RESOURCES F THE KHATANGA RIVER BASIN, (IN RUS-AN),
V. Luk'yanchikov.
v Biol-Geogr Nauchno-Issled Inst Irkutsk Univ. , p 127-134. 1971.
entifiers: Commercial fish, Fishes, *Fish orphology, River basins, *USSR(Khatanga iver basin), Fish foods.

he morphology and biology of fishes of the hatanga river (USSR) basin and their food sources are described. The current use of fish ock and measures that were developed to in-ease the population of commercial fishes are ven. The problems of further use of the fishes of e basin are defined.--Copyright 1973, Biological bstracts, Inc.
74-08130

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

ANNUAL REPORT '72 - '73.
Hawaii Univ., Honolulu. Water Resources Research Center.
Available from the National Technical Information Service as PB-232 016, $7.75 in paper copy, $1.45 in microfiche. 1973. 92 p. OWRR A-999-HI(9).

Descriptors: Water Resources Research Act, *Hawaii, Water quality, *Colleges, Runoff, Sedimentation, Water reuse, Waste water disposal, Landfills, Water supply, Irrigation, Reservoir design, Radioactive well logging, Isotope studies, Urban hydrology, *Water Resources Institute, *Universities, *Training, *Grants.

The Office of Water Resources Research allotment and matching grant programs provided a firm base for about one-third of the University of Hawaii Water Resources Research Center's research effort. Projects directed toward evaluation of runoff and sediment contributions to quality of surface waters included A-018-HI, A-027-HI, and A-030-HI. Wastewater reclamation potential was evaluated in A-018-HI and A-036-HI. In A-040-HI the pollution potential of sanitary landfill leachate was assayed. Projects directed toward water sufficiency included A-030-HI, concerning the patterns and trends of water demand in southern Oahu; A-031-HI, comparing drip to sprinkle irrigation; and modeling studies of infiltration, water demand, and optimal use of small reservoir systems in A-035-HI, A-037-HI, and A-038-HI, respectively. Radiation well logging and calibration techniques for that work were studied in A-032-HI and A-034-HI. Isotopic means of evaluating water age and movement was researched in B-030-HI. A new rain gage was developed and utilized in B-028-HI. Simulation of urban hydrology and water distribution system design were the objectives of B-028-HI and B-029-HI, respectively. (Knapp-USGS)
W74-07602

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W74-07842

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WATER RESOURCES RESEARCH IN VIRGINIA - ANNUAL REPORT FOR FISCAL YEAR 1972.
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Available from the National Technical Information Service as PB-232 243 $4.00 in paper copy, $1.45 in microfiche. Bulletin 72, February 1973, 105 p. OWRR A-999-VA(18).

Descriptors: *Water resources institute, *Grants, Colleges, *Universities, *Virginia, Training, *Education, *Research and development, Research facilities.

A summary of the research program carried out by the Virginia Water Resources Research Center for fiscal year 1972 is presented. Research on ten annual allotment programs and six matching grant programs is described.
W74-07842

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

PART I - A CONCEPTUAL MODEL FOR A TERRESTRIAL ECOSYSTEM PERTURBED WITH SEWAGE EFFLUENT, WITH SPECIAL REFERENCE TO THE MICHIGAN STATE UNIVERSITY WATER QUALITY MANAGEMENT PROJECT; PART II - A PERSONALIZED BIBLIOGRAPHI C RETRIEVAL PACKAGE FOR RESOURCE SCIENTISTS,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 05D.
W74-07606

MERCURY IN THE ENVIRONMENT, AN EPIDEMIOLOGICAL AND TOXICOLOGICAL APPRAISAL.
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10F. Preparation Of Reviews

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New York Univ. Medical Center, N.Y. Inst. of Environmental Medicine.
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Army Engineers, Waterways Experiment Station, Vicksburg, Miss.
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W74-07905

SUBJECT INDEX

ABSORPTION
Metabolism,
W74-07683 5B

Evaluation of Zinc Availability in Foodstuffs of Plant and Animal Origin,
W74-07706 5C

Effect of Ascorbic Acid on Cadmium Toxicity in the Young Coturnix,
W74-07707 5C

Trace Elements in Marine Shrimp,
W74-07806 5C

Biological Half-Lives for Zinc and Mercury in the Pacific Oyster, Crassostrea gigas,
W74-07807 5C

Effect of Water-Soluble Decomposition Products of Herbaceous Plants on Uptake of Radioisotopes in Soil. (in Russian),
W74-08117 2G

ACER
Growth Feature of Introduced Plants in Connection with Their Adaptation to Drought. (in Russian),
W74-08118 2I

ACETYLENE REDUCTION
Environmental Control of Nitrogen Fixation in Lakes, I. In situ Nitrogen Fixation by Free Living Blue-Green Algae, and II. Nitrogen Fixation by the Duckweed-Algal Association,
W74-07716 5C

ACID MINE WATER
Influence of Water Quality on the Corrosion and Electrochemical Behavior of Mild Steel in Synthetic Acid Mine Waters,
W74-07876 8G

Reverse Osmosis-Neutralization Process for Treating Mineral Contaminated Waters,
W74-08041 5D

ACIDIC SOLUTIONS
Corrosion Resistance of Piping and Construction Materials,
W74-07888 8G

ACIDIZATION
Dissolution of a Porous Matrix by a Slowly Reacting Acid,
W74-07860 8B

ACIDS
Dissolution of a Porous Matrix by a Slowly Reacting Acid,
W74-07860 8B

ACTIVATED CARBON
Adsorption from Aqueous Solution,
W74-07739 5D

Wastewater Treatment Using Electrolysis with Activated Carbon Cathode,
W74-08028 5D

ACTIVATED SILICA
Activated Silica in Wastewater Coagulation,
W74-07738 5D

ACTIVATED SLUDGE
The Treatment of Waste Water from Industries and Commerce in Public Purification Plants (in German),
W74-07748 5D

Mechanical-Biological Waste Water Purification Plant,
W74-08032 5D

Investigations on the Problem of Solubility and Stability of Steroid Ovulation Inhibitors in Water, Waste Water and Activated Sludge, (In German),
W74-08133 5A

ADHESION
Adhesion of Ice Frozen from Dilute Electrolyte Solutions,
W74-07618 2C

Corrosion Resistant Cements,
W74-07887 8F

ADHESIVES
Sand Control, (Part 4), Combinations, Comparisons, and Costs,
W74-07851 8A

ADMINISTRATIVE ORGANIZATION
State Organization for Water Resources Management,
W74-07733 6E

ADSORPTION
Adsorption of Fenuron and Monuron (Substituted Ureas) by Two Montmorillonite Clays,
W74-07627 5B

Fixation of Zinc by Clay Minerals,
W74-07629 2G

Anion Adsorption by Allophanic Tropical Soils: I. Chloride Adsorption,
W74-07634 2G

Anion Adsorption by Allophanic Tropical Soils: II. Sulfate Adsorption,
W74-07635 2G

Anion Adsorption by Allophanic Tropical Soils: III. Phosphate Adsorption,
W74-07636 2G

Adsorption from Aqueous Solution,
W74-07739 5D

Wastewater Treatment,
W74-08034 5D

AERATION
Oxygenation of Aqueous Bodies Using Liquid Oxygen-Loxination,
W74-07741 5D

Phytoplankton Community Structure and Nutrient Relationships in Lake Carl Blackwell, Oklahoma,
W74-07992 2H

Apparatus for Aerating Water,
W74-08023 5D

Submerged Turbine Aerator,
W74-08027 5D

Method and Apparatus for Aerating Bodies of Water,
W74-08031 5G

Mathematical Model for Post Aeration,
W74-08045 5D

Design and Simulation of Equalization Basins,
W74-08046 5D

AERATORS
Method and Apparatus for Aerating Bodies of Water,
W74-08031 5G

AEROBIC CONDITIONS
Results of Red Tide Formation in Tokyo Bay,
W74-07770 5C

AEROBIC TREATMENT
Oxygenation of Aqueous Bodies Using Liquid Oxygen-Loxination,
W74-07741 5D

AESTHETICS
A Summary of Quantity, Quality and Economic Methodology for Establishing Minimum Flows,
W74-07847 6B

AGRICULTURAL RUNOFF
Contribution to Water Pollution from Agricultural and Urban Sources in the Coachella Valley,
W74-07757 5B

AGRICULTURE
Environmental Aspects of Energy-Water Relationships,
W74-07965 6D

AIR POLLUTION
Inorganic Mercury-Relation Between Exposure and Effects,
W74-07686 5C

The Environmental Context,
W74-07696 5C

Trace Metals in Atmospheric Particulates and Atomic Absorption Spectroscopy,
W74-07705 5A

Analysis of Trace Metal Particulates in Atmospheric Samples Using X-Ray Fluorescence,
W74-07709 5A

The Determination of Mercury in Air Samples and Biological Materials,
W74-07710 5A

Tritium Distribution in the Nuclear Industry - The Requirements for Control Strategies,
W74-07784 5B

Environmental Radioactivity,
W74-07791 5B

Smelter Gases Yield Mercury,
W74-07956 5D

ALABAMA
Use of Fluorescent Dye Tracers in Mobile Bay,
W74-07642 5B

ALASKA
Effects of Crude Oil and Some of its Components on Young Coho and Sockeye Salmon,
W74-07613 5C

Laboratory Rearing Experiments on Artifically Propagated Inconnu (Stenodus Leucichthys),
W74-07725 8I

ALFALFA
Leaching Requirement Studies: Sensitivity of Alfalfa to Salinity of Irrigation and Drainage Waters,
W74-07774 3C

Effect of Establishment Method, Variety, and Seeding Rate on the Production and Quality of Alfalfa Under Dryland and Irrigation,
W74-08077 3F

Variations in Potassium Content of Alfalfa Grown on Pseudogley Soil Depending on Mineral Fertilizing, (In Serbo-Creation),
W74-08097 3F

ALGAE

The Use of Algal Assays for Determining the Effect of Iron and Phosphorus Compounds on the Growth of Various Algal Species,
W74-07776 5C

Phytoplankton Community Structure and Nutrient Relationships in Lake Carl Blackwell, Oklahoma,
W74-07992 2H

Species Composition of Epiphytic Bacteria of Green Filamentous Algae in the Northern Donets-Donbas Canal, (in Russian),
W74-08112 5C

Seasonal Changes of Benthos Algae of the Higher Part of Vorskla River, (In Russian),
W74-08142 5C

ALGAE (UNICELLULAR)

Experiments on the Movement Behavior of Unicellular Algae in Flowing Water,
W74-08120 2I

ALGAL

Toxicity of an Algal Complex on Freshwater Fauna: 1. Action on Some Benthic Animals and Fishes. (in French),
W74-08108 5C

Toxicity of an Algal Complex on Freshwater Fauna: 2. Action on Lymnaea Spp. (in French).
W74-08109 5C

ALGAL CONTROL

The Use of Algal Assays for Determining the Effect of Iron and Phosphorus Compounds on the Growth of Various Algal Species,
W74-07776 5C

Inorganic Nitrogen Removal in a Combined Tertiary Treatment-Marine Aquaculture System - II. Algal Bioassays,
W74-07777 5C

ALGAL GROWTH

Experiments on the Movement Behavior of Unicellular Algae in Flowing Water,
W74-08120 2I

ALGORITHMS

Induced Safety Algorithm for Hydrologic Design under Uncertainty,
W74-08017 6A

ALKALINE SOILS

Effects of Drainage and Organic Amendments on the Reclamation of a Sodic Soil Cropped With Rice,
W74-08087 3C

ALKALINITY

Activated Silica in Wastewater Coagulation,
W74-07738 5D

Investigation of River Water for the Presence of Escherichia coli and Enterococcus, (in Russian),
W74-08004 5A

ALLOYS

Corrosion Resistance of Piping and Construction Materials,
W74-07888 8G

ALLUVIAL CHANNELS

Exploration for a Buried Valley by Resistivity and Thermal Probe Surveys,
W74-07935 2F

ALLUVIUM

A Ground-Water Monitoring Network for Kootenai Flats, Northern Idaho,
W74-07662 7A

ALTERATION OF FLOW

Present and Future of Lake Sevan (Sovremennoye sostoyaniye i budushcheye ozera Sevan),
W74-08048 2H

ALUM RECOVERY

Coagulant Recovery and Reuse in Water Reclamation Systems,
W74-07844 5D

ALUMINUM

Effect of Monosilicic Acid on Hydrolytic Reactions of Aluminum,
W74-07626 2G

AMMONIA

A Kinetic Study of Ammonium and Nitrite Oxidation in a Soil Field Plot,
W74-07625 5B

ANAEROBIC BACTERIA

The Sulfate-Reducing Bacteria and Oilfield Bacterial Corrosion - A Review of the Current State-of-the-Art,
W74-07902 8G

ANALOG MODELS

Data on Fresh-Water Inflow, April 14-July 28, 1973, For Analog-Model Study of the Houston Ship Channel, Houston, Texas,
W74-07921 7C

ANALYSIS

Mercury Analysis by Atomic Absorption Spectrophotometry,
W74-07704 5A

ANALYTICAL TECHNIQUES

Mercury in the Environment, An Epidemiological and Toxicological Appraisal.
W74-07680 5C

Methods of Analysis,
W74-07681 5A

Methods of Mercurometric Investigations,
W74-07695 5A

Mercury Analysis by Atomic Absorption Spectrophotometry,
W74-07704 5A

The Determination of Mercury in Air Samples and Biological Materials,
W74-07710 5A

A Note Concerning the Environmental Acceptability of Nitrilotriacetic Acid (NTA): The Effect of NTA on the Growth of Gymnodinium breve,
W74-07775 5C

Fractionation of Suspended and Colloidal Particles in Natural Water,
W74-07783 5A

Determination of the Fate of Polynuclear Aromatic Hydrocarbons in Natural Water Systems,
W74-07827 5A

Gradient Analysis of Carbon Monoxide and Methane in Polluted and Other Nearshore Habitats,
W74-07984 5A

Sources, Sinks, and Methods of Analysis of Organic Nitrogen Compounds in Fresh Water Systems,
W74-08008 5C

ANASCO RIVER (P

Trace-Element Interactions Between River Water and Seawater,
W74-07805 5B

ANIMAL BEHAVIOR

The Effects of Crude Oil Pollution on the Behavior of Marine Invertebrates,
W74-07987 5C

ANIMAL DISEASES

Molluscan Mortality Studies,
W74-07995 8I

ANIMAL PATHOLOGY

Antagonistic Effect of Arginine on Zinc Metabolism in Chicks,
W74-07955 5C

ANIMALS

Tissue Sulfhydryl Groups in Selenium-Deficient Rats and Lambs,
W74-07952 5B

ANION EXCHANGE RESINS

Organic Water Impurities and Evaluation of Methods for their Removal in Water Mains (In Russian),
W74-07862 5D

ANIONS

Anion Adsorption by Allophanic Tropical Soils: I. Chloride Adsorption,
W74-07634 2G

Anion Adsorption by Allophanic Tropical Soils: II. Sulfate Adsorption,
W74-07635 2G

Anion Adsorption by Allophanic Tropical Soils: III. Phosphate Adsorption,
W74-07636 2G

ANNUAL INCREMENT

Effect of Climatic and Phytocenotic Factors on Annual Increment of Trees in Stands, (In Russian),
W74-08127 2I

ANTARCTICA (HASWELL ISLAND)

Freshwater Fauna and Flora in Haswell Island (Queen Mary Land, Eastern Antarctica),
W74-08107 2I

API WASTE WATER SEPARATOR

Sun Oil Develops Water Reuse Program,
W74-07882 5D

AQUATIC ANIMALS

Study on the Periphytic Colonizations of a Lateral Environment of the River Po(Italy), (In Italian),
W74-07702 2I

AQUATIC ENVIRONMENT

Iron-55 and Ruthenium-103 and -106 in the Brackish-Water Clam Rangia cuneata,
W74-07804 5A

AQUATIC INSECTS

Studies on Southeastern Aquatic Insects,
W74-07740 5C

The Effects of River Fluctuations Resulting from Hydroelectric Peaking on Selected Aquatic Invertebrates,
W74-07830 2I

AQUATIC LIFE
Plutonium in North Atlantic Ocean Organisms; Ecological Relationships,
W74-07800 5C

Thermoluminescent Dosimetry of AquatiR Organisms,
W74-07819 5C

AQUATIC PLANTS
A Preliminary Check-List of the Marine Algae of the Moss Landing Jetty: An Annotated Floristic Compilation,
W74-07981 5C

AQUATIC PLANTS BEECH
Tricladium varium, An Aquatic Hyphomycete on Wood in Water-Cooling Towers,
W74-08011 2I

AQUEOUS SOLUTIONS
Paper Chromatographic and Electrochromatographic Separation of Edta Complexes of Metal Ions,
W74-07693 5A

AQUICULTURE
Experiments to Re-establish Historical Oyster Seed Grounds and to Control the Southern Oyster Drill,
W74-07982 8I

AQUIFER CHARACTERISTICS
Porosity-Resistivity Cross-Plotting,
W74-07900 8G

AQUIFER SYSTEMS
Groundwater Pollution and Conservation.
W74-08071 5B

AQUIFERS
The Transport of Radioisotopes by Fine Particulate Matter in Aquifers,
W74-07730 5B

Buried Triassic Basin in the Central Savannah River Area, South Carolina and Georgia,
W74-07916 2F

Groundwater Pollution and Conservation.
W74-08071 5B

ARCTIC
Gypsum-Cement Blend Works Well in Permafrost Areas,
W74-07884 8F

Delimitation of Weathering Zones in the Fiord Area of Eastern Baffin Island, Canada,
W74-07937 2J

ARGENTINA (TUCUMAN)
'Hill-Top Irrigation,' A New System for Early Sweetpotato Planting, (In Spanish),
W74-08136 3F

ARGININE
Antagonistic Effect of Arginine on Zinc Metabolism in Chicks,
W74-07955 5C

ARIZONA
Geohydrology and Water Resources of the Tucson Basin, Arizona,
W74-07648 2F

Improving Municipal Water Supplies in Arizona by Desalting,
W74-08063 3A

ARKANSAS RIVER (COLO)
Transit Losses and Travel Times for Reservoir Releases, Upper Arkansas River Basin, Colorado,
W74-07931 4A

AROMATIC COMPOUNDS
Determination of the Fate of Polynuclear Aromatic Hydrocarbons in Natural Water Systems,
W74-07827 5A

AROMATIC HYDROCARBONS
The Effects of Crude Oil Pollution on the Behavior of Marine Invertebrates,
W74-07987 5C

ARTESIAN AQUIFERS
Hydrology and Chloride Contamination of the Principal Artesian Aquifer in Glynn County, Georgia,
W74-07919 2F

ASCORBIC ACID
Effect of Ascorbic Acid on Cadmium Toxicity in the Young Coturnix,
W74-07707 5C

ASH ELEMENTS
Effect of the Moisture and Temperature on the Leaching of Ash Elements from Plant Residues (in Russian),
W74-08016 2I

ASSAY
Radioactivity of Nevada Hot-Spring Systems,
W74-07786 5A

Plutonium in North Atlantic Ocean Organisms; Ecological Relationships,
W74-07800 5C

ATLANTIC OCEAN
Influence of Older Relief on the Location of Sand Waves in a Part of the Southern North Sea,
W74-07676 2J

Plutonium in North Atlantic Ocean Organisms; Ecological Relationships,
W74-07800 5C

ATOMIC ABSORPTION SPECTROPHOTOMETRY
Mercury Analysis by Atomic Absorption Spectrophotometry,
W74-07704 5A

ATOMIC ABSORPTION SPECTROSCOPY
Trace Metals in Atmospheric Particulates and Atomic Absorption Spectroscopy,
W74-07705 5A

Determination of Copper and Zinc in Biological Material,
W74-07712 5A

The Determination of Heavy Metals in Domestic Sewage Treatment Plant Wastes,
W74-07763 5A

An Instrumental Technique for the Determination of Sub-Microgram Concentrations of Mercury in Soils, Rocks, and Gas,
W74-07948 2K

AUSTRALIA
The Significance of Moisture Flow and Equilibria in Unsaturated Soils in Relation to the Design of Engineering Structures Built on Shallow Foundations in Australia,
W74-07899 8D

AUTOMATIC CONTROL
Automatic Pumping Installations for Livestock Sections,
W74-07864 8C

AUTOMATION
Automation of the Control and Operation of Water Pollution Control Works,
W74-07758 5D

A Data Acquisition System for Ecological Field Studies,
W74-07989 7B

AXISYMMETRIC INFILTRATION
Axisymmetric Infiltrations,
W74-07839 2G

BACTERIA
Survival of Intestinal Bacteria in Oligotrophic Waters,
W74-07737 5C

Coliforms are an Inadequate Index of Water Quality,
W74-07885 5A

Investigations on the Occurrence and Decomposition of Fats and Fatty Acids in Lakes, (In German),
W74-08141 5C

BACTERIA (EPIPHYTIC)
Species Composition of Epiphytic Bacteria of Green Filamentous Algae in the Northern Donets-Donbas Canal, (in Russian),
W74-08112 5C

BACTERIOLOGICAL STUDIES
Sowing of Ponds and Carp with Clostridium perfringens, (In Ukrainian),
W74-08076 5B

BAFFIN ISLAND (CANADA)
Delimitation of Weathering Zones in the Fiord Area of Eastern Baffin Island, Canada,
W74-07937 2J

BAJA CALIFORNIA
Ranger Submarine Slide, Northern Sebastian Vizcaino Bay, Baja California, Mexico,
W74-07938 2J

BARRIERS
Floating Barrier,
W74-08025 5G

Control of Waterborne Oil Slicks,
W74-08036 5G

BASELINE STUDIES
A Preliminary Check-List of the Marine Algae of the Moss Landing Jetty: An Annotated Floristic Compilation,
W74-07981 5C

BAYESIAN ANALYSIS
The Methodology of Bayesian Inference and Decision Making Applied to Extreme Hydrologic Events,
W74-07601 2A

BAYS
Use of Fluorescent Dye Tracers in Mobile Bay,
W74-07642 5B

A Numerical Study of the Steady Circulation in an Open Bay,
W74-07924 2L

BEACH EROSION
Sediment Distribution in a Beach Ridge Complex and its Application to Artificial Beach Replenishment,
W74-07666 2J

BEACHES
Bacteriological Water Quality Data, Beach Areas, Gatineau Park Lakes, National Capital Commission, 1973,
W74-07932 5B

BELGIUM (GHENT)
Limnological Observations on the 'National Watersportbaan Georges Nachez' at Ghent in 1968, 1969, 1970 and 1971,
W74-08113 5C

BELUGA
Biological Characteristics of the Volga School of Beluga and Stellate Sturgeon, (In Russian),
W74-08126 2I

BENTHIC RECOVERY
Aquatic Invertebrate Recovery in the Clinch River Following Hazardous Spills and Floods,
W74-07841 5C

BENTHOS
An Ecological Study of the Missouri River Prior to Channelization,
W74-07744 2I

Aquatic Invertebrate Recovery in the Clinch River Following Hazardous Spills and Floods,
W74-07841 5C

Seasonal Changes of Benthos Algae of the Higher Part of Vorskla River, (In Russian),
W74-08142 5C

BENTONITE
Effect of Bentonitic Fluid Properties on Drilling Rate,
W74-07879 8B

BIBLIOGRAPHIES
Part I - A Conceptual Model for a Terrestrial Ecosystem Perturbed with Sewage Effluent, with Special Reference to the Michigan State University Water Quality Management Project; Part II - A Personalized Bibliographi c Retrieval Package for Resource Scientists,
W74-07606 5D

Mercury in the Environment, An Epidemiological and Toxicological Appraisal.
W74-07680 5C

Capacity of Water-Based Recreation Systems Part I: The State of the Art - A Literature Review,
W74-07719 6B

Phreatophytes, A Bibliography, Revised.
W74-07829 3B

BIOACCUMULATION
Accumulation Phenomenon Which takes Place in a Mussel (Mytilus galloprovincialis LMK) Grown in an Artificially Polluted Environment, Verification of a Simplified Model of the Dynamic Equilibrium of Metal Ripartition Between Mussels and Sea-Water, Note II-Pollution from Copper, (Fenomeno di Accumulo Nel Mitilo (Mytilus galloprovincia-Lis LMK) Stabulato in Ambiente Artificialmente Inquinato. Verifica di un Modello Semplificato per L'equilibr io Dinamico di Ripartizione del Metalli fra Mitilo e Acqua Marina, Nota II: Inquinamento da rame),
W74-07746 5C

BIOASSAY
The LD(50) Value of Tetraethyl Lead,
W74-07700 5C

Tetraethyl Lead Dose Response Curve for Mortality in Laboratory Rats,
W74-07701 5C

BIOASSAYS
The Use of Algal Assays for Determining the Effect of Iron and Phosphorus Compounds on the Growth of Various Algal Species,
W74-07776 5C

Inorganic Nitrogen Removal in a Combined Tertiary Treatment-Marine Aquaculture System - II. Algal Bioassays,
W74-07777 5C

BIOCHEMICAL OXYGEN DEMAND
Carbon Measurements in Water Quality Monitoring,
W74-07641 5A

BOD, Solids and Nutrient Removal by Foam Flotation,
W74-07742 5D

BIOCHEMISTRY
Genetic Effects,
W74-07688 5C

BIODEGRADATION
Biodegradation of Nitrilotriacetate (NTA) in Soils,
W74-07624 5B

BIOINDICATORS
Accumulation Phenomenon Which takes Place in a Mussel (Mytilus galloprovincialis LMK) Grown in an Artificially Polluted Environment, Verification of a Simplified Model of the Dynamic Equilibrium of Metal Ripartition Between Mussels and Sea-Water, Note II-Pollution from Copper, (Fenomeno di Accumulo Nel Mitilo (Mytilus galloprovincia-Lis LMK) Stabulato in Ambiente Artificialmente Inquinato. Verifica di un Modello Semplificato per L'equilibr io Dinamico di Ripartizione del Metalli fra Mitilo e Acqua Marina, Nota II: Inquinamento da rame),
W74-07746 5C

Regularities of the Growth of the Body and Brain of the Common Carp in Bodies of Waters of the Amu-Dar'ya Delta, (in Russian),
W74-08106 2I

BIOLOGICAL COMMUNITIES
Phytoplankton Community Structure and Nutrient Relationships in Lake Carl Blackwell, Oklahoma,
W74-07992 2H

BIOLOGICAL HALF-LIFE
Biological Half-Lives for Zinc and Mercury in the Pacific Oyster, Crassostrea gigas,
W74-07807 5C

BIOLOGICAL SAMPLES
Determination of Copper and Zinc in Biological Material,
W74-07712 5A

BIOLOGICAL TREATMENT
Treatment Methods for Heavy Metal-Containing Liquid Waste (In Japanese),
W74-07745 5D

Mechanical-Biological Waste Water Purification Plant,
W74-08032 5D

Wastewater Treatment,
W74-08034 5D

BIOTA
An Ecological Study of the Missouri River Prior to Channelization,
W74-07744 2I

BIRDS
Evaluation of Zinc Availability in Foodstuffs of Plant and Animal Origin,
W74-07706 5C

BLACK SEA
Quality of Drinking Water on Ships in Relation to Sailing Conditions, (In Russian),
W74-08082 5D

BOGGY AREAS (DYSTROPHIC)
Relics of the Boggy Vegetation in Sodic Territories, (In Hungarian),
W74-08122 2I

BOILER FEEDWATER
Corrosion by Waters,
W74-07890 8G

BOILING WATER REACTORS
Final Environmental Statement Related to the Proposed Perry Nuclear Power Plant, Units 1 and 2.
W74-07793 5A

BONDING
Carbonate Bonding of Taconite Tailings,
W74-07959 5C

BORE PROPAGATION
The Numerical Solution of Transient Supercritical Flow by the Method of Characteristic with a Technique for Simulating Bore Propagation,
W74-07732 8B

BOREHOLE CAMERAS
37 Ways to Improve Your Well Completions,
W74-07870 8G

BOREHOLE GEOPHYSICS
Recent Advances in Log Evaluation,
W74-07853 8G

Location and Characteristics of the Interface Between Brine and Fresh Water from Geophysical Logs of Boreholes in the Upper Brazos River Basin, Texas,
W74-07859 8B

Casing Potential Logging Related to Metallic Corrosion Logging,
W74-07868 8G

37 Ways to Improve Your Well Completions,
W74-07870 8G

Solving Drilling Problems Utilizing Well Logs A Case History,
W74-07898 8G

BOREHOLES
Electric and Thermal Properties of Rocks,
W74-07906 8B

BOREHOLES GEOPHYSICS
Three-Dimensional Zone Model Log Interpretation,
W74-07735 8G

BOTTOM SEDIMENTS
Observations and Analysis of Bottom Turbidic Layers on the Oregon Continental Shelf,
W74-07632 2J

Investigation of the Sediments and Potential Manganese Nodule Resources of Green Bay, Wisconsin,
W74-07652 2J

BOUNDARY CONDITIONS
Three-Dimensional Zone Model Log Interpretation,
W74-07735 8G

BRAIN WEIGHT (FISH)
Regularities of the Growth of the Body and Brain of the Common Carp in Bodies of Waters of the Amu-Dar'ya Delta, (in Russian),
W74-08106 2I

BREAKWATERS
Floating Breakwater for Attenuating Seas,
W74-08043 8B

BREAM
Acclimatization of Introduced Fish Species in the Eravninsk Lakes (Buryat Assr), (In Russian),
W74-08129 8I

BRINE SHRIMP
Effects of Gamma Irradiation on the Reproductive Performance of Artermia as Determined by Individual Pair Matings,
W74-07822 5C

Effects of Gamma Irradiation on the Maintenance of Population Size in the Brine Shrimp, Artemia,
W74-07823 5C

BRINES
The Hydrogeology and Utilization of Brines in El Salado, Chile,
W74-07936 4A

BROWARD COUNTY (FLA)
Hydrologic Data for 1972, Broward County, Florida,
W74-07918 7C

BUBBLES
Electrolytic Flotation Apparatus,
W74-08030 5D

BUCKLING
Causes and Prevention of Drill Pipe Troubles,
W74-07889 8G

BUREAU OF RECLAMATION
Reclamation Research in the Seventies--First Progress Report.
W74-07922 4A

BURIED VALLEYS
Exploration for a Buried Valley by Resistivity and Thermal Probe Surveys,
W74-07935 2F

CADMIUM
Metals Focus Shifts to Cadmium,
W74-07697 5B

The Influence of Temperature and Salinity on the Toxicity of Cadmium to the Fiddler Crab, Uca pugilator,
W74-07699 5C

Effect of Ascorbic Acid on Cadmium Toxicity in the Young Coturnix,
W74-07707 5C

CALCIUM
Accumulation of Calcium-45 in Developing Coho Salmon Eggs and Fry reared in varying concentrations of Stable Calcium,
W74-07808 5C

CALCIUM BROMIDE
New Bromide Packer Fluid Cuts Corrosion Problems,
W74-07858 8G

CALCIUM CARBONATE
Prevention of Calcium Carbonate Scale Deposition in Mill Water Systems,
W74-07848 8G

Evaluation of Scaling Tendencies,
W74-07893 8G

CALCIUM CHLORIDE
New Bromide Packer Fluid Cuts Corrosion Problems,
W74-07858 8G

CALIFORNIA
Historic Flood Information for Northern California Streams from Geological and Botanical Evidence,
W74-07646 2E

Deformation Moduli of Water-Bearing Formations at Elevated Temperatures,
W74-07726 4B

Contribution to Water Pollution from Agricultural and Urban Sources in the Coachella Valley,
W74-07757 5B

Corrosive Effects of Southern California Potable Waters,
W74-07866 8G

Optimal Timing and Sizing of a Conjunctive Urban Water Supply and Waste Water System with Nonlinear Programming,
W74-08010 5D

Effects of Colorado River Water Quality and Supply on Irrigated Agriculture,
W74-08014 3C

Earthquake Damage Costs in the Design of Water Resource Systems,
W74-08018 4A

CANADA
A Similarity Solution for Steady-State Gravitational Circulation in Fjords,
W74-07675 2L

Cartmen Devises Technique for Disposing of 3.5 Million Gallons of Liquid Discards Annually.
W74-07762 5D

Gypsum-Cement Blend Works Well in Permafrost Areas,
W74-07884 8F

Bacteriological Water Quality Data, Beach Areas, Gatineau Park Lakes, National Capital Commission, 1973,
W74-07932 5B

Delimitation of Weathering Zones in the Fiord Area of Eastern Baffin Island, Canada,
W74-07937 2J

CAPILLARY ACTION
Calculation of Capillary Rise from Groundwater Table into the Root Zone Under Steady-State Conditions, (In German),
W74-08139 2G

CAPITAL COSTS
Pump Selection,
W74-07872 8C

CAPROLACTAM PRODUCTION
Experimental Study of the Protective Ability of Water-Treatment Plants with Respect to some Substances of Caprolactam Production (In Russian),
W74-07771 5D

CARABIDAE
Ground Beetles (Coleoptera, Carabidae) from the Boggy Areas of the Crimea, (in Russian),
W74-08103 2I

CARBON
Carbon Measurements in Water Quality Monitoring,
W74-07641 5A

CARBON-14 METHOD
Determination of Counting Efficiency by 14C by Liquid Scintillation in Primary Production Measurements in a Lagoon Environment, (In French),
W74-08143 5A

CARBON MONOXIDE
Gradient Analysis of Carbon Monoxide and Methane in Polluted and Other Nearshore Habitats,
W74-07984 5A

CARBON RADIOISOTOPES
An Investigation of the Water Quality and Productivity of Polson Bay, Flathead Lake, Montana,
W74-07717 5C

CARBONATE BONDING
Carbonate Bonding of Taconite Tailings,
W74-07959 5G

CARBONATE ROCKS
Microporosity in Carbonate Rocks,
W74-07861 4B

CARBONATES
Carbonate Bonding of Taconite Tailings,
W74-07959 5G

CARCINOGENS
The Photosensitizing Action of Carcinogens. I. The Action of 2-Naphthylamine on Escherichia Coli K-12 and Paramecium Caudatum,
W74-08095 5C

CARCINOMA
Liver Zinc in Carcinoma,
W74-07690 5C

CARP
Sensitivity of Carp (Cyprinus carpio) Embryos to Acute Gamma Radiation,
W74-07817 5C

Sowing of Ponds and Carp with Clostridium perfringens, (In Ukrainian),
W74-08076 5B

Regularities of the Growth of the Body and Brain of the Common Carp in Bodies of Waters of the Amu-Dar'ya Delta, (in Russian),
W74-08106 2I

CARP (AMUR)
Acclimatization of Introduced Fish Species in the Eravninsk Lakes (Buryat Assr), (In Russian),
W74-08129 8I

CARP (JUVENILES)
Effect of Organic and Inorganic Fertilizers on the Growth and Development of Juvenile Carp in Spawning Ponds, (In Russian),
W74-08124 5C

CARPIODES CARPIO
The Biology and Ecology of River Carpsucker, Carpiodes Carpio (Rafinesque), in the Little Missouri Arm of Lake Sakakawea, North Dakota,
W74-07991 2H

CARPSUCKER
The Biology and Ecology of River Carpsucker, Carpiodes Carpio (Rafinesque), in the Little Missouri Arm of Lake Sakakawea, North Dakota,
W74-07991 2H

CARRYING CAPACITY
The State of the System (SOS) Model: Measuring Growth Limitations Using Geological Concepts,
W74-07958 6G

CASPIAN ROACH
Growth of the Caspian Roach in the Mingechaur Reservoir, (In Azerbaijarian),
W74-08123 2H

CATALYSTS
The Surface Catalyzed Hydrolysis of Parathion on Kaolinite,
W74-07628 5B

CATHODIC PROTECTION
Galvanic Effects Increase Corrosion, Part 2,
W74-07904 8G

CELL DIVISION
Genetic Effects,
W74-07688 5C

CEMENT GROUTING
Using Improved Technology to Obtain Better Cement Jobs on Deep, Hot Liners,
W74-07878 8F

Gypsum-Cement Blend Works Well in Permafrost Areas,
W74-07884 8F

CEMENT THICKENING TIME
Using Improved Technology to Obtain Better Cement Jobs on Deep, Hot Liners,
W74-07878 8F

CEMENTS
Compensated Gamma Ray Densimeter Measures Slurry Densities in Flow,
W74-07877 8G

Using Improved Technology to Obtain Better Cement Jobs on Deep, Hot Liners,
W74-07878 8F

Corrosion Resistant Cements,
W74-07887 8F

CENTRIFUGAL PUMPS
South Dakota Standards for Irrigation Pumps and Power Units,
W74-07895 8C

CENTRIFUGATION
Fractionation of Suspended and Colloidal Particles in Natural Water,
W74-07783 5A

CEREAL CROPS
Ameliorative Effect of Field Shelterbelts Under Conditions in the Urals, (In Russian),
W74-08100 4A

CESIUM
Structure and Function of Hardwood Litter and Soil Subsystems After Chronic Gamma Irradiation, I. Mesofauna, Nitrogen, and Total Soil Respiration,
W74-07824 5C

Structure and Function of Hardwood Litter and Soil Subsystems After Chronic Gamma Irradiation. II. Microfungi,
W74-07825 5C

CEYLON
On Some Aspects of the Parasites of Ceylonese Fresh Water Crabs,
W74-08002 2I

CHANNEL ARMORING
The Role of Sediment Gradation on Channel Armoring,
W74-07731 2J

CHANNEL EROSION
The Role of Sediment Gradation on Channel Armoring,
W74-07731 2J

CHANNEL MORPHOLOGY
A Derivation of the Hydraulic Geometry of Steady-State Channels from Conservation Principles and Sediment Transport Laws,
W74-07633 2J

Evolution of Meander Loops,
W74-07661 2J

CHAPARRAL
Phreatophytes, A Bibliography, Revised.
W74-07829 3B

CHEMICAL ANALYSIS
The Determination of Mercury in Air Samples and Biological Materials,
W74-07710 5A

Collection, Detection, Identification, and Quantitation of Human Effluents,
W74-07912 5A

CHEMICAL PRECIPITATION
Leachate Treatment by Coagulation and Precipitation,
W74-08091 5D

CHEMICAL PROPERTIES
Corrosion Resistant Cements,
W74-07887 8F

Theory and Application of Continuous Monitoring for Chemical Research in Natural Water Systems,
W74-07985 5A

CHEMICAL TREATMENT
Activated Silica in Wastewater Coagulation,
W74-07738 5D

Lime Stabilization of Primary Sludges,
W74-07760 5D

Leachate Treatment by Coagulation and Precipitation,
W74-08091 5D

CHEMICAL WARFARE
Progress in Ecological Research at Edgewood Arsenal, Maryland: Fiscal Years 1971 and 1972,
W74-07986 5C

CHEMICALS
New Sludge Processing Plant of the Beeston and Stapleford Urban District Council.
W74-07779 5D

CHERNOZEM SOILS
Effect of Dilute Salt Solutions on Chernozem Soil Estimated Through the Hydration Properties of the Colloids,
W74-08135 2G

CHESAPEAKE BAY
Tidal Currents and Zig-Zag Sand Shoals in a Wide Estuary Entrance,
W74-07939 2L

The Effects of the Maryland Hydraulic Clam Dredge on Populations of the Soft-Shell Clam, 'Mya Arenaria,'
W74-07994 8I

Molluscan Mortality Studies,
W74-07995 8I

CHESTER RIVER (MD)
Chester River Study, Volumes I, II, and III
W74-07653 5B

Biochemical Investigations,
W74-07654 5B

Trace Metals Investigations,
W74-07655 5B

Biological Investigations,
W74-07656 5B

Geological Investigations,
W74-07657 5B

Meteorological and Hydrological Investigations,
W74-07658 5B

Data Management,
W74-07659 5B

CHICAGO (ILL)
A Streamflow Model for Metropolitan Planning and Design,
W74-07721 2A

CHILE (RIO SALADO CATCHMENT)
The Hydrogeology and Utilization of Brines in El Salado, Chile,
W74-07936 4A

CHIRONOMUS RIPARIUS
Chromosome Aberrations in Chironomus Riparius developing in Different Concentrations of Tritiated Water,
W74-07820 5C

CHLORANIL
Experimental Study of the Hazard Due to Chlorinated Quinones and their Safety Levels in Water Bodies (In Russian),
W74-07778 5C

CHLORIDE CELLS
A Scanning Electron Microscopic Study of Secondary Lamellae and Chloride Cells of Rainbow Trout (Salmo gairdneri),
W74-08096 5C

CHLORIDES
Hydrogeologic Investigation of a Sanitary Landfill in Stratified Glacial Drift,
W74-07728 5B

CHLORINATED HYDROCARBONS
Experimental Study of the Hazard Due to Chlorinated Quinones and their Safety Levels in Water Bodies (In Russian),
W74-07778 5C

HLORINATION
Experimental Study of the Protective Ability of Water-Treatment Plants with Respect to some Substances of Caprolactam Production (In Russian),
W74-07771 5D

HLOROPHACINONE
Destruction Trials of the Muskrat, Ondatra Zibethica L., in Ponds Using Poisoning Rafts, (In French),
W74-08128 5G

HLOROPHYLL
Distribution of Phosphorus, Silica, Chlorophyll a, and Conductivity in Lake Michigan and Green Bay,
W74-08000 5C

HOLECYSTITIS
Treatment of Children with Chronic Hepatoangiocholecystitis at the Lake Uchum Health Resort,
W74-08102 2I

HROMATOGRAPHY
Paper Chromatographic and Electrochromatographic Separation of Edta Complexes of Metal Ions,
W74-07693 5A

Collection, Detection, Identification, and Quantitation of Human Effluents,
W74-07912 5A

HROMIUM
Some Novel Complexes of Chromium(I),
W74-07946 5A

Process for Treating Water Contaminated with Hexavalent Chromium,
W74-08024 5D

HROMOSOMAL ABERRATIONS
Chromosome Aberrations in Chironomus Riparius developing in Different Concentrations of Tritiated Water,
W74-07820 5C

HROMOSOMES
Genetic Effects,
W74-07688 5C

ILIATES
The Photosensitizing Action of Carcinogens. I. The Action of 2-Naphthylamine on Escherichia Coli K-12 and Paramecium Caudatum,
W74-08095 5C

ITRUS
Irrigation of Citrus with Citrus Waste Water,
W74-07603 5D

LAMS
Iron-55 and Ruthenium-103 and -106 in the Brackish-Water Clam Rangia cuneata,
W74-07804 5A

The Effects of the Maryland Hydraulic Clam Dredge on Populations of the Soft-Shell Clam, 'Mya Arenaria,'
W74-07994 8I

Fluctuations in Gulf of Maine Sea Temperature and Specific Molluscan Abundance,
W74-08145 2I

CLAY MINERALS
Adsorption of Fenuron and Monuron (Substituted Ureas) by Two Montmorillonite Clays,
W74-07627 5B

Fixation of Zinc by Clay Minerals,
W74-07629 2G

CLAYEY SOILS
The Relationships Between Soil Water and Engineering Properties of the Clayey Soils, (In Japanese),
W74-07679 2G

CLAYS
Fixation of Zinc by Clay Minerals,
W74-07629 2G

Effect of Narrow Trenching in Harlingen Clay Soil on Plant Growth, Rooting Depth, and Salinity,
W74-08078 3F

CLEVELAND (OHIO)
Major Wastewater Treatment Plant to be Upgraded,
W74-07761 5D

CLOSTRIDIUM-PERFRINGENS
Sowing of Ponds and Carp with Clostridium perfringens, (In Ukrainian),
W74-08076 5B

CLOUD SEEDING
Project Skywater 1972 Annual Report.
W74-07928 3B

Some Climatological Characteristics of Seedable Upslope Cloud Systems in the High Plains,
W74-07929 3B

COACHELLA VALLEY (CALIF)
Contribution to Water Pollution from Agricultural and Urban Sources in the Coachella Valley,
W74-07757 5B

COAGULATION
Activated Silica in Wastewater Coagulation,
W74-07738 5D

Coagulant Recovery and Reuse in Water Reclamation Systems,
W74-07844 5D

Apparatus and Method for Treating Waste Liquid,
W74-08026 5D

Leachate Treatment by Coagulation and Precipitation,
W74-08091 5D

COASTS
Coastal Vegetation of Delaware,
W74-07616 2L

Pleistocene-Holocene Sediments Interpreted by Seismic Refraction and Wash-Bore Sampling, Plum Island-Castle Neck, Mass.,
W74-07875 2L

COBALT
Effects of Gamma Irradiation on the Reproductive Performance of Artermia as Determined by Individual Pair Matings,
W74-07822 5C

Effects of Gamma Irradiation on the Maintenance of Population Size in the Brine Shrimp, Artemia,
W74-07823 5C

COHO SALMON
Effects of Crude Oil and Some of its Components on Young Coho and Sockeye Salmon,
W74-07613 5C

COLEOPTERA
Ground Beetles (Coleoptera, Carabidae) from the Boggy Areas of the Crimea, (in Russian),
W74-08103 2I

COLIFORMS
Survival of Intestinal Bacteria in Oligotrophic Waters,
W74-07737 5C

Coliforms are an Inadequate Index of Water Quality,
W74-07885 5A

COLLEGES
Annual Report '72 - '73.
W74-07602 9A

COLONIZATION (ALGAE)
Experiments on the Movement Behavior of Unicellular Algae in Flowing Water,
W74-08120 2I

COLORADO
Transit Losses and Travel Times for Reservoir Releases, Upper Arkansas River Basin, Colorado,
W74-07931 4A

COLORADO RIVER AQUEDUCT
Corrosive Effects of Southern California Potable Waters,
W74-07866 8G

COLORADO RIVER BASIN
Regional Energy-Water Problems--Colorado River-Great Basin,
W74-07977 6D

COLORADO RIVER BASIN (TEX)
Quality of Surface Waters in the Colorado River Basin, Texas, 1966-72 Water Years,
W74-07670 5B

COLUMBIA RIVER
A Study of Pollutant Discharges from Reactor Operations Utilizing Ultracentrifugation Techniques,
W74-07782 5A

Thermoluminescent Dosimetry of AquatiR Organisms,
W74-07819 5C

The Columbia Interstate Compact: Politics of Water Resources in the Pacific Northwest,
W74-07846 6E

Sediment Transport by Streams in the Upper Columbia River Basin, Washington, May 1969-June 1971,
W74-07911 2J

COMBINED SEWERS
A Streamflow Model for Metropolitan Planning and Design,
W74-07721 2A

COMBINED TREATMENT
Inorganic Nitrogen Removal in a Combined Tertiary Treatment-Marine Aquaculture System - II. Algal Bioassays,
W74-07777 5C

COMMERCIAL SHELLFISH
Experiments to Re-establish Historical Oyster Seed Grounds and to Control the Southern Oyster Drill,
W74-07982 8I

COMPREHENSIVE PLANNING
Environmental Statement Related to Construction and Operation of Barnwell Nuclear Fuel Plant.
W74-07792 5B

Final Environmental Statement Related to the Proposed Perry Nuclear Power Plant, Units 1 and 2.
W74-07793 5A

COMPRESSIBILITY
Deformation Moduli of Water-Bearing Formations at Elevated Temperatures,
W74-07726 4B

COMPRESSIVE STRENGTH
Corrosion Resistant Cements,
W74-07887 8F

COMPUTER MODELS
A Streamflow Model for Metropolitan Planning and Design,
W74-07721 2A

Pricing of Industrial Wastewater Treatment Service,
W74-07727 5D

The Dispersion of Continuously Injected Effluents in Open Channels,
W74-07833 5B

A Stochastic Model for the James,
W74-07843 5B

Model for Estimating Soil Water, Plant, and Atmospheric Interrelations: II. Field Test of Model,
W74-08085 2G

COMPUTER PROGRAMS
Spillway Water-Surface Profiles,
W74-07913 8B

National Weather Service River Forecasting System,
W74-08057 4A

Dam Collapse Wave in a River,
W74-08060 2E

COMPUTERS
Automation of the Control and Operation of Water Pollution Control Works,
W74-07758 5D

CONCRETE CONSTRUCTION
Solid Forms for Savannah River Plant High-Level Waste,
W74-07787 5D

CONCRETES
Solid Forms for Savannah River Plant High-Level Waste,
W74-07787 5D

CONDUCTIVITY
Distribution of Phosphorus, Silica, Chlorophyll a, and Conductivity in Lake Michigan and Green Bay,
W74-08000 5C

CONFERENCES
The Role of Water in the Energy Crisis.
W74-07961 6D

All-Union Hydrologic Congresses (Vsesoyuznyye gidrologicheskiye syezdy),
W74-08056 6E

CONIFEROUS FORESTS
Models of Matter Flow in a Southern Mixed Hardwood Forest in Florida: Preliminary Results,
W74-07813 5B

CONJUNCTIVE OPERATION
Optimal Timing and Sizing of a Conjunctive Urban Water Supply and Waste Water System with Nonlinear Programming,
W74-08010 5D

CONJUNCTIVE USE
Geology and Water Resources of the Wharton Tract and the Mullica River Basin in Southern New Jersey,
W74-07668 4B

Optimal Conjunctive Use Model for Indus Basin,
W74-08059 4B

CONNECTICUT
Hydrogeologic Investigation of a Sanitary Landfill in Stratified Glacial Drift,
W74-07728 5B

CONSERVATION
A Summary of Quantity, Quality and Economic Methodology for Establishing Minimum Flows,
W74-07847 6B

CONSTRUCTION
South Dakota Standards for Construction of Irrigation Wells in Shallow Unconsolidated Glacial Sediments,
W74-07896 8A

Irrigation Well Construction.
W74-07897 8A

Processes, Procedures, and Methods to Control Pollution Resulting from All Construction Activity.
W74-07942 5B

CONSTRUCTION COSTS
Major Wastewater Treatment Plant to be Upgraded,
W74-07761 5D

Design and Simulation of Equalization Basins,
W74-08046 5D

CONSTRUCTION MATERIALS
South Dakota Standards for Construction of Irrigation Wells in Shallow Unconsolidated Glacial Sediments,
W74-07896 8A

CONSUMPTIVE USE
Estimated Use of Water in Florida, 1970,
W74-07917 6D

CONTINENTAL SHELF
Observations and Analysis of Bottom Turbid Layers on the Oregon Continental Shelf,
W74-07632 2J

A Numerical Study of the Steady Circulation in an Open Bay,
W74-07924 2L

CONTROL SYSTEMS
Redevelopment of Haven Sewage-Treatment Works, Colchester,
W74-07759 5D

COOLING WATER
A Study of Pollutant Discharges from Reactor Operations Utilizing Ultracentrifugation Techniques,
W74-07782 5A

A Prediction of Changes in the Thermal Cycle of a Stratified Lake Used to Cool a 1000 MW Power Plant,
W74-07998 5C

COPPER
Determination of Copper and Zinc in Biological Material,
W74-07712 5A

Aerial Pollution and the Rapid Evolution of Copper Tolerance,
W74-07713 5B

Accumulation Phenomenon Which takes Place in a Mussel (Mytilus galloprovincialis LMK) Grown in an Artificially Polluted Environment, Verification of a Simplified Model of the Dynamic Equilibrium of Metal Ripartition Between Mussels and Sea-Water, Note II-Pollution from Copper, (Fenomeno di Accumulo Nel Mitilo (Mytilus galloprovincia-Lis LMK) Stabulato in Ambiente Artificialmente Inquinato. Verifica di un Modello Semplificato per L'equilibr io Dinamico di Ripartizione del Metalli fra Mitilo e Acqua Marina, Nota II: Inquinamento da rame),
W74-07746 5C

COPPER ALLOYS
Performance and Selection of Materials for Potable Hot Water Service,
W74-07855 8G

CORROSION
Domestic Water Systems, Nonchemical Factors in Corrosion Control,
W74-07849 8G

Domestic Hot Water Systems, Silicate Treatment Inhibits Corrosion of Galvanized Steel and Copper Alloys,
W74-07850 8G

Performance and Selection of Materials for Potable Hot Water Service,
W74-07855 8G

Finding Answers to Corrosion Problems,
W74-07863 8G

Casing Potential Logging Related to Vertilog Corrosion Logging,
W74-07868 8G

Drill Pipe Failures: Where Do We Go From Here,
W74-07869 8G

Influence of Water Quality on the Corrosion and Electrochemical Behavior of Mild Steel in Synthetic Acid Mine Waters,
W74-07876 8G

Corrosive Effects of Potable Water,
W74-07886 8G

Corrosion Resistant Cements,
W74-07887 8F

Corrosion Resistance of Piping and Construction Materials,
W74-07888 8G

Corrosion by Waters,
W74-07890 8G

Zinc/Phosphate Combinations Control Corrosion in Potable Water Distribution Systems,
W74-07894 8G

The Sulfate-Reducing Bacteria and Oilfield Bacterial Corrosion - A Review of the Current State-of-the-Art,
W74-07902 8G

Galvanic Effects Increase Corrosion, Part 2,
W74-07904 8G

ORROSION CONTROL
Domestic Water Systems, Nonchemical Factors in Corrosion Control,
W74-07849 8G

Domestic Hot Water Systems, Silicate Treatment Inhibits Corrosion of Galvanized Steel and Copper Alloys,
W74-07850 8G

Performance and Selection of Materials for Potable Hot Water Service,
W74-07855 8G

Coupon Corrosion Rates Versus Hydrogen Probe Activity,
W74-07857 8G

New Bromide Packer Fluid Cuts Corrosion Problems,
W74-07858 8G

Finding Answers to Corrosion Problems,
W74-07863 8G

Corrosive Effects of Southern California Potable Waters,
W74-07866 8G

Influence of Water Quality on the Corrosion and Electrochemical Behavior of Mild Steel in Synthetic Acid Mine Waters,
W74-07876 8G

Corrosive Effects of Potable Water,
W74-07886 8G

Corrosion Resistance of Piping and Construction Materials,
W74-07888 8G

Causes and Prevention of Drill Pipe Troubles,
W74-07889 8G

Corrosion by Waters,
W74-07890 8G

Learn the Basics of Corrosion Control,
W74-07892 8G

Zinc/Phosphate Combinations Control Corrosion in Potable Water Distribution Systems,
W74-07894 8G

Commercial Desalting Plant Data and Analysis, Volumes I-VI,
W74-08061 3A

CORROSION ENGINEERING
Learn the Basics of Corrosion Control,
W74-07892 8G

CORROSION FATIGUE
Causes and Prevention of Drill Pipe Troubles,
W74-07889 8G

CORROSION LOGGING
Casing Potential Logging Related to Vertilog Corrosion Logging,
W74-07868 8G

CORROSION RATES
Coupon Corrosion Rates Versus Hydrogen Probe Activity,
W74-07857 8G

CORROSOMETERS
Corrosive Effects of Southern California Potable Waters,
W74-07866 8G

COST ANALYSIS
Improved Drilling Rates at Lower Costs,
W74-07901 8C

COST-BENEFIT RATIO
Summary Report for a Methodology Study to Develop Evaluation Criteria for Wild and Scenic Rivers,
W74-07608 6B

COST COMPARISONS
Mathematical Model for Post Aeration,
W74-08045 5D

High Temperature Electrodialysis, Phase IV,
W74-08070 3A

COST MINIMIZATION
Optimal Timing and Sizing of a Conjunctive Urban Water Supply and Waste Water System with Nonlinear Programming,
W74-08010 5D

Improved Dynamic Programing Procedures and Their Practical Application to Water Resource Systems,
W74-08013 6A

Earthquake Damage Costs in the Design of Water Resource Systems,
W74-08018 4A

COSTS
Redevelopment of Haven Sewage-Treatment Works, Colchester,
W74-07759 5D

COTTON
Effect of Narrow Trenching in Harlingen Clay Soil on Plant Growth, Rooting Depth, and Salinity,
W74-08078 3F

Ways of Increasing the Production of Takyr Soils of the Tedzhen Delta, (In Russian),
W74-08098 3F

Effectiveness of Mineral Fertilizers During Cotton Cultivating Depending on Soil Humidity, (In Azerbaijanian),
W74-08099 3F

COUPON CORROSION RATES
Coupon Corrosion Rates Versus Hydrogen Probe Activity,
W74-07857 8G

CRABS
The Influence of Temperature and Salinity on the Toxicity of Cadmium to the Fiddler Crab, Uca pugilator,
W74-07699 5C

Effect of Radiation, Salinity and Temperature on the Ionic Regulation of the Blue Crab, Callinectes sapidus,
W74-07818 5C

On Some Aspects of the Parasites of Ceylonese Fresh Water Crabs,
W74-08002 2I

CRACKS
Causes and Prevention of Drill Pipe Troubles,
W74-07889 8G

CROP PRODUCTION
Effect of Establishment Method, Variety, and Seeding Rate on the Production and Quality of Alfalfa Under Dryland and Irrigation,
W74-08077 3F

Tolerance of Rice (Oryza Sativa L.) to Salt During Boot, Flowering, and Grain-Filling Stages,
W74-08080 3C

'Hill-Top Irrigation,' A New System for Early Sweetpotato Planting, (In Spanish),
W74-08136 3F

Drought Hardening in Onions: I. Influence of Presowing Treatments on Vegetative Behavior and Yield, (In Spanish),
W74-08148 3F

CROP RESPONSE
Influence of Temperature and Moisture Stress from Sodium Chloride Salinization on Okra Emergence,
W74-08073 3C

Effect of Temperature and Plant Water Stress on Photosynthesis Diffusion Resistance, and Leaf Water Potential in Spring Wheat,
W74-08075 3F

Effect of Establishment Method, Variety, and Seeding Rate on the Production and Quality of Alfalfa Under Dryland and Irrigation,
W74-08077 3F

Effect of Narrow Trenching in Harlingen Clay Soil on Plant Growth, Rooting Depth, and Salinity,
W74-08078 3F

Sugarbeet Response to Irrigation as Measured with Growth Sensors,
W74-08079 3F

Tolerance of Rice (Oryza Sativa L.) to Salt During Boot, Flowering, and Grain-Filling Stages,
W74-08080 3C

CROP YIELD
Effects of Colorado River Water Quality and Supply on Irrigated Agriculture,
W74-08014 3C

CRUDE OIL
Effects of Crude Oil and Some of its Components on Young Coho and Sockeye Salmon,
W74-07613 5C

CRYOLOGY
Adhesion of Ice Frozen from Dilute Electrolyte Solutions,
W74-07618 2C

CULICIDAE
Effects of Chrome Radiation Exposure On Mosquitoes (Diptera: Culicidae). 1. Effects of Rearing in Sr-90 + Y-90 Solutions,
W74-07821 5C

CULVERT DEICING
Application of Electrical Energy to Culvert Icing Problems--A Laboratory Study,
W74-07909 8C

CULVERTS
Hydraulics of Culvert Outlets,
W74-07749 8B

Application of Electrical Energy to Culvert Icing Problems--A Laboratory Study,
W74-07909 8C

CURRENTS (WATER)
Test Results on Buoyant Jets Injected Horizontally in a Cross Flowing Stream,
W74-07766 8B

Tidal Currents and Zig-Zag Sand Shoals in a Wide Estuary Entrance,
W74-07939 2L

CYANOPHYTA
Environmental Control of Nitrogen Fixation in Lakes, I. In situ Nitrogen Fixation by Free Living Blue-Green Algae, and II. Nitrogen Fixation by the Duckweed-Algal Association,
W74-07716 5C

CYTOLOGICAL STUDIES
Genetic Effects,
W74-07688 5C

Liver Zinc in Carcinoma,
W74-07690 5C

Accumulation of Calcium-45 in Developing Coho Salmon Eggs and Fry reared in varying concentrations of Stable Calcium,
W74-07808 5C

Determination of Counting Efficiency by 14C by Liquid Scintillation in Primary Production Measurements in a Lagoon Environment, (In French),
W74-08143 5A

CZECHOSLOVAKIA (NOVY CEPSKY POND)
Zonation of Mosses on the Banks of the Novy Cepsky Pond. (in Czech.),
W74-08119 2H

DADE COUNTY (FLA)
Reconnaissance of the Water Resources in the Vicinity of Proposed Deep-Well Injection Sites in Southeast Dade County, Florida,
W74-07915 5B

DAM FAILURE
Dam Collapse Wave in a River,
W74-08060 2E

DAMAGE CONTROL
Prevention of Damage to Pipelines.
W74-07923 8A

DAMAGE PREVENTION
Prevention of Damage to Pipelines.
W74-07923 8A

DAMAGES
Earthquake Damage Costs in the Design of Water Resource Systems,
W74-08018 4A

DATA COLLECTIONS
Water Resources Data for Nebraska, 1972: Part I. Surface-Water Records,
W74-07647 7C

Ground-Water Levels in Observation Wells in Kansas, 1966-70,
W74-07650 7C

Equipment and Instrumentation,
W74-07660 5B

USGS Completes Nationwide Reconnaissance of Metals in Streams.
W74-07698 5A

Appendices to Water Resources Management for Metropolitan Washington: Analysis of the Joint Interactions of Water and Sewage Service, Public Policy, and Land Development Patterns in an Expanding Metropolitan Area.
W74-07724 6B

The Snodland-Ightham Regional Drainage Scheme: Design and Operation,
W74-07752 5D

Uranium-234,
W74-07790 5B

Project Rio Blanco Spall Measurements Data Report,
W74-07797 4B

Theory and Application of Continuous Monitoring for Chemical Research in Natural Water Systems,
W74-07985 5A

A Data Acquisition System for Ecological Field Studies,
W74-07989 7B

International Cooperation of Hydrologists (Mezhdunarodnoye sotrudnichestvo gidrologov),
W74-08047 7A

Application of Satellite Data for Hydrologic Purposes (Ispol'zovaniye sputnikovoy informatsii dlya gidrologicheskikh tseley),
W74-08049 7B

State Record Keeping on Water and Its Usage and Hydrologic Calculations and Forecasts (Gosudarstvennyy uchet vod i ikh ispol'zovaniya i gidrologicheskiye raschety i prognozy),
W74-08054 7A

Commercial Desalting Plant Data and Analysis, Volumes I-VI,
W74-08061 3A

DATA PROCESSING
Data Management,
W74-07659 5B

DATA STORAGE AND RETRIEVAL
Data Management,
W74-07659 5B

DDE
Factors Controlling the Dynamics of Non-Ionic Synthetic Organic Chemicals in Aquatic Environments,
W74-07831 5B

DDT
The Fate and Effects of Pesticides in the Aquatic Environment of the Flathead Lake Drainage Area,
W74-07835 5C

DECANTATION
Water Treatment Mud Decanting Tank,
W74-08042 5F

DECISION MAKING
The Methodology of Bayesian Inference and Decision Making Applied to Extreme Hydrologic Events,
W74-07601 2A

DECOMPOSING ORGANIC MATTER
Investigations on the Occurrence of Phenol-Decomposing Microorganisms in Waters and Sediments. (in German),
W74-08115 5C

DECOMPOSITION (HERBACEOUS PLANTS)
Effect of Water-Soluble Decomposition Products of Herbaceous Plants on Uptake of Radioisotopes in Soil. (in Russian),
W74-08117 2G

DECOMPOSITION (ORGANIC MATTER)
Investigations on the Occurrence and Decomposition of Fats and Fatty Acids in Lakes. (In German),
W74-08141 5C

DECOMPOSITION (PLANT RESIDUES)
Effect of the Moisture and Temperature on the Leaching of Ash Elements from Plant Residues (in Russian),
W74-08016 2I

DEFICIENT ELEMENTS
Antagonistic Effect of Arginine on Zinc Metabolism in Chicks,
W74-07955 5C

DEGRADATION (DECOMPOSITION)
Results of Red Tide Formation in Tokyo Bay.
W74-07770 5C

DEICERS
Effect of Deicing Chemicals on Ground and Surface Water--(Modus Operandi),
W74-07617 5B

Application of Electrical Energy to Culvert Icing Problems--A Laboratory Study,
W74-07909 8C

DELAWARE
Coastal Vegetation of Delaware,
W74-07616 2L

Alterations in the Hydrologic Cycle Induced by Urbanization in Northern New Castle County, Delaware: Magnitudes and Projections,
W74-07729 4C

DELAWARE ESTUARY (N
Process Control Model for Oxygen Regeneration of Polluted Rivers, Phases IV and V, and Spacially and Temporally Distributed Discharge of Effluents in Estuaries,
W74-07837 5B

DELAWARE RIVER
Regional Energy-Water Problems Northeast,
W74-07971 6D

DELTAS
Heterogeneities in Salinity in a River Plume,
W74-07672 2L

DEMINERALIZATION
Reverse Osmosis-Neutralization Process for Treating Mineral Contaminated Waters,
W74-08041 5D

DENITRIFICATION
Nitrogen Transformations in Soil During Leaching: I. Theoretical Considerations,
W74-07619 5B

Nitrogen Transformation in Soil During Leaching: II. Steady State Nitrification and Nitrate Reduction,
W74-07620 5B

Nitrogen Transformations in Soil During Leaching: III. Nitrate Reduction in Soil Columns,
W74-07621 5B

Nitrogen Transformations During Continuous Leaching,
W74-07623 5B

DENSITY
Compensated Gamma Ray Densimeter Measures Slurry Densities in Flow,
W74-07877 8G

DENSITY CURRENTS
Selective Withdrawal From Beech Fork Lake, Beech Fork River, West Virginia,
W74-07914 8B

DENTRIFICATION
Nitrogen Removal by Soil Mechanisms,
W74-08081 5D

DEPOSITION (SEDIMENTS)
Research to Determine the Environmental Response to the Deposition of Spoil on Salt Marshes Using Diked and Undiked Techniques.
W74-07990 6G

DEPTH SAMPLERS
Variations in the Design of Depth Samplers for use in Groundwater Studies,
W74-07865 8G

DESALINATION
Cellulosic Reverse Osmosis Membranes Having High Flux and High Salt Rejection,
W74-08022 3A

Method and Equipment for Desalination of Liquids,
W74-08038 3A

The Potential of Desalting for Industrial Water Supplies in Northeastern Wyoming,
W74-08062 3A

Improving Municipal Water Supplies in Arizona by Desalting,
W74-08063 3A

Potential Contribution of Desalting Systefs to Municipal Water Quality and Supply in South Dakota.
W74-08064 3A

The Future Role of Desalting in Nevada,
W74-08065 3A

High Temperature Electrodialysis, Phase I,
W74-08067 3A

High Temperature Electrodialysis, Phase II,
W74-08068 3A

High Temperature Electrodialysis, Phase III,
W74-08069 3A

High Temperature Electrodialysis, Phase IV,
W74-08070 3A

DESALINATION PLANTS
Commercial Desalting Plant Data and Analysis, Volumes I-VI,
W74-08061 3A

DESALINATION PROCESSES
Preliminary Study to Investigate Feasibility of Desalting Ground Water in North Dakota,
W74-08066 3A

DESERT PLANTS
Growth Feature of Introduced Plants in Connection with Their Adaptation to Drought. (in Russian),
W74-08118 2I

DESERTS
Hydrologic Reconnaissance of the Northern Great Salt Lake Desert and Summary Hydrologic Reconnaissance of Northwestern Utah,
W74-07665 2F

The Hydrogeology and Utilization of Brines in El Salado, Chile,
W74-07936 4A

DESIGN
A Streamflow Model for Metropolitan Planning and Design,
W74-07721 2A

An Evaluation of the Needs in Freshwater Research and Related Public Information Facilities,
W74-07838 6G

Induced Safety Algorithm for Hydrologic Design under Uncertainty,
W74-08017 6A

Earthquake Damage Costs in the Design of Water Resource Systems,
W74-08018 4A

Commercial Desalting Plant Data and Analysis, Volumes I-VI,
W74-08061 3A

High Temperature Electrodialysis, Phase III,
W74-08069 3A

High Temperature Electrodialysis, Phase IV,
W74-08070 3A

DESIGN CRITERIA
Hydraulics of Culvert Outlets,
W74-07749 8B

The Design, Planning and Construction of a 45 inch Diameter Water Main Across a Congested Area of West Bromwich,
W74-07751 8A

A Simple Method for Retention Basin Design,
W74-07753 5D

Major Wastewater Treatment Plant to be Upgraded,
W74-07761 5D

Hydrology and Structural Design (In Russian),
W74-07767 8B

DESIGN DATA
Design Data and Safety Features of Commercial Nuclear Power Plants, Vol I,
W74-07794 5G

Design Data and Safety Features of Commercial Nuclear Power Plants, Vol. II.
W74-07795 5G

Design Data and Safety Features of Commercial Nuclear Power Plants, Vol. III,
W74-07796 5G

DETERIORATION
Learn the Basics of Corrosion Control,
W74-07892 8G

DEVELOPING COUNTRIES
A Systems Approach to Assessment of Rural Water Supply Program Effectiveness,
W74-08012 6B

DEWATERING
New Sludge Processing Plant of the Beeston and Stapleford Urban District Council.
W74-07779 5D

DIAMOND BITS
Down-Hole Motors for Improved Drilling,
W74-07880 8C

DIELDRIN
Studies on Southeastern Aquatic Insects,
W74-07740 5C

DIETS
Evaluation of Zinc Availability in Foodstuffs of Plant and Animal Origin,
W74-07706 5C

Tissue Sulfhydryl Groups in Selenium-Deficient Rats and Lambs,
W74-07952 5B

Reduction of Lead Absorption from the Intestine in Newborn Rats,
W74-07953 5C

DIFFUSION
Transport of Radionuclides in Sediments,
W74-07814 5B

DIPTERA
Chromosome Aberrations in Chironomus Riparius developing in Different Concentrations of Tritiated Water,
W74-07820 5C

Effects of Chrome Radiation Exposure On Mosquitoes (Diptera: Culicidae). 1. Effects of Rearing in Sr-90 + Y-90 Solutions,
W74-07821 5C

DISCHARGE (WATER)
Data on Fresh-Water Inflow, April 14-July 28, 1973, For Analog-Model Study of the Houston Ship Channel, Houston, Texas,
W74-07921 7C

Trends and Problems in Investigation of Long-Term Fluctuations of River Runoff (Napravleniya i zadachi issledovaniya mnogoletnikh kolebaniy rechnogo stoka),
W74-08051 2E

DISEASE RESISTANCE
Liver Zinc in Carcinoma,
W74-07690 5C

DISPERISON
Packing-Induced Radial Particle-Size Segregation: Influence on Hydrodynamic Dispersion and Water Transfer Measurements,
W74-07630 2G

DISPERSION
The Dispersion of Continuously Injected Effluents in Open Channels,
W74-07833 5B

Harbor Pollution from Large Ships,
W74-08006 5B

DISPOSAL
Research to Determine the Environmental Response to the Deposition of Spoil on Salt Marshes Using Diked and Undiked Techniques.
W74-07990 6G

DISSOLVED OXYGEN
Process Control Model for Oxygen Regeneration of Polluted Rivers, Phases IV and V, and Spacially and Temporally Distributed Discharge of Effluents in Estuaries,
W74-07837 5B

DISTRIBUTION
'Normal' Concentrations of Mercury in Human Tissue and Urine,
W74-07685 5C

The Distribution of Lead in Human Deciduous Teeth,
W74-07691 5C

DISTRIBUTION

Influence of Dietary and Injected Selenium on Whole-Body Retention, Route of Excretion, and Tissue Retention of 75SeO3 (--) in the Rat,
W74-07708 5C

Endogenous Zinc Excretion and 65Zinc Metabolism in Holstein Calves Fed Intermediate to High But Nontoxic Zinc Levels in Practical Diets,
W74-07954 5C

The Biology and Ecology of River Carpsucker, Carpiodes Carpio (Rafinesque), in the Little Missouri Arm of Lake Sakakawea, North Dakota,
W74-07991 2H

DISTRIBUTION PATTERNS
Factors Controlling the Dynamics of Non-Ionic Synthetic Organic Chemicals in Aquatic Environments,
W74-07831 5B

Delimitation of Weathering Zones in the Fiord Area of Eastern Baffin Island, Canada,
W74-07937 2J

Foam Fractionation of Mercury(II) Nitro Complexes,
W74-07945 5A

Trichoptera in the Reservation Area Heiliges Meer in Westphalia,
W74-07997 2I

DISTRICT OF COLUMBIA
Water Resources Management for Metropolitan Washington: Analysis of the Joint Interactions of Water and Sewage Service, Public Policy and Land Development Patterns in an Expanding Metropolitan Area.
W74-07723 6B

Appendices to Water Resources Management for Metropolitan Washington: Analysis of the Joint Interactions of Water and Sewage Service, Public Policy, and Land Development Patterns in an Expanding Metropolitan Area.
W74-07724 6B

DIVERSION
Present and Future of Lake Sevan (Sovremennoye sostoyaniye i budushcheye ozera Sevan),
W74-08048 2H

DIVERSON LOSSES
Transit Losses and Travel Times for Reservoir Releases, Upper Arkansas River Basin, Colorado,
W74-07931 4A

DOMESTIC WASTES
Collection, Detection, Identification, and Quantitation of Human Effluents,
W74-07912 5A

DOMESTIC WATER
Water Quality and Treatment of Domestic Groundwater Supplies,
W74-07637 5F

Wells and Pumping Systems for Domestic Water Supplies,
W74-07638 8B

Planning a Domestic Groundwater Supply System,
W74-07639 4B

The Chemical/Physical and Microbiological Characteristics of Typical Bath and Laundry Waste Waters,
W74-07663 5B

DORMANCY
Effects of Ionizing Radiation on Processes Influencing Tolerance of Tree Seedlings,
W74-07815 5C

DOWN-HOLE MOTORS
Down-Hole Motors for Improved Drilling,
W74-07880 8C

DRAINAGE
Model for Estimating Soil Water, Plant, and Atmospheric Interrelations: II. Field Test of Model,
W74-08085 2G

Effects of Drainage and Organic Amendments on the Reclamation of a Sodic Soil Cropped With Rice,
W74-08087 3C

Quality of Drainage Water From a Heavy-Textured Soil,
W74-08088 5B

DRAINAGE AREA
Drainage Area and River Mileage of Nebraska Streams: Part 1--Salt and Weeping Water Creeks, Big and Little Nemaha Rivers, and Minor Streams in Southeastern Nebraska,
W74-07669 2E

DRAINAGE SYSTEMS
A Streamflow Model for Metropolitan Planning and Design,
W74-07721 2A

DRAWDOWN
Irrigation Well Construction.
W74-07897 8A

DREDGING
Research to Determine the Environmental Response to the Deposition of Spoil on Salt Marshes Using Diked and Undiked Techniques.
W74-07990 6G

The Effects of the Maryland Hydraulic Clam Dredge on Populations of the Soft-Shell Clam, 'Mya Arenaria,'
W74-07994 8I

DRIFT
Experiments on the Movement Behavior of Unicellular Algae in Flowing Water,
W74-08120 2I

DRILL PIPE
Drill Pipe Failures: Where Do We Go From Here,
W74-07869 8G

DRILLING
Optimum Drilling Sites for Ground-Water Development on the East Coast of Lanai Island,
W74-07734 4B

Effect of Bentonitic Fluid Properties on Drilling Rate,
W74-07879 8B

Down-Hole Motors for Improved Drilling,
W74-07880 8C

Water Jet Cutting of Sedimentary Rock,
W74-07883 8B

Two New Drilling Systems Pass Initial Field Tests, DC Electric Power Swivel Can Save Time and Money, Hydraulic Snubber Built to Operate in Rugged Terrain
W74-07980 8C

DRILLING EQUIPMENT
Down-Hole Motors for Improved Drilling,
W74-07880 8C

Two New Drilling Systems Pass Initial Field Tests, DC Electric Power Swivel Can Save Time and Money; Hydraulic Snubber Built to Operate in Rugged Terrain.
W74-07980 8C

DRILLING FLUIDS
Tracers in Mud Improve DST, Wireline Test Accuracy,
W74-07856 8G

Compensated Gamma Ray Densimeter Measures Slurry Densities in Flow,
W74-07877 8G

Effect of Bentonitic Fluid Properties on Drilling Rate,
W74-07879 8B

Improved Drilling Rates at Lower Costs,
W74-07901 8C

DRILLING RATE
Effect of Bentonitic Fluid Properties on Drilling Rate,
W74-07879 8B

DRILLSTEM TESTS
Tracers in Mud Improve DST, Wireline Test Accuracy,
W74-07856 8G

DROUGHT
Growth Feature of Introduced Plants in Connection with Their Adaptation to Drought. (in Russian),
W74-08118 2I

DROUGHT RESISTANCE (PLANTS)
Drought Hardening in Onions: I. Influence of Presowing Treatments on Vegetative Behavior and Yield, (In Spanish),
W74-08148 3F

Drought Hardening in Onions: II. Analysis of Growth, (In Spanish),
W74-08149 3F

DUMBARTON TRIASSIC BASIN (SO
Buried Triassic Basin in the Central Savannah River Area, South Carolina and Georgia,
W74-07916 2F

DUNE LAKES
The Freshwater Mollusks From the Dune Area North of the Hague,
W74-07996 2H

DYE RELEASES
Use of Fluorescent Dye Tracers in Mobile Bay,
W74-07642 5B

DYNAMIC PROGRAMMING
Improved Dynamic Programing Procedures and Their Practical Application to Water Resource Systems,
W74-08013 6A

DYSTROPHY
Relics of the Boggy Vegetation in Sodic Territories, (In Hungarian),
W74-08122 2H

Investigation of River Water for the Presence of Escherichia coli and Enterococcus, (in Russian),
W74-08004 5A

The Photosensitizing Action of Carcinogens. I. The Action of 2-Naphthylamine on Escherichia Coli K-12 and Paramecium Caudatum,
W74-08095 5C

EARLY DETECTION
Finding Answers to Corrosion Problems,
W74-07863 8G

EARTHQUAKES
Earthquake Damage Costs in the Design of Water Resource Systems,
W74-08018 4A

ECOLOGY
Plutonium in North Atlantic Ocean Organisms; Ecological Relationships,
W74-07800 5C

Error Analysis of Ecological Models,
W74-07811 5B

Progress in Ecological Research at Edgewood Arsenal, Maryland: Fiscal Years 1971 and 1972,
W74-07986 5C

Ecology of the Eulittoral Zone of Lakes,
W74-08003 5C

ECONOMIC ANALYSIS
Economic Evaluation of the Effect of Selected Crop Practices on Nonagricultural Uses of Water,
W74-07828 5B

ECONOMIC EFFICIENCY
Economic Optimization and Simulation Techniques for Management of Regional Water Resource Systems,
W74-07714 6A

ECONOMIC FEASIBILITY
Preliminary Study to Investigate Feasibility of Desalting Ground Water in North Dakota,
W74-08066 3A

ECONOMIC PREDICTIONS
An Analytical Interdisciplinary Evaluation of the Utilization of the Water Resources of the Rio Grande in New Mexico: Lower Rio Grande Region,
W74-07609 6B

ECONOMICS
Economic Aspects of Resource Use with Special Reference to Energy and Water,
W74-07964 6D

ECOSYSTEMS
Radionuclides in Ecosystems, Volume II.
W74-07799 5C

Error Analysis of Ecological Models,
W74-07811 5B

The State of the System (SOS) Model: Measuring Growth Limitations Using Geological Concepts,
W74-07958 6G

EDDIES
Big Eddies and Mixing Processes in the Great Lakes,
W74-07926 5B

EDGEWOOD ARSENAL (MD
Progress in Ecological Research at Edgewood Arsenal, Maryland: Fiscal Years 1971 and 1972,
W74-07986 5C

EDTA COMPLEXES
Paper Chromatographic and Electrochromatographic Separation of Edta Complexes of Metal Ions,
W74-07693 5A

EDUCATION
The Role of Public Involvement in Water Resources Planning and Development, A Report with Readings on Research and Experimentation in Public Affairs Education.
W74-07610 6B

Water Resources Research in Virginia - Annual Report for Fiscal Year 1972.
W74-07842 9D

EFFLUENTS
Part I - A Conceptual Model for a Terrestrial Ecosystem Perturbed with Sewage Effluent, with Special Reference to the Michigan State University Water Quality Management Project; Part II - A Personalized Bibliographi c Retrieval Package for Resource Scientists,
W74-07606 5D

Effluent Standards Strategy: Rejuvenation of an Old Game Plan,
W74-07769 5G

Environmental Radioactivity,
W74-07791 5B

ELECTRIC MOTORS
South Dakota Standards for Irrigation Pumps and Power Units,
W74-07895 8C

ELECTRIC POWER DEMAND
Municipal and Industrial Water Supply,
W74-07968 6D

Agricultural Water Supply,
W74-07969 6D

Regional Energy-Water Problems South Atlantic Gulf,
W74-07972 6D

Regional Energy-Water Problems, Ohio-Great Lakes.
W74-07973 6D

Regional Energy-Water Problems, Missouri River,
W74-07974 6D

Regional Energy-Water Problems, Pacific Northwest,
W74-07975 6D

Regional Energy-Water Problems, Southern Plains,
W74-07976 6D

Regional Energy-Water Problems--Colorado River-Great Basin,
W74-07977 6D

ELECTRIC POWERED SWIVEL
Two New Drilling Systems Pass Initial Field Tests, DC Electric Power Swivel Can Save Time and Money; Hydraulic Snubber Built to Operate in Rugged Terrain.
W74-07980 8G

ELECTRICAL CONDUCTANCE
An Oscillator Circuit for Automated Salinity Sensor Measurements,
W74-08074 2G

ELECTRICAL RESISTIVITY
The Electrical Resistivity Method (Part I),
W74-07852 7B

ELECTRICAL STUDIES
Electric and Thermal Properties of Rocks,
W74-07906 8E

ELECTRICAL WELL LOGGING
Three-Dimensional Zone Model Log Interpretation,
W74-07735 8G

37 Ways to Improve Your Well Completions,
W74-07870 8G

ELECTROCHEMISTRY
Galvanic Effects Increase Corrosion, Part 2,
W74-07904 8G

ELECTRODES
Wastewater Treatment Using Electrolysis with Activated Carbon Cathode,
W74-08028 5D

ELECTRODIALYSIS
High Temperature Electrodialysis, Phase I,
W74-08067 3A

High Temperature Electrodialysis, Phase II,
W74-08068 3A

High Temperature Electrodialysis, Phase III,
W74-08069 3A

High Temperature Electrodialysis, Phase IV,
W74-08070 3A

ELECTROLYSIS
Influence of Water Quality on the Corrosion and Electrochemical Behavior of Mild Steel in Synthetic Acid Mine Waters,
W74-07876 8G

Wastewater Treatment Using Electrolysis with Activated Carbon Cathode,
W74-08028 5D

Electrolytic Flotation Apparatus,
W74-08030 5D

ELECTROLYTES
Adhesion of Ice Frozen from Dilute Electrolyte Solutions,
W74-07618 2C

ELECTRON MICROSCOPY
A Scanning Electron Microscopic Study of Secondary Lamellae and Chloride Cells of Rainbow Trout (Salmo gairdneri),
W74-08096 5C

EMBRYONIC GROWTH STAGE
Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality-Phase I,
W74-07715 5C

EMBRYONIC GROWTH STAGES
Accumulation of Calcium-45 in Developing Coho Salmon Eggs and Fry reared in varying concentrations of Stable Calcium,
W74-07808 5C

EMERGY
Regional Energy-Water Problems, Ohio-Great Lakes.
W74-07973 6D

ENERGY
The Role of Water in the Energy Crisis.
W74-07961 6D

The Role of Water in the Energy Crisis,
W74-07962 6D

Economic Aspects of Resource Use with Special Reference to Energy and Water,
W74-07964 6D

Environmental Aspects of Energy-Water Relationships,
W74-07965 6D

The Role of Water Resources Research in the Energy Crisis,
W74-07966 6D

Energy Production,
W74-07967 6D

Municipal and Industrial Water Supply,
W74-07968 6D

Regional Energy-Water Problems Northeast,
W74-07971 6D

Regional Energy-Water Problems South Atlantic Gulf,
W74-07972 6D

Regional Energy-Water Problems, Missouri River,
W74-07974 6D

Regional Energy-Water Problems, Pacific Northwest,
W74-07975 6D

Regional Energy-Water Problems, Southern Plains,
W74-07976 6D

Regional Energy-Water Problems--Colorado River-Great Basin,
W74-07977 6D

ENERGY CONVERSION
Environmental Effects of the Construction and Operation of a Gaseous Diffusion Plant.
W74-07781 5C

ENERGY CRISIS
The Role of Water in the Energy Crisis.
W74-07961 6D

The Role of Water in the Energy Crisis,
W74-07962 6D

ENERGY POOL
The Role of Water in the Energy Crisis.
W74-07961 6D

ENERGY-WATER RELATIONSHIP
The Role of Water in the Energy Crisis.
W74-07961 6D

ENERGY-WATER RELATIONSHIPS
The Role of Water in the Energy Crisis,
W74-07962 6D

The Political-Social Aspects of Energy-Water Relationships,
W74-07963 6D

Economic Aspects of Resource Use with Special Reference to Energy and Water,
W74-07964 6D

Environmental Aspects of Energy-Water Relationships,
W74-07965 6D

The Role of Water Resources Research in the Energy Crisis,
W74-07966 6D

Energy Production,
W74-07967 6D

Municipal and Industrial Water Supply,
W74-07968 6D

Agricultural Water Supply,
W74-07969 6D

Pollution Control,
W74-07970 6D

Regional Energy-Water Problems Northeast,
W74-07971 6D

Regional Energy-Water Problems South Atlantic Gulf,
W74-07972 6D

Regional Energy-Water Problems, Ohio-Great Lakes.
W74-07973 6D

Regional Energy-Water Problems, Missouri River,
W74-07974 6D

Regional Energy-Water Problems, Pacific Northwest,
W74-07975 6D

Regional Energy-Water Problems, Southern Plains,
W74-07976 6D

Regional Energy-Water Problems--Colorado River-Great Basin,
W74-07977 6D

ENTERIC BACTERIA
Coliforms are an Inadequate Index of Water Quality,
W74-07885 5A

ENTEROCOCCUS
Investigation of River Water for the Presence of Escherichia coli and Enterococcus, (in Russian),
W74-08004 5A

ENVIRONMENT
Environmental Radioactivity,
W74-07791 5B

ENVIRONMENTAL CONTROL
The Environmental Context,
W74-07696 5C

ENVIRONMENTAL EFFECTS
Mercury in the Environment, An Epidemiological and Toxicological Appraisal.
W74-07680 5C

General Discussion and Conclusions-Need for Further Research,
W74-07689 5C

Environmental Effects of the Construction and Operation of a Gaseous Diffusion Plant.
W74-07781 5C

Research to Determine the Environmental Response to the Deposition of Spoil on Salt Marshes Using Diked and Undiked Techniques.
W74-07990 6G

ENVIRONMENTAL ENGINEERING
Infiltration and Landfill Behavior,
W74-08083 5B

ENVIRONMENTAL IMPACT STATEMENTS
Environmental Statement Related to Construction and Operation of Barnwell Nuclear Fuel Plant
W74-07792 5B

Final Environmental Statement Related to the Proposed Perry Nuclear Power Plant, Units 1 and 2
W74-07793 5A

ENVIRONMENTAL PROTECTION AGENCY
Active Research Tasks Report--Fiscal Year 1973
W74-07651 5G

EQUALIZATION BASINS
Design and Simulation of Equalization Basins,
W74-08046 5D

EQUALIZING RESERVOIRS
Design and Simulation of Equalization Basins,
W74-08046 5D

EQUATIONS
Analysis of Liquid-Waste Injection Wells in Illinois by Mathematical Models,
W74-07604 5B

EROSION
Effect of the Stand Density of Walnut Forests on Surface Runoff and Soil Erosion on the Spurs of the Southwestern Slope of the Darvaza Range, (In Russian),
W74-08137 4D

EROSION CONTROL
Sediment Distribution in a Beach Ridge Complex and its Application to Artificial Beach Replenishment,
W74-07666 2J

ESTUARIAL DISPERSION
Process Control Model for Oxygen Regeneration of Polluted Rivers, Phases IV and V, and Spacially and Temporally Distributed Discharge of Effluents in Estuaries,
W74-07837 5B

ESTUARIES
Use of Fluorescent Dye Tracers in Mobile Bay,
W74-07642 5B

Trace Metals Investigations,
W74-07655 5B

Biological Investigations,
W74-07656 5B

Geological Investigations,
W74-07657 5B

Meteorological and Hydrological Investigations,
W74-07658 5B

Equipment and Instrumentation,
W74-07660 5B

A Simple, Segmented Prism Model of Tidal Mixing in Well-Mixed Estuaries,
W74-07673 2L

Process Control Model for Oxygen Regeneration of Polluted Rivers, Phases IV and V, and Spacially and Temporally Distributed Discharge of Effluents in Estuaries,
W74-07837 5B

Tidal Currents and Zig-Zag Sand Shoals in a Wide Estuary Entrance,
W74-07939 2L

STUARINE FISHERIES
Concentrations of Manganese, Iron, and Zinc in Juveniles of Five Estuarine-Dependent Fishes,
W74-07803 5C

ULITTORAL ZONE
Ecology of the Eulittoral Zone of Lakes,
W74-08003 5C

UTROPHICATION
Environmental Control of Nitrogen Fixation in Lakes, I. In situ Nitrogen Fixation by Free Living Blue-Green Algae, and II. Nitrogen Fixation by the Duckweed-Algal Association,
W74-07716 5C

Results of Red Tide Formation in Tokyo Bay,
W74-07770 5C

Seasonal and Spatial Changes in Primary Production and Nutrients in Lake Michigan,
W74-07773 5C

A Note Concerning the Environmental Acceptability of Nitrilotriacetic Acid (NTA): The Effect of NTA on the Growth of Gymnodinium breve,
W74-07775 5C

The Use of Algal Assays for Determining the Effect of Iron and Phosphorus Compounds on the Growth of Various Algal Species,
W74-07776 5C

VALUATION
Summary Report for a Methodology Study to Develop Evaluation Criteria for Wild and Scenic Rivers,
W74-07608 6B

The Role of Public Involvement in Water Resources Planning and Development, A Report with Readings on Research and Experimentation in Public Affairs Education.
W74-07610 6B

An Evaluation of the Needs in Freshwater Research and Related Public Information Facilities,
W74-07838 6G

A Systems Approach to Assessment of Rural Water Supply Program Effectiveness,
W74-08012 6B

Problem of Assessing Effects of Human Activity on Surface-Water Resources (K probleme otsenki vliyaniya deyatel'nosti cheloveka na resursy poverkhnostnykh vod),
W74-08053 4A

VAPOTRANSPIRATION
Alterations in the Hydrologic Cycle Induced by Urbanization in Northern New Castle County, Delaware: Magnitudes and Projections,
W74-07729 4C

Phreatophytes, A Bibliography, Revised.
W74-07829 3B

XPLORATION
Research - - Targets and Developments, Regional Assessments,
W74-07903 7B

XTRACTION
Determination of Mercury in Vegetation with Dithizone - A Single Extraction Procedure,
W74-07949 5A

FAILURE (MECHANICS)
Drill Pipe Failures: Where Do We Go From Here,
W74-07869 8G

Causes and Prevention of Drill Pipe Troubles,
W74-07889 8G

FARM WASTES
Methods and Practices for Controlling Water Pollution from Agricultural Nonpoint Sources.
W74-07941 5B

FATE OF POLLUTANTS
Determination of the Fate of Polynuclear Aromatic Hydrocarbons in Natural Water Systems,
W74-07827 5A

Recovery, Residual Effects, and Fate of Nitrogen Fertilizer Sources in a Semiarid Region,
W74-08086 5B

FATIGUE (MECHANICS)
Drill Pipe Failures: Where Do We Go From Here,
W74-07869 8G

Causes and Prevention of Drill Pipe Troubles,
W74-07889 8G

FATS
Investigations on the Occurrence and Decomposition of Fats and Fatty Acids in Lakes, (In German),
W74-08141 5C

FATTY ACIDS
Investigations on the Occurrence and Decomposition of Fats and Fatty Acids in Lakes, (In German),
W74-08141 5C

FAUNA
Freshwater Fauna and Flora in Haswell Island (Queen Mary Land, Eastern Antarctica),
W74-08107 2I

Invertebrate Fauna of the Bodies of Water of the Stationary 'Agapa' (Western Taimir). (in Russian),
W74-08110 2I

FAUNA (FRESHWATER)
Toxicity of an Algal Complex on Freshwater Fauna: 1. Action on Some Benthic Animals and Fishes. (in French),
W74-08108 5C

Toxicity of an Algal Complex on Freshwater Fauna: 2. Action on Lymnaea Spp. (in French).
W74-08109 5C

FEASIBILITY STUDIES
The Treatment of Waste Water from Industries and Commerce in Public Purification Plants (in German),
W74-07748 5D

A Bill to Authorize the Secretary of the Interior to Engage in Feasibility Investigations of Certain Potential Water Resource Developments.
W74-07943 6E

The Potential of Desalting for Industrial Water Supplies in Northeastern Wyoming,
W74-08062 3A

Improving Municipal Water Supplies in Arizona by Desalting,
W74-08063 3A

Potential Contribution of Desalting Systefs to Municipal Water Quality and Supply in South Dakota.
W74-08064 3A

The Future Role of Desalting in Nevada,
W74-08065 3A

Preliminary Study to Investigate Feasibility of Desalting Ground Water in North Dakota,
W74-08066 3A

Pollution Control and Erection of Sewage Plants: Technical Feasibilities, Future Demands, (In German),
W74-08138 5G

FEDERAL GOVERNMENT
Effluent Standards Strategy: Rejuvenation of an Old Game Plan,
W74-07769 5G

FEDERAL WATER POLLUTION CONTROL ACT
Federal Laws and Regulations,
W74-07703 5G

FENURON
Adsorption of Fenuron and Monuron (Substituted Ureas) by Two Montmorillonite Clays,
W74-07627 5B

FERTILIZATION
Variations in Potassium Content of Alfalfa Grown on Pseudogley Soil Depending on Mineral Fertilizing, (In Serbo-Creation),
W74-08097 3F

Studies on the Influence of Irrigation and Different Doses of N, P and K on the Flowering Behaviour and Absorption of Nutrient Elements in Muskmelon (Cucumis melo L.),
W74-08144 3F

FERTILIZERS
Recovery, Residual Effects, and Fate of Nitrogen Fertilizer Sources in a Semiarid Region,
W74-08086 5B

Ways of Increasing the Production of Takyr Soils of the Tedzhen Delta, (In Russian),
W74-08098 3F

Effectiveness of Mineral Fertilizers During Cotton Cultivating Depending on Soil Humidity, (In Azerbaijanian),
W74-08099 3F

Effect of Organic and Inorganic Fertilizers on the Growth and Development of Juvenile Carp in Spawning Ponds, (In Russian),
W74-08124 5C

Correlations Between P, Fe and Mn Availability in Water-Logged Soil at Different Fertility Levels,
W74-08134 2G

FIDDLER CRABS
The Influence of Temperature and Salinity on the Toxicity of Cadmium to the Fiddler Crab, Uca pugilator,
W74-07699 5C

FILTERS
Corrosive Effects of Potable Water,
W74-07886 8G

FILTRATION
Apparatus and Method for Treating Waste Liquid,
W74-08026 5D

Method and Equipment for Desalination of Liquids,
W74-08038 3A

FINITE ELEMENT ANALYSIS
Analysis of Liquid-Waste Injection Wells in Illinois by Mathematical Models,
W74-07604 5B

FISH
Radiation Effects on Serum Proteins, Hematocrits, Electrophoretic Patterns and Protein Components in the Bluegill (Lepomis macrochirus),
W74-07816 5C

FISH BARRIERS (MESH)
Study of Mesh Fish Barriers in the Polder Systems of the Nemunas River Delta, (In Russian),
W74-08125 8I

FISH CONTROL AGENTS
The Application of 'Rotenone' for the Extermination of the Indigenous Fish Stock in Waters Where Intensive Fish Farming is to be Introduced,
W74-08001 8I

FISH DIETS
Laboratory Rearing Experiments on Artifically Propagated Inconnu (Stenodus Leucichthys),
W74-07725 8I

Distribution of ZN, FE, MN, and SR in Marine Fishes of Different Feeding Habits,
W74-07801 5C

FISH EGGS
Accumulation of Calcium-45 in Developing Coho Salmon Eggs and Fry reared in varying concentrations of Stable Calcium,
W74-07808 5C

Sensitivity of Carp (Cyprinus carpio) Embryos to Acute Gamma Radiation,
W74-07817 5C

FISH FARMING
Laboratory Rearing Experiments on Artifically Propagated Inconnu (Stenodus Leucichthys),
W74-07725 8I

FISH HATCHERIES
Laboratory Rearing Experiments on Artifically Propagated Inconnu (Stenodus Leucichthys),
W74-07725 8I

FISH MIGRATION
Study of Mesh Fish Barriers in the Polder Systems of the Nemunas River Delta, (In Russian),
W74-08125 8I

FISH MORPHOLOGY
Results and Prospects of Investigating Fishes and Their Food Resources of the Khatanga River Basin, (In Russian),
W74-08130 8I

FISH POPULATIONS
An Ecological Study of the Missouri River Prior to Channelization,
W74-07744 2I

Ecological Factors Affecting Anadromous Fishes of Lake Ponchartrain and Its Tributaries,
W74-07993 2H

FISH STOCKING
The Application of 'Rotenone' for the Extermination of the Indigenous Fish Stock in Waters Where Intensive Fish Farming is to be Introduced,
W74-08001 8I

FIXATION
The Technology of Tritium Fixation and Storage,
W74-07789 5D

FJORDS
A Similarity Solution for Steady-State Gravitational Circulation in Fjords,
W74-07675 2L

FLATHEAD LAKE (MONT)
An Investigation of the Water Quality and Productivity of Polson Bay, Flathead Lake, Montana,
W74-07717 5C

The Fate and Effects of Pesticides in the Aquatic Environment of the Flathead Lake Drainage Area,
W74-07835 5C

FLOCCULATION
Apparatus and Method for Treating Waste Liquid,
W74-08026 5D

Method of Treating Waste Water Containing Ligninsulfonate,
W74-08029 5D

FLOOD DISCHARGE
The Methodology of Bayesian Inference and Decision Making Applied to Extreme Hydrologic Events,
W74-07601 2A

FLOOD FREQUENCY
The Methodology of Bayesian Inference and Decision Making Applied to Extreme Hydrologic Events,
W74-07601 2A

FLOOD PROTECTION
The Methodology of Bayesian Inference and Decision Making Applied to Extreme Hydrologic Events,
W74-07601 2A

FLOOD WAVES
Dam Collapse Wave in a River,
W74-08060 2E

FLOODING
Flood and Seepage Water Sampling Techniques in Rice Fields Under Different Water Management Practices,
W74-08090 5B

The Moss Vegetation of the Forests in the Rhine Lowland Between Basel and Mannheim, (In German),
W74-08131 2I

FLOODS
Estimating the Magnitude of Peak Discharges for Selected Flood Frequencies on Small Streams in East Texas,
W74-07664 2E

Aquatic Invertebrate Recovery in the Clinc River Following Hazardous Spills and Floods,
W74-07841 5C

FLORA
Freshwater Fauna and Flora in Haswell Islan (Queen Mary Land, Eastern Antarctica),
W74-08107 2

FLORIDA
Irrigation of Citrus with Citrus Waste Water,
W74-07603 5I

Models of Matter Flow in a Southern Mixe Hardwood Forest in Florida: Preliminar Results,
W74-07813 5I

Reconnaissance of the Water Resources in th Vicinity of Proposed Deep-Well Injection Site in Southeast Dade County, Florida,
W74-07915 5I

Estimated Use of Water in Florida, 1970,
W74-07917 6I

Hydrologic Data for 1972, Broward County Florida,
W74-07918 7C

A Numerical Study of the Steady Circulation i an Open Bay,
W74-07924 2I

Hydrobiochemical Effects of Spraying Waste Treatment Effluent in St. Petersburg, Florida,
W74-07978 5C

Quantity and Quality of Surface Water i Marion County, Florida,
W74-08044 7C

FLOTATION
BOD, Solids and Nutrient Removal by Foam Flotation,
W74-07742 5D

Electrolytic Flotation Apparatus,
W74-08030 5D

FLOTSAM
Floating Barrier,
W74-08025 5G

FLOW CHARACTERISTICS
Positive Displacement Pumps,
W74-07874 8C

FLOW EQUATION
Analysis of Liquid-Waste Injection Wells in Illinois by Mathematical Models,
W74-07604 5B

FLOW MEASUREMENTS
Models of Matter Flow in a Southern Mixed Hardwood Forest in Florida: Preliminary Results,
W74-07813 5B

FLUCTUATIONS
Trends and Problems in Investigation of Long-Term Fluctuations of River Runoff (Napravleniya i zadachi issledovaniya mnogoletnikh kolebaniy rechnogo stoka),
W74-08051 2E

FLUORINE
Sanitary-Hygienic Evaluation of the Water Quality of the Nura Water Conduit of the Tselinograd District (In Russian),
W74-08052 5A

OAM FLOTATION
BOD, Solids and Nutrient Removal by Foam Flotation,
W74-07742 5D

OAM FRACTIONATION
Foam Fractionation of Mercury(II) Nitro Complexes,
W74-07945 5A

OOD CHAINS
Trace Elements in Marine Shrimp,
W74-07806 5C

Modeling Radionuclides and Pesticides in Food Chains,
W74-07810 5B

ORECASTING
Adsorption from Aqueous Solution,
W74-07739 5D

Hydrological Forecasting and Water Management (In Russian),
W74-07768 4A

Error Analysis of Ecological Models,
W74-07811 5B

Industrial Application of Whitford's Demand Forecasting Procedure,
W74-08015 6D

State Record Keeping on Water and Its Usage and Hydrologic Calculations and Forecasts (Gosudarstvennyy uchet vod i ikh ispol'zovaniya i gidrologicheskiye raschety i prognozy),
W74-08034 7A

OREST SOILS
Distribution of Free Iron and Organic Carbon as Related to Available Water in Some Forested Sandy Soils,
W74-07622 2G

OREST STANDS
Vegetation and Soil Relationships in Southern Beaufort County, North Carolina,
W74-08150 2K

ORESTS
The Moss Vegetation of the Forests in the Rhine Lowland Between Basel and Mannheim, (In German),
W74-08131 2I

Hydrological Investigations in Forest.
W74-08140 4C

ORESTS (STAND DENSITY)
Effect of the Stand Density of Walnut Forests on Surface Runoff and Soil Erosion on the Spurs of the Southwestern Slope of the Darvaza Range, (In Russian),
W74-08137 4D

ORMATION FACTORS
Porosity-Resistivity Cross-Plotting,
W74-07900 8G

OUNDATION INVESTIGATIONS
The Significance of Moisture Flow and Equilibria in Unsaturated Soils in Relation to the Design of Engineering Structures Built on Shallow Foundations in Australia,
W74-07899 8D

RANCE (LAC DU BOUNGET)
Toxicity of an Algal Complex on Freshwater Fauna: 1. Action on Some Benthic Animals and Fishes. (in French),
W74-08108 5C

FRANCE (LOIR-ET-CHER DEPARTMENT)
Destruction Trials of the Muskrat, Ondatra Zibethica L., in Ponds Using Poisoning Rafts, (In French),
W74-08128 5G

FRANCE (RHONE RIVER)
Heterogeneities in Salinity in a River Plume,
W74-07672 2L

FRESHWATER
An Evaluation of the Needs in Freshwater Research and Related Public Information Facilities,
W74-07838 6G

FUEL CYCLE
The Technology of Tritium Fixation and Storage,
W74-07789 5D

FUEL REPROCESSING
Tritium Distribution in the Nuclear Industry - The Requirements for Control Strategies,
W74-07784 5B

FUEL REPROCESSING PLANT
Environmental Statement Related to Construction and Operation of Barnwell Nuclear Fuel Plant.
W74-07792 5B

Iodine-129 Levels in Milk and Water Near a Nuclear Fuel Reprocessing Plant,
W74-07798 5B

FUELS
The Technology of Tritium Fixation and Storage,
W74-07789 5D

FUNGI
Structure and Function of Hardwood Litter and Soil Subsystems After Chronic Gamma Irradiation. II. Microfungi,
W74-07825 5C

FUNGICIDES
Organo-Mercury Fungicide Treatment of Sugar-Beet Seed,
W74-07951 5B

GALVANIC EFFECTS
Galvanic Effects Increase Corrosion, Part 2,
W74-07904 8G

GALVANIC SERIES
Galvanic Effects Increase Corrosion, Part 2,
W74-07904 8G

GAMBUSIA
Gambusia in the Zeravshan River Basin, (in Russian),
W74-08105 2I

GAME BIRDS
Effect of Ascorbic Acid on Cadmium Toxicity in the Young Coturnix,
W74-07707 5C

GAMMA RAY DENSIMETER
Compensated Gamma Ray Densimeter Measures Slurry Densities in Flow,
W74-07877 8G

GAMMA RAYS
Sensitivity of Carp (Cyprinus carpio) Embryos to Acute Gamma Radiation,
W74-07817 5C

Compensated Gamma Ray Densimeter Measures Slurry Densities in Flow,
W74-07877 8G

GASEOUS DIFFUSION PLANT
Environmental Effects of the Construction and Operation of a Gaseous Diffusion Plant.
W74-07781 5C

GASES
Gradient Analysis of Carbon Monoxide and Methane in Polluted and Other Nearshore Habitats,
W74-07984 5A

GASTROINTESTINAL DISEASES
Quality of Drinking Water on Ships in Relation to Sailing Conditions, (In Russian),
W74-08082 5B

GATES
Flow-Induced Vibration of Vertical-Lift Gate,
W74-08058 8C

GENETICS
Genetic Effects,
W74-07688 5C

GEOCHEMISTRY
Methods of Mercurometric Investigations,
W74-07695 5A

Uranium-234,
W74-07790 5B

GEOLOGICAL SURVEYS
An Instrumental Technique for the Determination of Sub-Microgram Concentrations of Mercury in Soils, Rocks, and Gas,
W74-07948 2K

GEOPHYSICS
Exploration for a Buried Valley by Resistivity and Thermal Probe Surveys,
W74-07935 2F

GEORGIA
State Organization for Water Resources Management,
W74-07733 6E

Buried Triassic Basin in the Central Savannah River Area, South Carolina and Georgia,
W74-07916 2F

Hydrology and Chloride Contamination of the Principal Artesian Aquifer in Glynn County, Georgia,
W74-07919 2F

Patterns of Water Flow and Sediment Dispersion Adjacent to an Eroding Barrier Island,
W74-07920 2J

Geohydrology of the Buried Triassic Basin at the Savannah River Plant,
W74-07934 5B

GEOTHERMAL ENERGY
Icelandic Geothermal Activity and the Mercury of the Greenland Icecap,
W74-07944 5B

GEOTHERMAL STUDIES
Electric and Thermal Properties of Rocks,
W74-07906 8E

Exploration for a Buried Valley by Resistivity and Thermal Probe Surveys,
W74-07935 2F

Icelandic Geothermal Activity and the Mercury of the Greenland Icecap,
W74-07944 5B

GERMANY
Problems for Hydrobiological Investigation under Conditions of Complex Use of Water Resources (In Russian),
W74-07765 5F

GERMANY (LOWER SAXONY)
Calculation of Capillary Rise from Groundwater Table into the Root Zone Under Steady-State Conditions, (In German),
W74-08139 2G

GERMINATION
Effects of Ionizing Radiation on Processes Influencing Tolerance of Tree Seedlings,
W74-07815 5C

GLACIAL AQUIFERS
Exploration for a Buried Valley by Resistivity and Thermal Probe Surveys,
W74-07935 2F

GLACIAL DRIFT
Hydrogeologic Investigation of a Sanitary Landfill in Stratified Glacial Drift,
W74-07728 5B

GLACIOHYDROLOGY
Isua, Greenland: Glaciological Investigations During 1973,
W74-07910 2C

GLACIOLOGY
Isua, Greenland: Glaciological Investigations During 1973,
W74-07910 2C

GRANTS
Annual Report '72 - '73.
W74-07602 9A

Water Resources Research in Virginia - Annual Report for Fiscal Year 1972.
W74-07842 9D

GRAPHICAL METHODS
Porosity-Resistivity Cross-Plotting,
W74-07900 8G

GRASSES
Studies of Re-Vegetation in Vehicle Tracks in Svalbard. (in Norwegian),
W74-08116 4A

GRAVEL PACKS
Sand Control, (Part 4), Combinations, Comparisons, and Costs,
W74-07851 8A

Sand Control in Oil and Gas Wells, Part I,
W74-07891 8B

GREAT LAKES
World's Greatest Source of Fresh Water,
W74-07643 2H

Transport of Radionuclides in Sediments,
W74-07814 5B

Hydrologic Models of the Great Lakes,
W74-07826 2H

Big Eddies and Mixing Processes in the Great Lakes,
W74-07926 5B

GREAT LAKES REGION
World's Greatest Source of Fresh Water,
W74-07643 2H

Regional Energy-Water Problems, Ohio-Great Lakes.
W74-07973 6D

GREAT PLAINS
Regional Energy-Water Problems, Southern Plains,
W74-07976 6D

GREAT SALT LAKE DESERT (UTAH)
Hydrologic Reconnaissance of the Northern Great Salt Lake Desert and Summary Hydrologic Reconnaissance of Northwestern Utah,
W74-07665 2F

GREEN BAY (WIS
Distribution of Phosphorus, Silica, Chlorophyll a, and Conductivity in Lake Michigan and Green Bay,
W74-08000 5C

GREEN BAY (WISC)
Investigation of the Sediments and Potential Manganese Nodule Resources of Green Bay, Wisconsin.
W74-07652 2J

GREENBRIER COUNTY (W
Hydrology of Limestone Karst in Greenbrier County, West Virginia,
W74-07908 2F

GREENLAND
Icelandic Geothermal Activity and the Mercury of the Greenland Icecap,
W74-07944 5B

GREENLAND (ISUA)
Isua, Greenland: Glaciological Investigations During 1973,
W74-07910 2C

GROUND BEETLES
Ground Beetles (Coleoptera, Carabidae) from the Boggy Areas of the Crimea, (in Russian),
W74-08103 2I

GROUND WATER
Sand Control in Oil and Gas Wells, Part I,
W74-07891 8B

GROUNDWATER
Groundwater Pollution Features of Federal and State Satutes and Regulations,
W74-07614 5G

Polluted Groundwater: Some Causes, Effects, Controls, and Monitoring.
W74-07615 5B

Water Quality and Treatment of Domestic Groundwater Supplies,
W74-07637 5F

Wells and Pumping Systems for Domestic Water Supplies,
W74-07638 8B

Planning a Domestic Groundwater Supply System,
W74-07639 4B

Geohydrology and Water Resources of the Tucson Basin, Arizona,
W74-07648 2F

Water Resources of Lehigh County, Pennsylvania,
W74-07649 4A

Hydrologic Reconnaissance of the Northern Great Salt Lake Desert and Summary Hydrologic Reconnaissance of Northwestern Utah,
W74-07665 2F

Geology and Water Resources of the Wharto Tract and the Mullica River Basin in Southe New Jersey,
W74-07668 4

Water Resources of the Little River Basi Louisiana,
W74-07671 4

Alterations in the Hydrologic Cycle Induced b Urbanization in Northern New Castle Count Delaware Magnitudes and Projections.
W74-07729 4

Optimum Drilling Sites for Ground-Wat Development on the East Coast of Lan Island,
W74-07734 4

Groundwater Issue Merits More Federal Pr tection, Groundwater Pollution and Conserv tion,
W74-07854 5

Location and Characteristics of the Interfac Between Brine and Fresh Water fro Geophysical Logs of Boreholes in the Upp Brazos River Basin, Texas,
W74-07859 8

Variations in the Design of Depth Samplers fo use in Groundwater Studies,
W74-07865 8

South Dakota Standards for Construction of I rigation Wells in Shallow Unconsolidated Gl cial Sediments,
W74-07896 8

Water in the Okanogan River Basin, Washin ton,
W74-07907 3

Ground-Water Quality Models: What They Ca and Cannot Do,
W74-07933 5

Preliminary Study to Investigate Feasibility o Desalting Ground Water in North Dakota,
W74-08066 3

Groundwater Pollution and Conservation.
W74-08071 5

Injection Wells Pose a Potential Threat.
W74-08072 5

GROUNDWATER BASINS
Buried Triassic Basin in the Central Savanna River Area, South Carolina and Georgia,
W74-07916 2

Geohydrology of the Buried Triassic Basin a the Savannah River Plant,
W74-07934 5

GROUNDWATER MOVEMENT
Hydrogeologic Investigation of a Sanitary Landfill in Stratified Glacial Drift,
W74-07728 5

GROUNDWATER POTENTIAL
The Electrical Resistivity Method (Part I),
W74-07852 7

GROUTING
Lime Grout Penetration and Associated Moisture Movements in Soil,
W74-07871 8

OWTH
Regularities of the Growth of the Body and Brain of the Common Carp in Bodies of Waters of the Amu-Dar'ya Delta, (in Russian),
W74-08106 2I

Growth of the Caspian Roach in the Mingechaur Reservoir, (In Azerbaijarian),
W74-08123 2H

Effect of Organic and Inorganic Fertilizers on the Growth and Development of Juvenile Carp in Spawning Ponds, (In Russian),
W74-08124 5C

OWTH ONION PLANTS
Drought Hardening in Onions: II. Analysis of Growth, (In Spanish),
W74-08149 3F

OWTH RATES
A Note Concerning the Environmental Acceptability of Nitrilotriacetic Acid (NTA): The Effect of NTA on the Growth of Gymnodinium breve,
W74-07775 5C

LF OF MAINE
Fluctuations in Gulf of Maine Sea Temperature and Specific Molluscan Abundance,
W74-08145 2I

LF OF MEXICO
Trace Elements in Marine Shrimp,
W74-07806 5C

LF OF PANAMA
Distribution of ZN, FE, MN, and SR in Marine Fishes of Different Feeding Habits,
W74-07801 5C

MNODINIUM
A Note Concerning the Environmental Acceptability of Nitrilotriacetic Acid (NTA): The Effect of NTA on the Growth of Gymnodinium breve,
W74-07775 5C

PSUM
Gypsum-Cement Blend Works Well in Permafrost Areas,
W74-07884 8F

PSUM-CEMENT BLEND
Gypsum-Cement Blend Works Well in Permafrost Areas,
W74-07884 8F

NGMAN CREEK (IDAHO)
Geology and Groundwater Resources of the Hangman Creek Drainage Basin, Idaho-Washington,
W74-07644 4A

RBORS
Harbor Pollution from Large Ships,
W74-08006 5B

RDNESS (WATER)
Evaluation of Scaling Tendencies,
W74-07893 8G

RDWOOD
Structure and Function of Hardwood Litter and Soil Subsystems After Chronic Gamma Irradiation, I. Mesofauna, Nitrogen, and Total Soil Respiration,
W74-07824 5C

HARVESTING
The Effects of the Maryland Hydraulic Clam Dredge on Populations of the Soft-Shell Clam, 'Mya Arenaria,'
W74-07994 8I

HAWAII
Annual Report '72 - '73.
W74-07602 9A

Optimum Drilling Sites for Ground-Water Development on the East Coast of Lanai Island,
W74-07734 4B

HAZARDOUS MATERIALS
Aquatic Invertebrate Recovery in the Clinch River Following Hazardous Spills and Floods,
W74-07841 5C

HAZARDS
Design Data and Safety Features of Commercial Nuclear Power Plants, Vol I,
W74-07794 5G

Design Data and Safety Features of Commercial Nuclear Power Plants, Vol. II.
W74-07795 5G

Design Data and Safety Features of Commercial Nuclear Power Plants, Vol. III,
W74-07796 5G

HEAD LOSS
Pump Selection,
W74-07872 8C

Head Drop Across Bar Screens,
W74-08092 5D

HEAVY METALS
Polyacrylamide Gel Disc Electrophoresis of Rat Bile after Intravenous Administration of 52 MnC12, 64CuC12, 203HgC12 and 210 Pb(N03)2,
W74-07694 5C

USGS Completes Nationwide Reconnaissance of Metals in Streams.
W74-07698 5A

Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality-Phase I,
W74-07715 5C

Treatment Methods for Heavy Metal-Containing Liquid Waste (In Japanese),
W74-07745 5D

Reverse Osmosis Process and its Application, (In Japanese),
W74-07750 5D

The Determination of Heavy Metals in Domestic Sewage Treatment Plant Wastes,
W74-07763 5A

The Removal of Soluble Mercury from Waste Water by Complexing Techniques,
W74-07845 5D

Some Novel Complexes of Chromium(I),
W74-07946 5A

Uranium, Thorium, and Lead Concentrations in Three Silicate Standards and a Method of Lead Isotopic Analysis,
W74-07947 2K

Smelter Gases Yield Mercury,
W74-07956 5D

HEPATITIS
Use of Morshin Mineral Water in Disease of the Liver and Biliary Tracts in Children, (in Ukrainian),
W74-08101 2I

HERBICIDES
Adsorption of Fenuron and Monuron (Substituted Ureas) by Two Montmorillonite Clays,
W74-07627 5B

HISTOCHEMICAL METHODS
Lead Detection in Living Plant Tissue Using a New Histochemical Method,
W74-07711 5A

HISTORIC FLOODS
Historic Flood Information for Northern California Streams from Geological and Botanical Evidence,
W74-07646 2E

HISTORY
All-Union Hydrologic Congresses (Vsesoyuznyye gidrologicheskiye syezdy),
W74-08056 6E

HOT SPRINGS
Radioactivity of Nevada Hot-Spring Systems,
W74-07786 5A

HOUSTON SHIP CHANNEL (TEX)
Data on Fresh-Water Inflow, April 14-July 28, 1973, For Analog-Model Study of the Houston Ship Channel, Houston, Texas,
W74-07921 7C

HUMAN DISEASE
Metals Focus Shifts to Cadmium,
W74-07697 5B

HUMAN DISEASES
Environmental Factors of Leukemia Morbidity, (In Polish),
W74-07999 5C

Use of Morshin Mineral Water in Disease of the Liver and Biliary Tracts in Children, (in Ukrainian),
W74-08101 2I

HUMAN PATHOLOGY
Symptoms and Signs of Intoxication,
W74-07684 5C

The Distribution of Lead in Human Deciduous Teeth,
W74-07691 5C

Iron and Associated Trace Mineral Problems in Man and Animals,
W74-07950 2K

HUMAN PHYSIOLOGY
'Normal' Concentrations of Mercury in Human Tissue and Urine,
W74-07685 5C

HUMAN POPULATION
Present Problems in the Study of Surface-Water Quality (Aktual'nyye problemy issledovaniya kachestva poverkhnostnykh vod),
W74-08050 5G

Problem of Assessing Effects of Human Activity on Surface-Water Resources (K probleme otsenki vliyaniya deyatel'nosti cheloveka na resursy poverkhnostnykh vod),
W74-08053 4A

HUMAN RESOURCES
Problem of Assessing Effects of Human Activity on Surface-Water Resources (K probleme otsenki vliyaniya deyatel'nosti cheloveka na resursy poverkhnostnykh vod),
W74-08053 4A

HUMAN TEETH
The Distribution of Lead in Human Deciduous Teeth,
W74-07691 5C

HUNGARY (LAJTA RIVER)
Induced Safety Algorithm for Hydrologic Design under Uncertainty,
W74-08017 6A

HUNGARY (TISZA RIVER)
Induced Safety Algorithm for Hydrologic Design under Uncertainty,
W74-08017 6A

HUNGARY (VELENCE LAKE)
Relics of the Boggy Vegetation in Sodic Territories, (In Hungarian),
W74-08122 2H

HYDRAULIC CONDUCTIVITY
Calculation of Capillary Rise from Groundwater Table into the Root Zone Under Steady-State Conditions, (In German),
W74-08139 2G

HYDRAULIC MODELS
Selective Withdrawal From Beech Fork Lake, Beech Fork River, West Virginia,
W74-07914 8B

Outlet Works Stilling Basins, Clinton and Fort Scott Dams, Wakarusa and Marmaton Rivers, Kansas,
W74-07930 8A

HYDRAULIC SNUBBER UNIT
Two New Drilling Systems Pass Initial Field Tests, DC Electric Power Swivel Can Save Time and Money; Hydraulic Snubber Built to Operate in Rugged Terrain.
W74-07980 8G

HYDRAULICS
Flow-Induced Vibration of Vertical-Lift Gate,
W74-08058 8C

HYDROBIONTS
Problems for Hydrobiological Investigation under Conditions of Complex Use of Water Resources (In Russian),
W74-07765 5F

HYDRODYNAMICS
Hydrologic Response of Ice-Covered Streams,
W74-07832 2E

HYDROGEN
Tritium Distribution in the Nuclear Industry - The Requirements for Control Strategies,
W74-07784 5B

HYDROGEN PROBE ACTIVITY
Coupon Corrosion Rates Versus Hydrogen Probe Activity,
W74-07857 8G

HYDROGEOLOGY
Geology and Groundwater Resources of the Hangman Creek Drainage Basin, Idaho-Washington,
W74-07644 4A

Ground-Water Resources of Montgomery County, Indiana,
W74-07645 2F

Geohydrology and Water Resources of the Tucson Basin, Arizona,
W74-07648 2F

Hydrology and Chloride Contamination of the Principal Artesian Aquifer in Glynn County, Georgia,
W74-07919 2F

Geohydrology of the Buried Triassic Basin at the Savannah River Plant,
W74-07934 5B

Exploration for a Buried Valley by Resistivity and Thermal Probe Surveys,
W74-07935 2F

The Hydrogeology and Utilization of Brines in El Salado, Chile,
W74-07936 4A

HYDROLOGIC ASPECTS
Hydrological Aspect of Surface Run-Off,
W74-07756 2A

Hydrology and Structural Design (In Russian),
W74-07767 8B

Hydrological Forecasting and Water Management (In Russian),
W74-07768 4A

HYDROLOGIC CYCLE
Documentation of Prosper - A Model of Atmosphere-Soil-Plant Water Flow,
W74-07785 2A

HYDROLOGIC DATA
Water Resources Data for Nebraska, 1972: Part I. Surface-Water Records,
W74-07647 7C

Ground-Water Levels in Observation Wells in Kansas, 1966-70,
W74-07650 7C

Documentation of Prosper - A Model of Atmosphere-Soil-Plant Water Flow,
W74-07785 2A

Porosity-Resistivity Cross-Plotting,
W74-07900 8G

Hydrologic Data for 1972, Broward County, Florida,
W74-07918 7C

Data on Fresh-Water Inflow, April 14-July 28, 1973, For Analog-Model Study of the Houston Ship Channel, Houston, Texas,
W74-07921 7C

Application of Satellite Data for Hydrologic Purposes (Ispol'zovaniye sputnikovoy informatsii dlya gidrologicheskikh tseley),
W74-08049 7B

State Record Keeping on Water and Its Usage and Hydrologic Calculations and Forecasts (Gosudarstvennyy uchet vod i ikh ispol'zovaniya i gidrologicheskiye raschety i prognozy),
W74-08054 7A

HYDROLOGIC MODELS
Documentation of Prosper - A Model of Atmosphere-Soil-Plant Water Flow,
W74-07785 2A

HYDROLOGICAL STUDIES
Hydrological Investigations in Forest.
W74-08140 4C

HYDROLOGY
Meteorological and Hydrological Investiga
tions,
W74-07658 5E

International Cooperation of Hydrologist
(Mezhdunarodnoye sotrudnichestv
gidrologov),
W74-08047 7A

Problem of Rational Use and Conservation o
Water Resources and Goals of Hydrolog
(Problema ratsional'nogo ispol'zovaniya i ok
hrany vodnykh resursov i zadachi gidrologii),
W74-08055 6E

All-Union Hydrologic Congresse
(Vsesoyuznyye gidrologicheskiye syezdy),
W74-08056 6E

HYDROLYSIS
Effect of Monosilicic Acid on Hydrolytic Reac
tions of Aluminum,
W74-07626 2C

The Surface Catalyzed Hydrolysis of Parathio
on Kaolinite,
W74-07628 5E

Wastewater Treatment,
W74-08034 5D

HYPHOMYCETES
Tricladium varium, An Aquatic Hyphomycete
on Wood in Water-Cooling Towers,
W74-08011 2

ICE
Adhesion of Ice Frozen from Dilute Electrolyte
Solutions,
W74-07618 2C

Application of Electrical Energy to Culver
Icing Problems--A Laboratory Study,
W74-07909 8C

ICEBERGS
Icelandic Geothermal Activity and the Mercury
of the Greenland Icecap,
W74-07944 5B

IDAHO
Summary Report for a Methodology Study to
Develop Evaluation Criteria for Wild and
Scenic Rivers,
W74-07608 6B

Geology and Groundwater Resources of the
Hangman Creek Drainage Basin, Idaho-
Washington,
W74-07644 4A

A Ground-Water Monitoring Network for
Kootenai Flats, Northern Idaho,
W74-07662 7A

The Effects of River Fluctuations Resulting
from Hydroelectric Peaking on Selected
Aquatic Invertebrates,
W74-07830 2I

ILLINOIS
Analysis of Liquid-Waste Injection Wells in Il-
linois by Mathematical Models,
W74-07604 5B

Water Quality and Treatment of Domestic
Groundwater Supplies,
W74-07637 5F

Wells and Pumping Systems for Domestic
Water Supplies,
W74-07638 8B

Planning a Domestic Groundwater Supply System,
W74-07639 4B

Sediment Distribution in a Beach Ridge Complex and its Application to Artificial Beach Replenishment,
W74-07666 2J

The 7-Day 10-Year Low Flows of Illinois Streams,
W74-07677 2E

Quality of Surface Water in Illinois, 1966-1971,
W74-07678 5A

A Streamflow Model for Metropolitan Planning and Design,
W74-07721 2A

Chemical Engineering Division, Waste Management Programs, Quarterly Report, July-September 1973,
W74-07788 5D

Hydrologic Response of Ice-Covered Streams,
W74-07832 2E

LITE
Effect of Dilute Salt Solutions on Chernozem Soil Estimated Through the Hydration Properties of the Colloids,
W74-08135 2G

IPACT ANALYSIS
A Systems Approach to Assessment of Rural Water Supply Program Effectiveness,
W74-08012 6B

IPERIAL VALLEY (CALIF)
Deformation Moduli of Water-Bearing Formations at Elevated Temperatures,
W74-07726 4B

Effects of Colorado River Water Quality and Supply on Irrigated Agriculture,
W74-08014 3C

-PLANT SURVEYS
Industrial Liquid Waste Surveys: Training Manual.
W74-07988 5G

CINERATION
Cartmen Devises Technique for Disposing of 3.5 Million Gallons of Liquid Discards Annually.
W74-07762 5D

CONNU
Laboratory Rearing Experiments on Artifically Propagated Inconnu (Stenodus Leucichthys),
W74-07725 8I

DIA (CALCUTTA)
Hydrological Aspect of Surface Run-Off,
W74-07756 2A

DIANA
Ground-Water Resources of Montgomery County, Indiana,
W74-07645 2F

DUSTRIAL INNOVATION
Innovation: A Case Study,
W74-07720 6B

DUSTRIAL WASTES
Aerial Pollution and the Rapid Evolution of Copper Tolerance,
W74-07713 5B

The Treatment of Waste Water from Industries and Commerce in Public Purification Plants (in German),
W74-07748 5D

Social and Economic Factors in the Adoption by Industry of Water Pollution Control Measures in Minnesota,
W74-07834 5G

Industrial Liquid Waste Surveys: Training Manual.
W74-07988 5G

Industrial Waste Processing Apparatus,
W74-08035 5D

INDUSTRIAL WATER
Pricing of Industrial Wastewater Treatment Service,
W74-07727 5D

Industrial Application of Whitford's Demand Forecasting Procedure,
W74-08015 6D

The Potential of Desalting for Industrial Water Supplies in Northeastern Wyoming,
W74-08062 3A

INFILTRATION
Axisymmetric Infiltrations,
W74-07839 2G

Infiltration and Landfill Behavior,
W74-08083 5B

INFORMATION RETRIEVAL
Part I - A Conceptual Model for a Terrestrial Ecosystem Perturbed with Sewage Effluent, with Special Reference to the Michigan State University Water Quality Management Project; Part II - A Personalized Bibliographi c Retrieval Package for Resource Scientists,
W74-07606 5D

INFRA-RED STUDIES
Research - - Targets and Developments, Regional Assessments,
W74-07903 7B

INFRARED SPECTROSCOPY
Some Novel Complexes of Chromium(I),
W74-07946 5A

INHIBITORS
Investigations on the Problem of Solubility and Stability of Steroid Ovulation Inhibitors in Water, Waste Water and Activated Sludge, (In German),
W74-08133 5A

INJECTION
The Dispersion of Continuously Injected Effluents in Open Channels,
W74-07833 5B

INJECTION WELLS
Analysis of Liquid-Waste Injection Wells in Illinois by Mathematical Models,
W74-07604 5B

Reconnaissance of the Water Resources in the Vicinity of Proposed Deep-Well Injection Sites in Southeast Dade County, Florida,
W74-07915 5B

Injection Wells Pose a Potential Threat.
W74-08072 5B

INNOVATION
Innovation: A Case Study,
W74-07720 6B

INORGANIC COMPOUNDS
Transport and Transformation of Mercury in Nature and Possible Routes of Exposure,
W74-07682 5B

Symptoms and Signs of Intoxication,
W74-07684 5C

Inorganic Mercury-Relation Between Exposure and Effects,
W74-07686 5C

INSPECTION
Finding Answers to Corrosion Problems,
W74-07863 8G

INSTALLATION
Valve Installation, Operation and Maintenance,
W74-07867 8C

Pump Installation and Maintenance,
W74-07873 8C

INSTALLATION COSTS
Sand Control, (Part 4), Combinations, Comparisons, and Costs,
W74-07851 8A

INSTITUTIONS
State Organization for Water Resources Management,
W74-07733 6E

INSTRUMENTATION
Equipment and Instrumentation,
W74-07660 5B

Interdisciplinary Monitoring of the New York Bight,
W74-07764 5A

An Instrumental Technique for the Determination of Sub-Microgram Concentrations of Mercury in Soils, Rocks, and Gas,
W74-07948 2K

INTERNATIONAL HYDROLOGICAL DECADE
International Cooperation of Hydrologists (Mezhdunarodnoye sotrudnichestvo gidrologov),
W74-08047 7A

INUNDATION
Phytosociological Observations in Inundation Zone Farmlands in the Northern Upper Rhine Valley, (In German),
W74-08121 2I

INVENTION
Innovation: A Case Study,
W74-07720 6B

INVERTEBRATE
Invertebrate Fauna of the Bodies of Water of the Stationary 'Agapa' (Western Taimir). (in Russian),
W74-08110 2I

INVERTEBRATES
The Effects of River Fluctuations Resulting from Hydroelectric Peaking on Selected Aquatic Invertebrates,
W74-07830 2I

Aquatic Invertebrate Recovery in the Clinch River Following Hazardous Spills and Floods,
W74-07841 5C

ION ENTRAMPMENT
Fixation of Zinc by Clay Minerals,
W74-07629 2G

ION EXCHANGE
Reverse Osmosis Process and its Application, (In Japanese),
W74-07750 5D

The Removal of Soluble Mercury from Waste Water by Complexing Techniques,
W74-07845 5D

Foam Fractionation of Mercury(II) Nitro Complexes,
W74-07945 5A

Ionic Activity Coefficients in Water Solutions Calculated by Means of Nomographs,
W74-08093 2K

ION TRANSPORT
Anion Exclusion and Coupling Effects in Nonsteady Transport Through Unsaturated Soils: II. Laboratory and Numerical Experiments,
W74-07631 2G

Soil Moisture Transport in Arid Site Vadose Zones,
W74-07780 2G

High Temperature Electrodialysis, Phase I,
W74-08067 3A

High Temperature Electrodialysis, Phase II,
W74-08068 3A

IONIC SPECIES
Influence of Water Quality on the Corrosion and Electrochemical Behavior of Mild Steel in Synthetic Acid Mine Waters,
W74-07876 8G

IONS
Solvent Extraction of Selenium (IV) with 2-Thenoyltri-Fluoroacetone,
W74-07692 5A

Paper Chromatographic and Electrochromatographic Separation of Edta Complexes of Metal Ions,
W74-07693 5A

Effect of Radiation, Salinity and Temperature on the Ionic Regulation of the Blue Crab, Callinectes sapidus,
W74-07818 5C

Ionic Activity Coefficients in Water Solutions Calculated by Means of Nomographs,
W74-08093 2K

IRISH SEA
Radioecology of the Plaice (Pleuronectes platessa L) in the Northeast Irish Sea,
W74-07802 5C

IRON
Distribution of Free Iron and Organic Carbon as Related to Available Water in Some Forested Sandy Soils,
W74-07622 2G

The Use of Algal Assays for Determining the Effect of Iron and Phosphorus Compounds on the Growth of Various Algal Species,
W74-07776 5C

Distribution of ZN, FE, MN, and SR in Marine Fishes of Different Feeding Habits,
W74-07801 5C

Concentrations of Manganese, Iron, and Zinc in Juveniles of Five Estuarine-Dependent Fishes,
W74-07803 5C

Iron and Associated Trace Mineral Problems in Man and Animals,
W74-07950 2K

Sanitary-Hygienic Evaluation of the Water Quality of the Nura Water Conduit of the Tselinograd District (In Russian),
W74-08052 5A

IRRIGATION
Irrigation of Citrus with Citrus Waste Water,
W74-07603 5D

Studies on the Influence of Irrigation and Different Doses of N, P and K on the Flowering Behaviour and Absorption of Nutrient Elements in Muskmelon (Cucumis melo L.),
W74-08144 3F

IRRIGATION DESIGN
Irrigation Well Construction.
W74-07897 8A

IRRIGATION EFFECTS
The Significance of Rainfall on Salt and Sodium Accumulations Under Irrigation,
W74-07743 3C

IRRIGATION PRACTICES
'Hill-Top Irrigation,' A New System for Early Sweetpotato Planting, (In Spanish),
W74-08136 3F

IRRIGATION SYSTEMS
Economic Optimization and Simulation Techniques for Management of Regional Water Resource Systems,
W74-07714 6A

IRRIGATION WATER
Agricultural Water Supply,
W74-07969 6D

Effects of Colorado River Water Quality and Supply on Irrigated Agriculture,
W74-08014 3C

Optimal Conjunctive Use Model for Indus Basin,
W74-08059 4B

IRRIGATION WELLS
South Dakota Standards for Construction of Irrigation Wells in Shallow Unconsolidated Glacial Sediments,
W74-07896 8A

Irrigation Well Construction.
W74-07897 8A

ISOTOPE FRACTIONATION
Uranium, Thorium, and Lead Concentrations in Three Silicate Standards and a Method of Lead Isotopic Analysis,
W74-07947 2K

ITALY (RIVER PO)
Study on the Periphytic Colonizations of a Lateral Environment of the River Po(Italy), (In Italian),
W74-07702 2I

JAMES RIVER ESTUARY (VA
A Stochastic Model for the James,
W74-07843 5B

JAPAN
The Relationships Between Soil Water and Engineering Properties of the Clayey Soils, (In Japanese),
W74-07679 2G

JAPAN (KOBE)
Reverse Osmosis Process and its Application, (In Japanese),
W74-07750 5D

JAPAN (TOKYO BAY)
Results of Red Tide Formation in Tokyo Bay.
W74-07770 5C

JETS
Hydraulics of Culvert Outlets,
W74-07749 8B

Test Results on Buoyant Jets Injected Horizontally in a Cross Flowing Stream,
W74-07766 8B

Water Jet Cutting of Sedimentary Rock,
W74-07883 8B

JOINT TREATMENT
The Treatment of Waste Water from Industries and Commerce in Public Purification Plants (in German),
W74-07748 5D

KANSAS
Ground-Water Levels in Observation Wells in Kansas, 1966-70,
W74-07650 7C

Outlet Works Stilling Basins, Clinton and Fort Scott Dams, Wakarusa and Marmaton Rivers, Kansas,
W74-07930 8A

KAOLINITE
The Surface Catalyzed Hydrolysis of Parathion on Kaolinite,
W74-07628 5B

KARST HYDROLOGY
Hydrology of Limestone Karst in Greenbrier County, West Virginia,
W74-07908 2F

KENTUCKY
Seasonal Changes in Water Quality and Primary Productivity in Doe Valley Lake,
W74-07605 5C

KINETICS
Adsorption from Aqueous Solution,
W74-07739 5D

Modeling Radionuclides and Pesticides in Food Chains,
W74-07810 5B

KOOTENAI FLATS (IDAHO)
A Ground-Water Monitoring Network for Kootenai Flats, Northern Idaho,
W74-07662 7A

LABORATORIES
Fractionation of Suspended and Colloidal Particles in Natural Water,
W74-07783 5A

LABORATORY ANIMALS
The LD(50) Value of Tetraethyl Lead,
W74-07700 5C

Tetraethyl Lead Dose Response Curve for Mortality in Laboratory Rats,
W74-07701 5C

LABORATORY TESTS
'Normal' Concentrations of Mercury in Human Tissue and Urine,
W74-07685 5C

LAKE CARL BLACKWELL (OKLA
Phytoplankton Community Structure and Nutrient Relationships in Lake Carl Blackwell, Oklahoma,
W74-07992 2H

LAKE CHAMPLAIN (VT
Pollution Monitoring in Lake Champlain Using ERTS-1 Imagery,
W74-08009 5A

LAKE ERIE
Final Environmental Statement Related to the Proposed Perry Nuclear Power Plant, Units 1 and 2.
W74-07793 5A

LAKE MICHIGAN
Investigation of the Sediments and Potential Manganese Nodule Resources of Green Bay, Wisconsin,
W74-07652 2J

Sediment Distribution in a Beach Ridge Complex and its Application to Artificial Beach Replenishment,
W74-07666 2J

Seasonal and Spatial Changes in Primary Production and Nutrients in Lake Michigan,
W74-07773 5C

Distribution of Phosphorus, Silica, Chlorophyll a, and Conductivity in Lake Michigan and Green Bay,
W74-08000 5C

LAKE MORPHOLOGY
Present and Future of Lake Sevan (Sovremennoye sostoyaniye i budushcheye ozera Sevan),
W74-08048 2H

LAKE MORPHOMETRY
Present and Future of Lake Sevan (Sovremennoye sostoyaniye i budushcheye ozera Sevan),
W74-08048 2H

LAKE PONCHARTRAIN (LA
Ecological Factors Affecting Anadromous Fishes of Lake Ponchartrain and Its Tributaries,
W74-07993 2H

LAKE STAGES
Seasonal Changes in Water Quality and Primary Productivity in Doe Valley Lake,
W74-07605 5C

LAKES
An Investigation of the Water Quality and Productivity of Polson Bay, Flathead Lake, Montana,
W74-07717 5C

Determining a Recreational Lake's Tolerance for Development and Usage,
W74-07836 5A

Ecology of the Eulittoral Zone of Lakes,
W74-08003 5C

LAMELLAE
A Scanning Electron Microscopic Study of Secondary Lamellae and Chloride Cells of Rainbow Trout (Salmo gairdneri),
W74-08096 5C

LANAI ISLAND (H
Optimum Drilling Sites for Ground-Water Development on the East Coast of Lanai Island,
W74-07734 4B

LAND DISPOSAL
Part I - A Conceptual Model for a Terrestrial Ecosystem Perturbed with Sewage Effluent, with Special Reference to the Michigan State University Water Quality Management Project; Part II - A Personalized Bibliographi c Retrieval Package for Resource Scientists,
W74-07606 5D

LAND DISPOSAL (WASTES)
Biodegradation of Nitrilotriacetate (NTA) in Soils,
W74-07624 5B

Hydrobiochemical Effects of Spraying Waste-Treatment Effluent in St. Petersburg, Florida,
W74-07978 5C

LAND USE
The Environmental Context,
W74-07696 5C

Water Resources Management for Metropolitan Washington: Analysis of the Joint Interactions of Water and Sewage Service, Public Policy and Land Development Patterns in an Expanding Metropolitan Area.
W74-07723 6B

Appendices to Water Resources Management for Metropolitan Washington: Analysis of the Joint Interactions of Water and Sewage Service, Public Policy, and Land Development Patterns in an Expanding Metropolitan Area.
W74-07724 6B

LANDFILLS
Hydrogeologic Investigation of a Sanitary Landfill in Stratified Glacial Drift,
W74-07728 5B

Infiltration and Landfill Behavior,
W74-08083 5B

Leachate Treatment by Coagulation and Precipitation,
W74-08091 5D

LANDSLIDES
Ranger Submarine Slide, Northern Sebastian Vizcaino Bay, Baja California, Mexico,
W74-07938 2J

LARVAE MORTALITY
Environmental Stress in the Pasture Scarab Sericesthis nigrolineata Boisd.: Mortality in Larvae Caused by High Temperature,
W74-08146 5C

LEACHING
Nitrogen Transformations in Soil During Leaching: I. Theoretical Considerations,
W74-07619 5B

Nitrogen Transformation in Soil During Leaching: II. Steady State Nitrification and Nitrate Reduction,
W74-07620 5B

Nitrogen Transformations in Soil During Leaching: III. Nitrate Reduction in Soil Columns,
W74-07621 5B

Nitrogen Transformations During Continuous Leaching,
W74-07623 5B

Anion Exclusion and Coupling Effects in Nonsteady Transport Through Unsaturated Soils: II. Laboratory and Numerical Experiments,
W74-07631 2G

Leaching Requirement Studies: Sensitivity of Alfalfa to Salinity of Irrigation and Drainage Waters,
W74-07774 3C

Effect of the Moisture and Temperature on the Leaching of Ash Elements from Plant Residues (in Russian),
W74-08016 2I

Recovery, Residual Effects, and Fate of Nitrogen Fertilizer Sources in a Semiarid Region,
W74-08086 5B

Quality of Drainage Water From a Heavy-Textured Soil,
W74-08088 5B

Leachate Treatment by Coagulation and Precipitation,
W74-08091 5D

LEAD
The Distribution of Lead in Human Deciduous Teeth,
W74-07691 5C

The LD(50) Value of Tetraethyl Lead,
W74-07700 5C

Tetraethyl Lead Dose Response Curve for Mortality in Laboratory Rats,
W74-07701 5C

Lead Detection in Living Plant Tissue Using a New Histochemical Method,
W74-07711 5A

Reduction of Lead Absorption from the Intestine in Newborn Rats,
W74-07953 5C

LEGISLATION
Groundwater Pollution Features of Federal and State Satutes and Regulations,
W74-07614 5G

The Environmental Context,
W74-07696 5C

Federal Laws and Regulations,
W74-07703 5G

A Bill to Authorize the Secretary of the Interior to Engage in Feasibility Investigations of Certain Potential Water Resource Developments.
W74-07943 6E

LETHAL LIMIT
The LD(50) Value of Tetraethyl Lead,
W74-07700 5C

LEUKEMIA MORBIDITY
Environmental Factors of Leukemia Morbidity, (In Polish),
W74-07999 5C

LEVEES
Induced Safety Algorithm for Hydrologic Design under Uncertainty,
W74-08017 6A

LIFE HISTORY STUDIES
The Biology and Ecology of River Carpsucker, Carpiodes Carpio (Rafinesque), in the Little Missouri Arm of Lake Sakakawea, North Dakota,
W74-07991 2H

LIGNINSULFONATE
Method of Treating Waste Water Containing Ligninsulfonate,
W74-08029 5D

LIME
Lime Stabilization of Primary Sludges,
W74-07760 5D

LIME GROUT PENETRATION
Lime Grout Penetration and Associated Moisture Movements in Soil,
W74-07871 8D

LIME TREATMENT
Activated Silica in Wastewater Coagulation,
W74-07738 5D

LIMESTONE
Water Jet Cutting of Sedimentary Rock,
W74-07883 8B

LIMNOLOGICAL STUDIES
Limnological Observations on the 'National Watersportbaan Georges Nachez' at Ghent in 1968, 1969, 1970 and 1971,
W74-08113 5C

LIMNOLOGY
Determining a Recreational Lake's Tolerance for Development and Usage,
W74-07836 5A

LINDANE
Factors Controlling the Dynamics of Non-Ionic Synthetic Organic Chemicals in Aquatic Environments,
W74-07831 5B

LIQUID OXYGEN
Oxygenation of Aqueous Bodies Using Liquid Oxygen-Loxination,
W74-07741 5D

LIQUID WASTES
Cartmen Devises Technique for Disposing of 3.5 Million Gallons of Liquid Discards Annually.
W74-07762 5D

Industrial Liquid Waste Surveys: Training Manual.
W74-07988 5G

LITHOLOGIC LOGS
37 Ways to Improve Your Well Completions,
W74-07870 8G

LITTER
Structure and Function of Hardwood Litter and Soil Subsystems After Chronic Gamma Irradiation, I. Mesofauna, Nitrogen, and Total Soil Respiration,
W74-07824 5C

LITTLE RIVER BASIN (LA)
Water Resources of the Little River Basin, Louisiana,
W74-07671 4A

LITTORAL
Ecology of the Eulittoral Zone of Lakes,
W74-08003 5C

LITTORAL DRIFT
The Effects of River Fluctuations Resulting from Hydroelectric Peaking on Selected Aquatic Invertebrates,
W74-07830 2I

LIVESTOCK
Automatic Pumping Installations for Livestock Sections,
W74-07864 8C

LOBSTER HOLDING TANKS
A Water Quality Problem in Lobster Holding Tanks,
W74-07983 8I

LOBSTERS
A Water Quality Problem in Lobster Holding Tanks,
W74-07983 8I

LOGGING (RECORDING)
Recent Advances in Log Evaluation,
W74-07853 8G

Location and Characteristics of the Interface Between Brine and Fresh Water from Geophysical Logs of Boreholes in the Upper Brazos River Basin, Texas,
W74-07859 8B

Casing Potential Logging Related to Vertilog Corrosion Logging,
W74-07868 8G

37 Ways to Improve Your Well Completions,
W74-07870 8G

Solving Drilling Problems Utilizing Well Logs - A Case History,
W74-07898 8G

LONG-TERM PLANNING
Improved Dynamic Programing Procedures and Their Practical Application to Water Resource Systems,
W74-08013 6A

LOS ANGELES (CALIF
Optimal Timing and Sizing of a Conjunctive Urban Water Supply and Waste Water System with Nonlinear Programming,
W74-08010 5D

LOUISIANA
Water Resources of the Little River Basin, Louisiana,
W74-07671 4A

Experiments to Re-establish Historical Oyster Seed Grounds and to Control the Southern Oyster Drill,
W74-07982 8I

LOW FLOW
The 7-Day 10-Year Low Flows of Illinois Streams,
W74-07677 2E

A Summary of Quantity, Quality and Economic Methodology for Establishing Minimum Flows,
W74-07847 6B

LYMNAEA-SPP
Toxicity of an Algal Complex on Freshwater Fauna: 2. Action on Lymnaea Spp. (in French).
W74-08109 5C

LYSIMETERS
Leaching Requirement Studies: Sensitivity of Alfalfa to Salinity of Irrigation and Drainage Waters,
W74-07774 3C

MAINTENANCE
Pump Installation and Maintenance,
W74-07873 8C

Commercial Desalting Plant Data and Analysis Volumes I-VI.
W74-08061 3A

MAINTENANCE COSTS
Valve Installation, Operation and Maintenance
W74-07867 8C

MANAGEMENT
Water Resources Management for Metropolitan Washington Analysis of the Joint Interaction of Water and Sewage Service, Public Policy and Land Development Patterns in an Expanding Metropolitan Area.
W74-07723 6E

Management Priorities Now and the Future.
W74-07755 6E

MANGANESE
Investigation of the Sediments and Potential Manganese Nodule Resources of Green Bay Wisconsin,
W74-07652 2

Distribution of ZN, FE, MN, and SR in Marine Fishes of Different Feeding Habits,
W74-07801 5C

Concentrations of Manganese, Iron, and Zinc in Juveniles of Five Estuarine-Dependent Fishes,
W74-07803 5C

Correlations Between P, Fe and Mn Availability in Water-Logged Soil at Different Fertility Levels,
W74-08134 2G

MANNINGS EQUATION
Hydraulics of Culvert Outlets,
W74-07749 8E

MAPPING
Coastal Vegetation of Delaware,
W74-07616 2I

MAPS
Quantity and Quality of Surface Water in Marion County, Florida,
W74-08044 7C

MARINE ALGAE
A Preliminary Check-List of the Marine Algae of the Moss Landing Jetty: An Annotated Floristic Compilation,
W74-07981 5C

MARINE ANIMALS
Effects of Gamma Irradiation on the Reproductive Performance of Artemia as Determined by Individual Pair Matings,
W74-07822 5C

The Effects of Crude Oil Pollution on the Behavior of Marine Invertebrates,
W74-07987 5C

MARKOV PROCESSES
Optimization of Stochastic Storage Model Formulated by P.A.P. Moran, and Z. Kaczmarek (Optymalizaeja stochastycznych modeli retencjonwania podanych przes P.A.P. Moran i Z. Kaczmarka),
W74-07747 4A

MARYLAND
Chester River Study, Volumes I, II, and III.
W74-07653 5I

Biochemical Investigations,
W74-07654 5I

Trace Metals Investigations,
W74-07655 5B

Biological Investigations,
W74-07656 5B

Geological Investigations,
W74-07657 5B

Meteorological and Hydrological Investigations,
W74-07658 5B

Equipment and Instrumentation,
W74-07660 5B

Progress in Ecological Research at Edgewood Arsenal, Maryland: Fiscal Years 1971 and 1972,
W74-07986 5C

MASS-TRANSPORT EQUATION
Analysis of Liquid-Waste Injection Wells in Illinois by Mathematical Models,
W74-07604 5B

MASS WASTING
Ranger Submarine Slide, Northern Sebastian Vizcaino Bay, Baja California, Mexico,
W74-07938 2J

MASSACHUSETTS
Effect of Deicing Chemicals on Ground and Surface Water--(Modus Operandi),
W74-07617 5B

Pleistocene-Holocene Sediments Interpreted by Seismic Refraction and Wash-Bore Sampling, Plum Island-Castle Neck, Mass.,
W74-07875 2L

MATERIALS
Corrosion Resistance of Piping and Construction Materials,
W74-07888 8G

MATERIALS ENGINEER
Learn the Basics of Corrosion Control,
W74-07892 8G

MATHEMATICAL MODELS
Analysis of Liquid-Waste Injection Wells in Illinois by Mathematical Models,
W74-07604 5B

Estimation of Imperviousness and Specific Curb Length for Forecasting Stormwater Quality and Quantity,
W74-07640 5B

Adsorption from Aqueous Solution,
W74-07739 5D

Optimization of Stochastic Storage Models Formulated by P.A.P. Moran, and Z. Kaczmarek (Optymalizaeja stochastycznych modeli retencjonwania podanych przes P.A.P. Morana i Z. Kaczmarka),
W74-07747 4A

Process Control Model for Oxygen Regeneration of Polluted Rivers, Phases IV and V, and Spacially and Temporally Distributed Discharge of Effluents in Estuaries,
W74-07837 5B

Some Climatological Characteristics of Seedable Upslope Cloud Systems in the High Plains,
W74-07929 3B

Ground-Water Quality Models: What They Can and Cannot Do,
W74-07933 5B

Application of Remote Sensing to Hydrology--Final Technical Report,
W74-07940 2A

A Prediction of Changes in the Thermal Cycle of a Stratified Lake Used to Cool a 1000 MW Power Plant,
W74-07998 5C

Oxygen Depletion Model for Cayuga Lake,
W74-08007 5C

Mathematical Model for Post Aeration,
W74-08045 5D

Optimal Conjunctive Use Model for Indus Basin,
W74-08059 4B

Dam Collapse Wave in a River,
W74-08060 2E

MATHEMATICAL STUDIES
Hydraulics of Culvert Outlets,
W74-07749 8B

A Simple Method for Retention Basin Design,
W74-07753 5D

Test Results on Buoyant Jets Injected Horizontally in a Cross Flowing Stream,
W74-07766 8B

Hydrology and Structural Design (In Russian),
W74-07767 8B

Mathematical Model of Tritiated and Stable Water Movement in an Old-Field Ecosystem,
W74-07812 5B

MEANDERS
Evolution of Meander Loops,
W74-07661 2J

MEASUREMENT
Methods of Analysis,
W74-07681 5A

Trace Metals in Atmospheric Particulates and Atomic Absorption Spectroscopy,
W74-07705 5A

Interdisciplinary Monitoring of the New York Bight,
W74-07764 5A

Soil Moisture Transport in Arid Site Vadose Zones,
W74-07780 2G

Radioactivity of Nevada Hot-Spring Systems,
W74-07786 5A

Theory and Application of Continuous Monitoring for Chemical Research in Natural Water Systems,
W74-07985 5A

MELTING
Application of Electrical Energy to Culvert Icing Problems--A Laboratory Study,
W74-07909 8C

MEMBRANE PROCESS
High Temperature Electrodialysis, Phase II,
W74-08068 3A

MEMBRANE PROCESSES
Reverse Osmosis Process and its Application, (In Japanese),
W74-07750 5D

High Temperature Electrodialysis, Phase I,
W74-08067 3A

High Temperature Electrodialysis, Phase III,
W74-08069 3A

High Temperature Electrodialysis, Phase IV,
W74-08070 3A

MEMBRANES
Cellulosic Reverse Osmosis Membranes Having High Flux and High Salt Rejection,
W74-08022 3A

System for Reversed Osmosis,
W74-08037 5D

MERCURY
Mercury in the Environment, An Epidemiological and Toxicological Appraisal.
W74-07680 5C

Methods of Analysis,
W74-07681 5A

Transport and Transformation of Mercury in Nature and Possible Routes of Exposure,
W74-07682 5B

Metabolism,
W74-07683 5B

Symptoms and Signs of Intoxication,
W74-07684 5C

'Normal' Concentrations of Mercury in Human Tissue and Urine,
W74-07685 5C

Inorganic Mercury-Relation Between Exposure and Effects,
W74-07686 5C

Organic Mercury Compounds-Relation Between Exposure and Effects,
W74-07687 5C

Genetic Effects,
W74-07688 5C

General Discussion and Conclusions-Need for Further Research,
W74-07689 5C

Methods of Mercurometric Investigations,
W74-07695 5A

Mercury Analysis by Atomic Absorption Spectrophotometry,
W74-07704 5A

The Determination of Mercury in Air Samples and Biological Materials,
W74-07710 5A

Biological Half-Lives for Zinc and Mercury in the Pacific Oyster, Crassostrea gigas,
W74-07807 5C

The Removal of Soluble Mercury from Waste Water by Complexing Techniques,
W74-07845 5D

Icelandic Geothermal Activity and the Mercury of the Greenland Icecap,
W74-07944 5B

Foam Fractionation of Mercury(II) Nitro Complexes,
W74-07945 5A

An Instrumental Technique for the Determination of Sub-Microgram Concentrations of Mercury in Soils, Rocks, and Gas,
W74-07948 2K

MERCURY

Determination of Mercury in Vegetation with Dithizone - A Single Extraction Procedure,
W74-07949 5A

Organo-Mercury Fungicide Treatment of Sugar-Beet Seed,
W74-07951 5B

Smelter Gases Yield Mercury,
W74-07956 5D

METABOLISM

Metabolism,
W74-07683 5B

Polyacrylamide Gel Disc Electrophoresis of Rat Bile after Intravenous Administration of 52 MnC12, 64CuC12, 203HgC12 and 210 Pb(N03)2,
W74-07694 5C

Effect of Ascorbic Acid on Cadmium Toxicity in the Young Coturnix,
W74-07707 5C

Influence of Dietary and Injected Selenium on Whole-Body Retention, Route of Excretion, and Tissue Retention of 75SeO3 (--) in the Rat,
W74-07708 5C

Endogenous Zinc Excretion and 65Zinc Metabolism in Holstein Calves Fed Intermediate to High But Nontoxic Zinc Levels in Practical Diets,
W74-07954 5C

METAL PLATING INDUSTRY

Process for Treating Water Contaminated with Hexavalent Chromium,
W74-08024 5D

METALS

Paper Chromatographic and Electrochromatographic Separation of Edta Complexes of Metal Ions,
W74-07693 5A

Metals Focus Shifts to Cadmium,
W74-07697 5B

Analysis of Trace Metal Particulates in Atmospheric Samples Using X-Ray Fluorescence,
W74-07709 5A

Some Novel Complexes of Chromium(I),
W74-07946 5A

Tissue Sulfhydryl Groups in Selenium-Deficient Rats and Lambs,
W74-07952 5B

Process for Treating Water Contaminated with Hexavalent Chromium,
W74-08024 5D

METASTABLE SOLUTIONS

Evaluation of Scaling Tendencies,
W74-07893 8G

METEOROLOGICAL DATA

Precipitation Characteristics of the Northern New Jersey, New York City Metropolitan Area,
W74-07607 2B

METEOROLOGY

Meteorological and Hydrological Investigations,
W74-07658 5B

Some Climatological Characteristics of Seedable Upslope Cloud Systems in the High Plains,
W74-07929 3B

METHANE

Gradient Analysis of Carbon Monoxide and Methane in Polluted and Other Nearshore Habitats,
W74-07984 5A

METHODOLOGY

Summary Report for a Methodology Study to Develop Evaluation Criteria for Wild and Scenic Rivers,
W74-07608 6B

Hydrological Forecasting and Water Management (In Russian),
W74-07768 4A

METROPOLITAN STUDIES

A Streamflow Model for Metropolitan Planning and Design,
W74-07721 2A

METROPOLITAN WASHINGTON

Water Resources Management for Metropolitan Washington: Analysis of the Joint Interactions of Water and Sewage Service, Public Policy and Land Development Patterns in an Expanding Metropolitan Area.
W74-07723 6B

Appendices to Water Resources Management for Metropolitan Washington: Analysis of the Joint Interactions of Water and Sewage Service, Public Policy, and Land Development Patterns in an Expanding Metropolitan Area.
W74-07724 6B

MEXICO

Ranger Submarine Slide, Northern Sebastian Vizcaino Bay, Baja California, Mexico,
W74-07938 2J

MICHIGAN

Environmental Control of Nitrogen Fixation in Lakes, I. In situ Nitrogen Fixation by Free Living Blue-Green Algae, and II. Nitrogen Fixation by the Duckweed-Algal Association,
W74-07716 5C

MICRITE

Microporosity in Carbonate Rocks,
W74-07861 4B

MICRO ORGANISMS

Investigations on the Occurrence of Phenol-Decomposing Microorganisms in Waters and Sediments. (in German),
W74-08115 5C

MICROBIAL ACTIVITY

Effect of Humidity and Temperature on Microbial Activity in Moor Peat Soils, (In Russian),
W74-08089 2G

MICROBIT DRILLING

Effect of Bentonitic Fluid Properties on Drilling Rate,
W74-07879 8B

MICROORGANISMS

Structure and Function of Hardwood Litter and Soil Subsystems After Chronic Gamma Irradiation. II. Microfungi,
W74-07825 5C

MICROPOROSITY

Microporosity in Carbonate Rocks,
W74-07861 4B

MICROSTRAINERS

Corrosive Effects of Potable Water,
W74-07886 8G

MILD STEEL

Influence of Water Quality on the Corros
and Electrochemical Behavior of Mild Stee
Synthetic Acid Mine Waters.
W74-07876

MILK

Iodine-129 Levels in Milk and Water Nea
Nuclear Fuel Reprocessing Plant,
W74-07798

MILL WATER SYSTEMS

Prevention of Calcium Carbonate Scale Depo
tion in Mill Water Systems.
W74-07848

MINE DRAINAGE

Mine Drainage Pollution Control Via Reve
Osmosis,
W74-07881

MINE WASTES

Processes, Procedures, and Methods to Cont
Pollution from Mining Activities
W74-07927

MINE WATER

Mine Drainage Pollution Control Via Reve
Osmosis,
W74-07881

Processes, Procedures, and Methods to Cont
Pollution from Mining Activities.
W74-07927

MINERAL WATER

Use of Morshin Mineral Water in Disease
the Liver and Biliary Tracts in Children,
Ukrainian),
W74-08101

MINERALS

Variations in Potassium Content of Alfa
Grown on Pseudogley Soil Depending
Mineral Fertilizing, (In Serbo-Creation),
W74-08097

Effectiveness of Mineral Fertilizers Dur
Cotton Cultivating Depending on Soil Humi
ty, (In Azerbaijanian),
W74-08099

MINNESOTA

Carbon Measurements in Water Quality Mo
toring,
W74-07641

Social and Economic Factors in the Adopti
by Industry of Water Pollution Control M
sures in Minnesota,
W74-07834

MISSISSIPPI

Outlet Works, Stilling Basin for Tallahala Da
Tallahala Creek, Mississippi,
W74-07925

MISSOURI RIVER

An Ecological Study of the Missouri Riv
Prior to Channelization,
W74-07744

MISSOURI RIVER BASIN

Regional Energy-Water Problems, Misso
River,
W74-07974

MIXING

Heterogeneities in Salinity in a River Plume,
W74-07672

ig Eddies and Mixing Processes in the Great akes,
74-07926 5B

BILE BAY (ALA)
se of Fluorescent Dye Tracers in Mobile Bay,
74-07642 5B

DEL STUDIES
Simple, Segmented Prism Model of Tidal ixing in Well-Mixed Estuaries,
74-07673 2L

ppendices to Water Resources Management r Metropolitan Washington: Analysis of the int Interactions of Water and Sewage Ser-ce, Public Policy, and Land Development atterns in an Expanding Metropolitan Area.
74-07724 6B

hree-Dimensional Zone Model Log Interpreta-on,
74-07735 8G

ptimization of Stochastic Storage Models ormulated by P.A.P. Moran, and Z. Kacz-arek (Optymalizaeja stochastycznych modeli tencjonwania podanych przes P.A.P. Morana Z. Kaczmarka),
74-07747 4A

ydrological Aspect of Surface Run-Off,
74-07756 2A

ocumentation of Prosper - A Model of At-osphere-Soil-Plant Water Flow,
74-07785 2A

lodeling Radionuclides and Pesticides in Food hains,
74-07810 5B

lathematical Model of Tritiated and Stable ater Movement in an Old-Field Ecosystem,
74-07812 5B

lodels of Matter Flow in a Southern Mixed ardwood Forest in Florida: Preliminary esults,
74-07813 5B

ydrologic Models of the Great Lakes,
74-07826 2H

he Dispersion of Continuously Injected Ef-uents in Open Channels,
74-07833 5B

xisymmetric Infiltrations,
74-07839 2G

ata on Fresh-Water Inflow, April 14-July 28, 973, For Analog-Model Study of the Houston hip Channel, Houston, Texas,
74-07921 7C

pplication of Remote Sensing to Hydrology--inal Technical Report,
74-07940 2A

he State of the System (SOS) Model: Measur-g Growth Limitations Using Geological Con-epts,
74-07958 6G

ational Weather Service River Forecasting ystem,
74-08057 4A

ISTURE EQUILIBRIUM
he Significance of Moisture Flow and quilibria in Unsaturated Soils in Relation to the Design of Engineering Structures Built on Shallow Foundations in Australia,
W74-07899 8D

MOISTURE FLOW
The Significance of Moisture Flow and Equilibria in Unsaturated Soils in Relation to the Design of Engineering Structures Built on Shallow Foundations in Australia,
W74-07899 8D

MOLLUSKS
Molluscan Mortality Studies,
W74-07995 8I

The Freshwater Mollusks From the Dune Area North of the Hague,
W74-07996 2H

Fluctuations in Gulf of Maine Sea Temperature and Specific Molluscan Abundance,
W74-08145 2I

MONITORING
Polluted Groundwater: Some Causes, Effects, Controls, and Monitoring.
W74-07615 5B

Carbon Measurements in Water Quality Monitoring,
W74-07641 5A

Interdisciplinary Monitoring of the New York Bight,
W74-07764 5A

Bacteriological Water Quality Data, Beach Areas, Gatineau Park Lakes, National Capital Commission, 1973,
W74-07932 5B

Pollution Monitoring in Lake Champlain Using ERTS-1 Imagery,
W74-08009 5A

MONOSILICIC ACID
Effect of Monosilicic Acid on Hydrolytic Reactions of Aluminum,
W74-07626 2G

MONTANA
Annual Peak Discharges from Small Drainage Areas in Montana, Through September 1972,
W74-07667 2E

An Investigation of the Water Quality and Productivity of Polson Bay, Flathead Lake, Montana,
W74-07717 5C

Testacea (Protozoa: Sarcodina) as Indicators of Water Quality in Western Montana,
W74-07718 5A

The Fate and Effects of Pesticides in the Aquatic Environment of the Flathead Lake Drainage Area,
W74-07835 5C

MONTGOMERY COUNTY (IND)
Ground-Water Resources of Montgomery County, Indiana,
W74-07645 2F

MONTMORILLONITE
Adsorption of Fenuron and Monuron (Substituted Ureas) by Two Montmorillonite Clays,
W74-07627 5B

Effect of Dilute Salt Solutions on Chernozem Soil Estimated Through the Hydration Properties of the Colloids,
W74-08135 2G

MOROCCO (BOU REGREG DAM)
Dam Collapse Wave in a River,
W74-08060 2E

MORTALITY
Effects of Crude Oil and Some of its Components on Young Coho and Sockeye Salmon,
W74-07613 5C

Tetraethyl Lead Dose Response Curve for Mortality in Laboratory Rats,
W74-07701 5C

Molluscan Mortality Studies,
W74-07995 8I

MORTALITY (FISH)
Limnological Observations on the 'National Watersportbaan Georges Nachez' at Ghent in 1968, 1969, 1970 and 1971,
W74-08113 5C

MOSITURE TENSION
The Relationships Between Soil Water and Engineering Properties of the Clayey Soils, (In Japanese),
W74-07679 2G

MOSQUITOES
Effects of Chrome Radiation Exposure On Mosquitoes (Diptera: Culicidae). 1. Effects of Rearing in Sr-90 + Y-90 Solutions,
W74-07821 5C

MOSS
The Moss Vegetation of the Forests in the Rhine Lowland Between Basel and Mannheim, (In German),
W74-08131 2I

MOSS LANDING (CALIF
A Preliminary Check-List of the Marine Algae of the Moss Landing Jetty: An Annotated Floristic Compilation,
W74-07981 5C

MOSSES
Zonation of Mosses on the Banks of the Novy Cepsky Pond. (in Czech.),
W74-08119 2H

MUD
Water Treatment Mud Decanting Tank,
W74-08042 5F

MULLICA RIVER (NJ)
Geology and Water Resources of the Wharton Tract and the Mullica River Basin in Southern New Jersey,
W74-07668 4B

MUNICIPAL WATER
Improving Municipal Water Supplies in Arizona by Desalting,
W74-08063 3A

Potential Contribution of Desalting Systefs to Municipal Water Quality and Supply in South Dakota.
W74-08064 3A

MUSKMELON
Studies on the Influence of Irrigation and Different Doses of N, P and K on the Flowering Behaviour and Absorption of Nutrient Elements in Muskmelon (Cucumis melo L.),
W74-08144 3F

MUSKRAT
Destruction Trials of the Muskrat, Ondatra Zibethica L., in Ponds Using Poisoning Rafts, (In French),
W74-08128 5G

MUSSELS
Accumulation Phenomenon Which takes Place in a Mussel (Mytilus galloprovincialis LMK) Grown in an Artificially Polluted Environment, Verification of a Simplified Model of the Dynamic Equilibrium of Metal Ripartition Between Mussels and Sea-Water, Note II-Pollution from Copper, (Fenomeno di Accumulo Nel Mitilo (Mytilus galloprovincia-Lis LMK) Stabulato in Ambiente Artificialmente Inquinato. Verifica di un Modello Semplificato per L'equilibr io Dinamico di Ripartizione del Metalli fra Mitilo e Acqua Marina, Nota II: Inquinamento da rame),
W74-07746 5C

MYA ARENARIA
The Effects of the Maryland Hydraulic Clam Dredge on Populations of the Soft-Shell Clam, 'Mya Arenaria,'
W74-07994 8I

NATIONAL ENVIRONMENTAL POLICY ACT (NEPA)
Federal Laws and Regulations,
W74-07703 5G

NATURAL GAS
Project Rio Blanco Spall Measurements Data Report,
W74-07797 4B

NATURAL RESOURCES
Uranium-234,
W74-07790 5B

NATURAL WATERS
Fractionation of Suspended and Colloidal Particles in Natural Water,
W74-07783 5A

NEBRASKA
Water Resources Data for Nebraska, 1972: Part I. Surface-Water Records,
W74-07647 7C

Drainage Area and River Mileage of Nebraska Streams: Part 1--Salt and Weeping Water Creeks, Big and Little Nemaha Rivers, and Minor Streams in Southeastern Nebraska,
W74-07669 2E

NETHERLANDS (HAGUE)
The Freshwater Mollusks From the Dune Area North of the Hague,
W74-07996 2H

NEUTRALIZATION
Reverse Osmosis-Neutralization Process for Treating Mineral Contaminated Waters,
W74-08041 5D

NEUTROLYSIS
Mine Drainage Pollution Control Via Reverse Osmosis,
W74-07881 5D

NEVADA
Radioactivity of Nevada Hot-Spring Systems,
W74-07786 5A

The Future Role of Desalting in Nevada,
W74-08065 3A

NEW HAMPSHIRE
Determining a Recreational Lake's Tolerance for Development and Usage,
W74-07836 5A

NEW JERSEY
Geology and Water Resources of the Wharton Tract and the Mullica River Basin in Southern New Jersey,
W74-07668 4B

Process Control Model for Oxygen Regeneration of Polluted Rivers, Phases IV and V, and Spacially and Temporally Distributed Discharge of Effluents in Estuaries,
W74-07837 5B

NEW MEXICO
An Analytical Interdisciplinary Evaluation of the Utilization of the Water Resources of the Rio Grande in New Mexico Lower Rio Grande Region,
W74-07609 6B

NEW YORK
The Role of Public Involvement in Water Resources Planning and Development, A Report with Readings on Research and Experimentation in Public Affairs Education
W74-07610 6B

Iodine-129 Levels in Milk and Water Near a Nuclear Fuel Reprocessing Plant,
W74-07798 5B

NEW YORK BIGHT
Interdisciplinary Monitoring of the New York Bight,
W74-07764 5A

NEWPORT RIVER (N
Concentrations of Manganese, Iron, and Zinc in Juveniles of Five Estuarine-Dependent Fishes,
W74-07803 5C

NITRATES
A Kinetic Study of Ammonium and Nitrite Oxidation in a Soil Field Plot,
W74-07625 5B

Tracers in Mud Improve DST, Wireline Test Accuracy,
W74-07856 8G

NITRIFICATION
Nitrogen Transformations in Soil During Leaching: I. Theoretical Considerations,
W74-07619 5B

Nitrogen Transformation in Soil During Leaching: II. Steady State Nitrification and Nitrate Reduction,
W74-07620 5B

Nitrogen Transformations in Soil During Leaching: III. Nitrate Reduction in Soil Columns,
W74-07621 5B

Nitrogen Transformations During Continuous Leaching,
W74-07623 5B

NITRILOTRIACETIC ACID
Biodegradation of Nitrilotriacetate (NTA) in Soils,
W74-07624 5B

A Note Concerning the Environmental Acceptability of Nitrilotriacetic Acid (NTA): The Effect of NTA on the Growth of Gymnodinium breve,
W74-07775 5C

NITROGEN
Characterization of Suspended Sediments Water from Selected Watersheds as Related t Control Processes Nutrient Contents an Lake Eutrophication
W74-07736 5

Inorganic Nitrogen Removal in a Combine Tertiary Treatment Marine Aquaculture System II Algal Bioassays
W74-07777 5

Structure and Function of Hardwood Litter an Soil Subsystems After Chronic Gamma Irradiation. I. Mesofauna Nitrogen, and Total So Respiration,
W74-07824 5

Nitrogen Removal by Soil Mechanisms.
W74-08081 5

Recovery, Residual Effects, and Fate o Nitrogen Fertilizer Sources in a Semiarid Re gion.
W74-08086 5

Studies on the Influence of Irrigation and Dif ferent Doses of N, P and K on the Floweri Behaviour and Absorption of Nutrient El ments in Muskmelon (Cucumis melo L.).
W74-08144 3

NITROGEN COMPOUNDS
Sources, Sinks, and Methods of Analysis o Organic Nitrogen Compounds in Fresh Wate Systems.
W74-08008 5C

NITROGEN FIXATION
Environmental Control of Nitrogen Fixation i Lakes, I. In situ Nitrogen Fixation by Free Liv ing Blue-Green Algae, and II. Nitrogen Fixa tion by the Duckweed-Algal Association,
W74-07716 5C

NONLINEAR PROGRAMMING
Optimal Timing and Sizing of a Conjunctive Urban Water Supply and Waste Water Systen with Nonlinear Programming,
W74-08010 5I

NORTH CAROLINA
Concentrations of Manganese, Iron, and Zinc in Juveniles of Five Estuarine-Dependen Fishes,
W74-07803 5C

Iron-55 and Ruthenium-103 and -106 in the Brackish-Water Clam Rangia cuneata,
W74-07804 5A

NORTH CAROLINA (BEAUFORT COUNTY)
Vegetation and Soil Relationships in Southern Beaufort County, North Carolina,
W74-08150 2K

NORTH DAKOTA
The Biology and Ecology of River Carpsucker Carpiodes Carpio (Rafinesque), in the Little Missouri Arm of Lake Sakakawea, North Dakota,
W74-07991 2H

Preliminary Study to Investigate Feasibility of Desalting Ground Water in North Dakota,
W74-08066 3A

NORTH SEA
Influence of Older Relief on the Location of Sand Waves in a Part of the Southern North Sea,
W74-07676 2J

NORWAY (SVALBARD)
Studies of Re-Vegetation in Vehicle Tracks in Svalbard. (in Norwegian),
W74-08116 4A

NUCLEAR ENERGY
Environmental Effects of the Construction and Operation of a Gaseous Diffusion Plant.
W74-07781 5C

NUCLEAR EXPLOSIONS
Project Rio Blanco Spall Measurements Data Report,
W74-07797 4B

NUCLEAR POWERPLANTS
A Study of Pollutant Discharges from Reactor Operations Utilizing Ultracentrifugation Techniques,
W74-07782 5A

Tritium Distribution in the Nuclear Industry - The Requirements for Control Strategies,
W74-07784 5B

Environmental Statement Related to Construction and Operation of Barnwell Nuclear Fuel Plant.
W74-07792 5B

Final Environmental Statement Related to the Proposed Perry Nuclear Power Plant, Units 1 and 2.
W74-07793 5A

Design Data and Safety Features of Commercial Nuclear Power Plants, Vol I,
W74-07794 5G

Design Data and Safety Features of Commercial Nuclear Power Plants, Vol. II.
W74-07795 5G

Design Data and Safety Features of Commercial Nuclear Power Plants, Vol. III,
W74-07796 5G

Iodine-129 Levels in Milk and Water Near a Nuclear Fuel Reprocessing Plant,
W74-07798 5B

Radioecology of the Plaice (Pleuronectes platessa L) in the Northeast Irish Sea,
W74-07802 5C

Regional Energy-Water Problems Northeast,
W74-07971 6D

NUCLEAR REACTORS
A Study of Pollutant Discharges from Reactor Operations Utilizing Ultracentrifugation Techniques,
W74-07782 5A

NUCLEAR WASTES
A Study of Pollutant Discharges from Reactor Operations Utilizing Ultracentrifugation Techniques,
W74-07782 5A

The Technology of Tritium Fixation and Storage,
W74-07789 5D

NUTRIENT REMOVAL
BOD, Solids and Nutrient Removal by Foam Flotation,
W74-07742 5D

Nitrogen Removal by Soil Mechanisms,
W74-08081 5D

Recovery, Residual Effects, and Fate of Nitrogen Fertilizer Sources in a Semiarid Region,
W74-08086 5B

Flood and Seepage Water Sampling Techniques in Rice Fields Under Different Water Management Practices,
W74-08090 5B

NUTRIENT REQUIREMENTS
Iron and Associated Trace Mineral Problems in Man and Animals,
W74-07950 2K

NUTRIENTS
Testacea (Protozoa: Sarcodina) as Indicators of Water Quality in Western Montana,
W74-07718 5A

Characterization of Suspended Sediments in Water from Selected Watersheds as Related to Control Processes, Nutrient Contents, and Lake Eutrophication,
W74-07736 5B

Seasonal and Spatial Changes in Primary Production and Nutrients in Lake Michigan,
W74-07773 5C

Methods and Practices for Controlling Water Pollution from Agricultural Nonpoint Sources.
W74-07941 5B

Tissue Sulfhydryl Groups in Selenium-Deficient Rats and Lambs,
W74-07952 5B

Phytoplankton Community Structure and Nutrient Relationships in Lake Carl Blackwell, Oklahoma,
W74-07992 2H

OATS
Relationship Between Soil Oxygen Diffusion Rate and Yield of Oats in a Coastal Alluvial Soil at Critical Salinity Level,
W74-08094 3C

OCEAN WAVES
Floating Breakwater for Attenuating Seas,
W74-08043 8B

ODOR CONTROL
Odors Emitted from Raw and Digested Sewage Sludge,
W74-07960 5D

OHIO
Lime Stabilization of Primary Sludges,
W74-07760 5D

Final Environmental Statement Related to the Proposed Perry Nuclear Power Plant, Units 1 and 2.
W74-07793 5A

Exploration for a Buried Valley by Resistivity and Thermal Probe Surveys,
W74-07935 2F

OHIO RIVER
Environmental Effects of the Construction and Operation of a Gaseous Diffusion Plant.
W74-07781 5C

OIL FIELDS
Mathematical Model of Tritiated and Stable Water Movement in an Old-Field Ecosystem,
W74-07812 5B

OIL INDUSTRY
Two New Drilling Systems Pass Initial Field Tests, DC Electric Power Swivel Can Save Time and Money; Hydraulic Snubber Built to Operate in Rugged Terrain.
W74-07980 8G

OIL POLLUTION
Effects of Crude Oil and Some of its Components on Young Coho and Sockeye Salmon,
W74-07613 5C

Petroleum Systems Reliability Analysis, A Program for Prevention of Oil Spills Using an Engineering Approach to a Study of Offshore and Onshore Crude Oil Petroleum Systems, Volume II - Appendices,
W74-07957 5G

The Effects of Crude Oil Pollution on the Behavior of Marine Invertebrates,
W74-07987 5C

Multi-Unit Apparatus for Collecting Oil from the Surface of a Body of Water,
W74-08020 5G

Floating Barrier,
W74-08025 5G

Oil Recovery Apparatus,
W74-08033 5G

Control of Waterborne Oil Slicks,
W74-08036 5G

OIL SPILL RECORDS
Petroleum Systems Reliability Analysis, A Program for Prevention of Oil Spills Using an Engineering Approach to a Study of Offshore and Onshore Crude Oil Petroleum Systems, Volume II - Appendices,
W74-07957 5G

OIL SPILLS
Floating Barrier,
W74-08025 5G

Oil Recovery Apparatus,
W74-08033 5G

Control of Waterborne Oil Slicks,
W74-08036 5G

OILFIELD BACTERIAL CORROSION
The Sulfate-Reducing Bacteria and Oilfield Bacterial Corrosion - A Review of the Current State-of-the-Art,
W74-07902 8G

OKANOGAN RIVER BASIN (WASH)
Water in the Okanogan River Basin, Washington,
W74-07907 3B

OKLAHOMA
Solving Drilling Problems Utilizing Well Logs - A Case History,
W74-07898 8G

OKRA
Influence of Temperature and Moisture Stress from Sodium Chloride Salinization on Okra Emergence,
W74-08073 3C

OLIGOTROPHY
Survival of Intestinal Bacteria in Oligotrophic Waters,
W74-07737 5C

ON-SITE DATA COLLECTIONS
Contribution to Water Pollution from Agricultural and Urban Sources in the Coachella Valley,
W74-07757 5B

ON-SITE INVESTIGATIONS
Interdisciplinary Monitoring of the New York Bight,
W74-07764 5A

An Instrumental Technique for the Determination of Sub-Microgram Concentrations of Mercury in Soils, Rocks, and Gas,
W74-07948 2K

ONIONS
Drought Hardening in Onions: I. Influence of Presowing Treatments on Vegetative Behavior and Yield, (In Spanish),
W74-08148 3F

Drought Hardening in Onions: II. Analysis of Growth, (In Spanish),
W74-08149 3F

OPERATING COSTS
Pump Selection,
W74-07872 8C

Commercial Desalting Plant Data and Analysis, Volumes I-VI,
W74-08061 3A

OPERATION
Improved Dynamic Programing Procedures and Their Practical Application to Water Resource Systems,
W74-08013 6A

OPERATION AND MAINTENANCE
The Snodland-Ightham Regional Drainage Scheme: Design and Operation,
W74-07752 5D

Valve Installation, Operation and Maintenance,
W74-07867 8C

OPTIMIZATION
Optimization of Stochastic Storage Models Formulated by P.A.P. Moran, and Z. Kaczmarek (Optymalizaeja stochastycznych modeli retencjonwania podanych przes P.A.P. Morana i Z. Kaczmarka),
W74-07747 4A

Optimal Conjunctive Use Model for Indus Basin,
W74-08059 4B

OPTIMUM DEVELOPMENT PLANS
Economic Optimization and Simulation Techniques for Management of Regional Water Resource Systems,
W74-07714 6A

OREGON
Survey of Oregon's Water Laws,
W74-07611 6E

Observations and Analysis of Bottom Turbid Layers on the Oregon Continental Shelf,
W74-07632 2J

ORGANIC CARBON
Distribution of Free Iron and Organic Carbon as Related to Available Water in Some Forested Sandy Soils,
W74-07622 2G

ORGANIC COMPOUNDS
Effects of Crude Oil and Some of its Components on Young Coho and Sockeye Salmon,
W74-07613 5C

Transport and Transformation of Mercury in Nature and Possible Routes of Exposure,
W74-07682 5B

Symptoms and Signs of Intoxication,
W74-07684 5C

Organic Mercury Compounds-Relation Between Exposure and Effects,
W74-07687 5C

Sources, Sinks, and Methods of Analysis of Organic Nitrogen Compounds in Fresh Water Systems,
W74-08008 5C

ORGANIC MATTER
Distribution of Free Iron and Organic Carbon as Related to Available Water in Some Forested Sandy Soils,
W74-07622 2G

Carbon Measurements in Water Quality Monitoring,
W74-07641 5A

The Determination of Mercury in Air Samples and Biological Materials,
W74-07710 5A

Organic Water Impurities and Evaluation of Methods for their Removal in Water Mains (In Russian),
W74-07862 5D

ORGANIC PESTICIDES
Factors Controlling the Dynamics of Non-Ionic Synthetic Organic Chemicals in Aquatic Environments,
W74-07831 5B

ORGANIZATIONS
Regional Water Authorities: Organizational Patterns-Purpose or Professional,
W74-07754 5G

ORGANOLEPTIC PROPERTIES
Experimental Study of the Hazard Due to Chlorinated Quinones and their Safety Levels in Water Bodies (In Russian),
W74-07778 5C

ORGANOMERCURIC COMPOUNDS
Organo-Mercury Fungicide Treatment of Sugar-Beet Seed,
W74-07951 5B

ORGANOPHOSPHORUS PESTICIDES
The Surface Catalyzed Hydrolysis of Parathion on Kaolinite,
W74-07628 5B

OSPREY
The Fate and Effects of Pesticides in the Aquatic Environment of the Flathead Lake Drainage Area,
W74-07835 5C

OTTAWA RIVER (CANADA)
Bacteriological Water Quality Data, Beach Areas, Gatineau Park Lakes, National Capital Commission, 1973,
W74-07932 5B

OUTLET WORKS
Outlet Works, Stilling Basin for Tallahala Dam, Tallahala Creek, Mississippi,
W74-07925 8B

OUTLETS
Hydraulics of Culvert Outlets,
W74-07749 8B

Outlet Works Stilling Basins, Clinton and Fort Scott Dams, Wakarusa and Marmaton Rivers, Kansas,
W74-07930 8A

OXIDATION
A Kinetic Study of Ammonium and Nitrite Oxidation in a Soil Field Plot,
W74-07625 5B

OXYGEN REGENERATION
Process Control Model for Oxygen Regeneration of Polluted Rivers. Phases IV and V and Spacially and Temporally Distributed Discharge of Effluents in Estuaries,
W74-07837 5B

OXYGEN SAG
Oxygen Depletion Model for Cayuga Lake,
W74-08007 5C

OXYGENATION
Oxygenation of Aqueous Bodies Using Liquid Oxygen-Loxination,
W74-07741 5D

Process and Apparatus for the Purification of a Natural Body of Water,
W74-08019 5D

Apparatus for Aerating Water,
W74-08023 5D

Relationship Between Soil Oxygen Diffusion Rate and Yield of Oats in a Coastal Alluvial Soil at Critical Salinity Level,
W74-08094 3C

OYSTER SEED GROUNDS
Experiments to Re-establish Historical Oyster Seed Grounds and to Control the Southern Oyster Drill,
W74-07982 8I

OYSTERS
Biological Half-Lives for Zinc and Mercury in the Pacific Oyster, Crassostrea gigas,
W74-07807 5C

Experiments to Re-establish Historical Oyster Seed Grounds and to Control the Southern Oyster Drill,
W74-07982 8I

PACIFIC NORTHWEST U
The Columbia Interstate Compact: Politics of Water Resources in the Pacific Northwest,
W74-07846 6E

Regional Energy-Water Problems, Pacific Northwest,
W74-07975 6D

PACIFIC OCEAN
Biological Half-Lives for Zinc and Mercury in the Pacific Oyster, Crassostrea gigas,
W74-07807 5C

PACKER FLUIDS
New Bromide Packer Fluid Cuts Corrosion Problems,
W74-07858 8G

PADUS
Growth Feature of Introduced Plants in Connection with Their Adaptation to Drought. (in Russian),
W74-08118 2I

PAKISTAN (INDUS RIVER)
Optimal Conjunctive Use Model for Indus Basin,
W74-08059 4B

PARAGONIMUS-SPP
On Some Aspects of the Parasites of Ceylonese Fresh Water Crabs,
W74-08002 2I

PARAMECIUM CAUDATUM
The Photosensitizing Action of Carcinogens. I. The Action of 2-Naphthylamine on Escherichia Coli K-12 and Paramecium Caudatum,
W74-08095 5C

PARASITES (CRABS)
On Some Aspects of the Parasites of Ceylonese Fresh Water Crabs,
W74-08002 2I

PARATHION
The Surface Catalyzed Hydrolysis of Parathion on Kaolinite,
W74-07628 5B

PATENTS
Process and Apparatus for the Purification of a Natural Body of Water,
W74-08019 5D

Multi-Unit Apparatus for Collecting Oil from the Surface of a Body of Water,
W74-08020 5G

Pivotable Fluid Diverter for Recirulation System,
W74-08021 5D

Cellulosic Reverse Osmosis Membranes Having High Flux and High Salt Rejection,
W74-08022 3A

Apparatus for Aerating Water,
W74-08023 5D

Process for Treating Water Contaminated with Hexavalent Chromium,
W74-08024 5D

Floating Barrier,
W74-08025 5G

Apparatus and Method for Treating Waste Liquid,
W74-08026 5D

Submerged Turbine Aerator,
W74-08027 5D

Wastewater Treatment Using Electrolysis with Activated Carbon Cathode,
W74-08028 5D

Method of Treating Waste Water Containing Ligninsulfonate,
W74-08029 5D

Electrolytic Flotation Apparatus,
W74-08030 5D

Method and Apparatus for Aerating Bodies of Water,
W74-08031 5G

Mechanical-Biological Waste Water Purification Plant,
W74-08032 5D

Oil Recovery Apparatus,
W74-08033 5G

Wastewater Treatment,
W74-08034 5D

Industrial Waste Processing Apparatus,
W74-08035 5D

Control of Waterborne Oil Slicks,
W74-08036 5G

System for Reversed Osmosis,
W74-08037 5D

Method and Equipment for Desalination of Liquids,
W74-08038 3A

Storage and Dispensing Apparatus for a Reverse Osmosis Water Purification System,
W74-08039 5D

Valve for Reverse Osmosis Purification and Storage System,
W74-08040 5D

Reverse Osmosis-Neutralization Process for Treating Mineral Contaminated Waters,
W74-08041 5D

Water Treatment Mud Decanting Tank,
W74-08042 5F

Floating Breakwater for Attenuating Seas,
W74-08043 8B

PATH OF POLLUTANTS
Effect of Deicing Chemicals on Ground and Surface Water--(Modus Operandi),
W74-07617 5B

Biodegradation of Nitrilotriacetate (NTA) in Soils,
W74-07624 5B

Adsorption of Fenuron and Monuron (Substituted Ureas) by Two Montmorillonite Clays,
W74-07627 5B

Use of Fluorescent Dye Tracers in Mobile Bay,
W74-07642 5B

Chester River Study, Volumes I, II, and III.
W74-07653 5B

Biochemical Investigations,
W74-07654 5B

Chemical Evidence for the Dispersal of River Mersey Run-off in Liverpool Bay,
W74-07674 5B

Transport and Transformation of Mercury in Nature and Possible Routes of Exposure,
W74-07682 5B

Metabolism,
W74-07683 5B

The Transport of Radioisotopes by Fine Particulate Matter in Aquifers,
W74-07730 5B

Characterization of Suspended Sediments in Water from Selected Watersheds as Related to Control Processes, Nutrient Contents, and Lake Eutrophication,
W74-07736 5B

Radionuclides in Ecosystems, Volume II.
W74-07799 5C

A Systems analysis Methodology for Predicting Dose to Man From a Radioactively Contaminated Terrestrial Environment,
W74-07809 5C

Big Eddies and Mixing Processes in the Great Lakes,
W74-07926 5B

Recovery, Residual Effects, and Fate of Nitrogen Fertilizer Sources in a Semiarid Region,
W74-08086 5B

PATHOGENIC BACTERIA
Coliforms are an Inadequate Index of Water Quality,
W74-07885 5A

PEAK DISCHARGE
Estimating the Magnitude of Peak Discharges for Selected Flood Frequencies on Small Streams in East Texas,
W74-07664 2E

Annual Peak Discharges from Small Drainage Areas in Montana, Through September 1972,
W74-07667 2E

PEAT SOILS
Effect of Humidity and Temperature on Microbial Activity in Moor Peat Soils, (In Russian),
W74-08089 2G

PENNSYLVANIA
Water Resources of Lehigh County, Pennsylvania,
W74-07649 4A

PERIPHYTIC POPULATIONS
Study on the Periphytic Colonizations of a Lateral Environment of the River Po(Italy), (In Italian),
W74-07702 2I

PERIPHYTON
Testacea (Protozoa: Sarcodina) as Indicators of Water Quality in Western Montana,
W74-07718 5A

Survival of Intestinal Bacteria in Oligotrophic Waters,
W74-07737 5C

An Ecological Study of the Missouri River Prior to Channelization,
W74-07744 2I

PERMAFROST
Gypsum-Cement Blend Works Well in Permafrost Areas,
W74-07884 8F

PERMEABILITY
Estimation of Imperviousness and Specific Curb Length for Forecasting Stormwater Quality and Quantity,
W74-07640 5B

PERSISTENCE
Factors Controlling the Dynamics of Non-Ionic Synthetic Organic Chemicals in Aquatic Environments,
W74-07831 5B

PERSONNAL MANAGEMENT
Management Priorities: Now and the Future,
W74-07755 6B

PESTICIDE KINETICS
Factors Controlling the Dynamics of Non-Ionic Synthetic Organic Chemicals in Aquatic Environments,
W74-07831 5B

PESTICIDE REMOVAL
Factors Controlling the Dynamics of Non-Ionic Synthetic Organic Chemicals in Aquatic Environments,
W74-07831 5B

PESTICIDE RESIDUES
The Fate and Effects of Pesticides in the Aquatic Environment of the Flathead Lake Drainage Area,
W74-07835 5C

PHENOLS
Investigations on the Occurrence of Phenol-Decomposing Microorganisms in Waters and Sediments. (in German),
W74-08115 5C

PHOSPHATES
Zinc/Phosphate Combinations Control Corrosion in Potable Water Distribution Systems,
W74-07894 8G

PHOSPHORUS
The Use of Algal Assays for Determining the Effect of Iron and Phosphorus Compounds on the Growth of Various Algal Species,
W74-07776 5C

Distribution of Phosphorus, Silica, Chlorophyll a, and Conductivity in Lake Michigan and Green Bay,
W74-08000 5C

Correlations Between P, Fe and Mn Availability in Water-Logged Soil at Different Fertility Levels,
W74-08134 2G

Studies on the Influence of Irrigation and Different Doses of N, P and K on the Flowering Behaviour and Absorption of Nutrient Elements in Muskmelon (Cucumis melo L.),
W74-08144 3F

PHOTOACTIVATION
The Photosensitizing Action of Carcinogens. I. The Action of 2-Naphthylamine on Escherichia Coli K-12 and Paramecium Caudatum,
W74-08095 5C

PHOTODECOMPOSITION
Determination of the Fate of Polynuclear Aromatic Hydrocarbons in Natural Water Systems,
W74-07827 5A

PHOTOGRAPHY
Application of Satellite Data for Hydrologic Purposes (Ispol'zovaniye sputnikovoy informatsii dlya gidrologicheskikh tseley),
W74-08049 7B

PHOTOSENSITIZING
The Photosensitizing Action of Carcinogens. I. The Action of 2-Naphthylamine on Escherichia Coli K-12 and Paramecium Caudatum,
W74-08095 5C

PHOTOSYNTHESIS
Effect of Temperature and Plant Water Stress on Photosynthesis Diffusion Resistance, and Leaf Water Potential in Spring Wheat,
W74-08075 3F

PHREATOPHYTES
Phreatophytes, A Bibliography, Revised.
W74-07829 3B

PHYSIOCHEMICAL ANALYSIS
Vegetation and Soil Relationships in Southern Beaufort County, North Carolina,
W74-08150 2K

PHYTOCENOTIC FACTORS
Effect of Climatic and Phytocenotic Factors on Annual Increment of Trees in Stands, (In Russian),
W74-08127 2I

PHYTOPLANKTON
An Investigation of the Water Quality and Productivity of Polson Bay, Flathead Lake, Montana,
W74-07717 5C

Results of Red Tide Formation in Tokyo Bay,
W74-07770 5C

Phytoplankton Community Structure and Nutrient Relationships in Lake Carl Blackwell, Oklahoma,
W74-07992 2H

Primary Production and Respiration of the Phytoplankton of the Rivers Thames and Kennet at Reading,
W74-08132 5C

PHYTOSOCIOLOGICAL STUDIES
Phytosociological Observations in Inundation Zone Farmlands in the Northern Upper Rhine Valley, (In German),
W74-08121 2I

PILOT PLANTS
Lime Stabilization of Primary Sludges,
W74-07760 5D

PIPE BENDING
Causes and Prevention of Drill Pipe Troubles,
W74-07889 8G

PIPE BRIDGES
The Design, Planning and Construction of a 45 inch Diameter Water Main Across a Congested Area of West Bromwich,
W74-07751 8A

PIPELINES
Prevention of Damage to Pipelines.
W74-07923 8A

PITTING (CORROSION)
Casing Potential Logging Related to Vertilog Corrosion Logging,
W74-07868 8G

Causes and Prevention of Drill Pipe Troubles,
W74-07889 8G

PLAICE
Radioecology of the Plaice (Pleuronectes platessa L) in the Northeast Irish Sea,
W74-07802 5C

PLANKTON
Biological Investigations,
W74-07656 5B

Plankton Production and Water Quality in Spanish Reservoirs. First Report on a Research Project,
W74-08005 5C

Studies on the Occurrence of Planktonic Rotatoria in Urban Waters and Their Relationship to Saprobism. (in German),
W74-08111 2I

PLANNING
The Role of Public Involvement in Water Resources Planning and Development, A Report with Readings on Research and Experimentation in Public Affairs Education.
W74-07610 6B

Analytical Techniques for Planning Complex Water Resource Systems.
W74-07722 6A

Water Resources Management for Metropolitan Washington: Analysis of the Joint Interactions of Water and Sewage Service, Public Policy and Land Development Patterns in an Expanding Metropolitan Area.
W74-07723 6B

Appendices to Water Resources Management for Metropolitan Washington: Analysis of the Joint Interactions of Water and Sewage Service, Public Policy, and Land Development Patterns in an Expanding Metropolitan Area.
W74-07724 6B

Regional Water Authorities: Organizational Patterns-Purpose or Professional,
W74-07754 5G

Earthquake Damage Costs in the Design of Water Resource Systems,
W74-08018 4A

Problem of Rational Use and Conservation of Water Resources and Goals of Hydrology (Problema ratsional'nogo ispol'zovaniya i okhrany vodnykh resursov i zadachi gidrologii),
W74-08055 6B

All-Union Hydrologic Congresses (Vsesoyuznyye gidrologicheskiye syezdy),
W74-08056 6E

The Potential of Desalting for Industrial Water Supplies in Northeastern Wyoming,
W74-08062 3A

Improving Municipal Water Supplies in Arizona by Desalting,
W74-08063 3A

Potential Contribution of Desalting Systefs to Municipal Water Quality and Supply in South Dakota.
W74-08064 3A

The Future Role of Desalting in Nevada,
W74-08065 3A

PLANT GROWTH
Aerial Pollution and the Rapid Evolution of Copper Tolerance,
W74-07713 5B

PLANT TISSUES
Lead Detection in Living Plant Tissue Using a New Histochemical Method,
W74-07711 5A

PLANTING MANAGEMENT
Effect of Establishment Method, Variety, and Seeding Rate on the Production and Quality of Alfalfa Under Dryland and Irrigation,
W74-08077 3F

PLUTONIUM
Plutonium in North Atlantic Ocean Organisms; Ecological Relationships,
W74-07800 5C

POISONING RAFTS
Destruction Trials of the Muskrat, Ondatra Zibethica L., in Ponds Using Poisoning Rafts, (In French),
W74-08128 5G

POLAND CRACOW REGION
Environmental Factors of Leukemia Morbidity, (In Polish),
W74-07999 5C

POLITICAL ASPECTS
The Columbia Interstate Compact: Politics of Water Resources in the Pacific Northwest,
W74-07846 6E

Economic Aspects of Resource Use with Special Reference to Energy and Water,
W74-07964 6D

POLLUTANT IDENTIFICATION
Methods of Analysis,
W74-07681 5A

Solvent Extraction of Selenium (IV) with 2-Thenoyltri-Fluoroacetone,
W74-07692 5A

Paper Chromatographic and Electrochromatographic Separation of Edta Complexes of Metal Ions,
W74-07693 5A

Mercury Analysis by Atomic Absorption Spectrophotometry,
W74-07704 5A

Trace Metals in Atmospheric Particulates and Atomic Absorption Spectroscopy,
W74-07705 5A

Analysis of Trace Metal Particulates in Atmospheric Samples Using X-Ray Fluorescence,
W74-07709 5A

The Determination of Mercury in Air Samples and Biological Materials,
W74-07710 5A

Lead Detection in Living Plant Tissue Using a New Histochemical Method,
W74-07711 5A

Determination of Copper and Zinc in Biological Material,
W74-07712 5A

Testacea (Protozoa: Sarcodina) as Indicators of Water Quality in Western Montana,
W74-07718 5A

The Determination of Heavy Metals in Domestic Sewage Treatment Plant Wastes,
W74-07763 5A

Determination of the Fate of Polynuclear Aromatic Hydrocarbons in Natural Water Systems,
W74-07827 5A

Collection, Detection, Identification, and Quantitation of Human Effluents,
W74-07912 5A

Some Novel Complexes of Chromium(I),
W74-07946 5A

Odors Emitted from Raw and Digested Sewage Sludge,
W74-07960 5D

POLLUTION ABATEMENT
Mine Drainage Pollution Control Via Reverse Osmosis,
W74-07881 5D

Petroleum Systems Reliability Analysis, A Program for Prevention of Oil Spills Using an Engineering Approach to a Study of Offshore and Onshore Crude Oil Petroleum Systems, Volume II - Appendices,
W74-07957 5G

Multi-Unit Apparatus for Collecting Oil from the Surface of a Body of Water,
W74-08020 5G

Apparatus for Aerating Water,
W74-08023 5D

Floating Barrier,
W74-08025 5G

Method and Apparatus for Aerating Bodies of Water,
W74-08031 5G

Oil Recovery Apparatus,
W74-08033 5G

Control of Waterborne Oil Slicks,
W74-08036 5G

POLLUTION TAXES (CHARGES)
Pricing of Industrial Wastewater Treatment Service,
W74-07727 5D

POLYCHLORINATED BIPHENYLS
Chester River Study, Volumes I, II, and III.
W74-07653 5B

Biochemical Investigations,
W74-07654 5B

POLYMYXIN
Investigation of River Water for the Presence of Escherichia coli and Enterococcus, (in Russian),
W74-08004 5A

POLYNUCLEAR AROMATIC HYDROCARBONS
Determination of the Fate of Polynuclear Aromatic Hydrocarbons in Natural Water Systems,
W74-07827 5A

PORE PRESSURE
Axisymmetric Infiltrations,
W74-07839 2G

POROSITY
Microporosity in Carbonate Rocks,
W74-07861 4B

POSITIVE-DISPLACEMENT PUMPS
Positive Displacement Pumps,
W74-07874 8C

POST AERATION TECHNIQUES
Mathematical Model for Post Aeration,
W74-08045 5D

POTABLE WATER
The Severn Scheme of the Bristol Waterworks Company.
W74-07772 5F

Domestic Water Systems, Nonchemical Factors in Corrosion Control,
W74-07849 8G

Domestic Hot Water Systems, Silicate Treatment Inhibits Corrosion of Galvanized Steel and Copper Alloys,
W74-07850 8G

Performance and Selection of Materials for Potable Hot Water Service,
W74-07855 8G

Corrosive Effects of Southern California Potable Waters,
W74-07866 8G

Corrosive Effects of Potable Water,
W74-07886 8G

Zinc/Phosphate Combinations Control Corrosion in Potable Water Distribution Systems,
W74-07894 8G

Environmental Factors of Leukemia Morbidity, (In Polish),
W74-07999 5C

A Systems Approach to Assessment of Rural Water Supply Program Effectiveness,
W74-08012 6B

Quality of Drinking Water on Ships in Relation to Sailing Conditions, (In Russian),
W74-08082 5B

Pollution Control and Erection of Sewage Plants: Technical Feasibilities, Future Demands, (In German),
W74-08138 5G

POTASSIUM
Effect of the Moisture and Temperature on the Leaching of Ash Elements from Plant Residues (in Russian),
W74-08016 2I

Variations in Potassium Content of Alfalfa Grown on Pseudogley Soil Depending on Mineral Fertilizing, (In Serbo-Creation),
W74-08097 3F

Studies on the Influence of Irrigation and Different Doses of N, P and K on the Flowering Behaviour and Absorption of Nutrient Elements in Muskmelon (Cucumis melo L.),
W74-08144 3F

POTENTIAL WATER SUPPLY
A Bill to Authorize the Secretary of the Interior to Engage in Feasibility Investigations of Certain Potential Water Resource Developments.
W74-07943 6E

POULTRY
Antagonistic Effect of Arginine on Zinc Metabolism in Chicks,
W74-07955 5C

POWER UNIT STANDARDS
South Dakota Standards for Irrigation Pumps and Power Units,
W74-07895 8C

POWERPLANTS
Energy Production,
W74-07967 6D

PRECIPITATION
Precipitation Characteristics of the Northern New Jersey, New York City Metropolitan Area,
W74-07607 2B

PRECIPITATION (ATMOSPHERIC)
Hydrologic Models of the Great Lakes,
W74-07826 2H

PRESOWING TREATMENT
Drought Hardening in Onions: I. Influence of Presowing Treatments on Vegetative Behavior and Yield, (In Spanish),
W74-08148 3F

PRESSURE HEAD
Pump Selection,
W74-07872 8C

PRESSURE RELIEF
Pump Installation and Maintenance,
W74-07873 8C

PRICING
Pricing of Industrial Wastewater Treatment Service,
W74-07727 5D

PRIMARY PRODUCTION
Primary Production and Respiration of the Phytoplankton of the Rivers Thames and Kennet at Reading,
W74-08132 5C

Determination of Counting Efficiency by 14C by Liquid Scintillation in Primary Production Measurements in a Lagoon Environment, (In French),
W74-08143 5A

PRIMARY PRODUCTIVITY
Seasonal Changes in Water Quality and Primary Productivity in Doe Valley Lake,
W74-07605 5C

An Investigation of the Water Quality and Productivity of Polson Bay, Flathead Lake, Montana,
W74-07717 5C

Seasonal and Spatial Changes in Primary Production and Nutrients in Lake Michigan,
W74-07773 5C

PRIOR APPROPRIATION
Survey of Oregon's Water Laws,
W74-07611 6E

PROBABILITY
Industrial Application of Whitford's Demand Forecasting Procedure,
W74-08015 6D

PRODUCTION
Energy Production,
W74-07967 6D

PRODUCTIVITY
The Use of Algal Assays for Determining the Effect of Iron and Phosphorus Compounds on the Growth of Various Algal Species,
W74-07776 5C

Dissolution of a Porous Matrix by a Slowly Reacting Acid,
W74-07860 8B

Plankton Production and Water Quality in Spanish Reservoirs. First Report on a Research Project,
W74-08005 5C

PROFILES
Spillway Water-Surface Profiles,
W74-07913 8B

PROJECT PLANNING
Innovation: A Case Study,
W74-07720 6B

A Streamflow Model for Metropolitan Planning and Design,
W74-07721 2A

The Design, Planning and Construction of a 45 inch Diameter Water Main Across a Congested Area of West Bromwich,
W74-07751 8A

PROJECT SKYWATER
Project Skywater 1972 Annual Report.
W74-07928 3B

PROJECTS
The Role of Public Involvement in Water Resources Planning and Development, A Report with Readings on Research and Experimentation in Public Affairs Education.
W74-07610 6B

PROPAGATION (BIOLOGICAL)
Sensitivity of Carp (Cyprinus carpio) Embryos to Acute Gamma Radiation,
W74-07817 5C

PROSPECTING
Research - - Targets and Developments, Regional Assessments,
W74-07903 7B

PROTEINS
Polyacrylamide Gel Disc Electrophoresis of Rat Bile after Intravenous Administration of 52 MnC12, 64CuC12, 203HgC12 and 210 Pb(N03)2,
W74-07694 5C

PROTOZOA
Testacea (Protozoa: Sarcodina) as Indicators of Water Quality in Western Montana,
W74-07718 5A

Survival of Intestinal Bacteria in Oligotrophic Waters,
W74-07737 5C

PSEUDOGLEY SOIL
Variations in Potassium Content of Alfalfa Grown on Pseudogley Soil Depending on Mineral Fertilizing, (In Serbo-Creation),
W74-08097 3F

PUBLIC HEALTH
Mercury in the Environment, An Epidemiological and Toxicological Appraisal.
W74-07680 5C

Environmental Factors of Leukemia Morbidity, (In Polish),
W74-07999 5C

PUBLIC INFORMATION
An Evaluation of the Needs in Freshwater Research and Related Public Information Facilities,
W74-07838 6G

PUBLIC INVOLVEMENT
The Role of Public Involvement in Water Resources Planning and Development, A Report with Readings on Research and Experimentation in Public Affairs Education.
W74-07610 6B

PUERTO RICO
Distribution of ZN, FE, MN, and SR in Marine Fishes of Different Feeding Habits,
W74-07801 5C

Trace-Element Interactions Between River Water and Seawater,
W74-07805 5B

PULP WASTES
Pollution Monitoring in Lake Champlain Using ERTS-1 Imagery,
W74-08009 5A

Method of Treating Waste Water Containing Ligninsulfonate,
W74-08029 5D

PULSATION DAMPENERS
Pump Installation and Maintenance,
W74-07873 8C

PUMPS
Automatic Pumping Installations for Livestock Sections,
W74-07864 8C

Pump Selection,
W74-07872 8C

Pump Installation and Maintenance,
W74-07873 8C

Positive Displacement Pumps,
W74-07874 8C

South Dakota Standards for Irrigation Pumps and Power Units,
W74-07895 8C

QUAIL
Effect of Ascorbic Acid on Cadmium Toxicity in the Young Coturnix,
W74-07707 5C

QUINONES
Experimental Study of the Hazard Due to Chlorinated Quinones and their Safety Levels in Water Bodies (In Russian),
W74-07778 5C

RADIATION
Effects of Ionizing Radiation on Processes Influencing Tolerance of Tree Seedlings,
W74-07815 5C

Sensitivity of Carp (Cyprinus carpio) Embryos to Acute Gamma Radiation,
W74-07817 5C

Effect of Radiation, Salinity and Temperature on the Ionic Regulation of the Blue Crab, Callinectes sapidus,
W74-07818 5C

RADIATION EXPOSURE
Radiation Effects on Serum Proteins, Hematocrits, Electrophoretic Patterns and Protein Components in the Bluegill (Lepomis macrochirus),
W74-07816 5C

RADIOACTIVE WASTE DISPOSAL
Solid Forms for Savannah River Plant High-Level Waste,
W74-07787 5D

Chemical Engineering Division, Waste Management Programs, Quarterly Report, July-September 1973,
W74-07788 5D

RADIOACTIVE WASTES
The Transport of Radioisotopes by Fine Particulate Matter in Aquifers,
W74-07730 5B

Geohydrology of the Buried Triassic Basin at the Savannah River Plant,
W74-07934 5B

RADIOACTIVE WELL LOGGING
37 Ways to Improve Your Well Completions,
W74-07870 8G

RADIOACTIVITY
Environmental Effects of the Construction and Operation of a Gaseous Diffusion Plant.
W74-07781 5C

Radioactivity of Nevada Hot-Spring Systems,
W74-07786 5A

Environmental Radioactivity,
W74-07791 5B

Design Data and Safety Features of Commercial Nuclear Power Plants, Vol I,
W74-07794 5G

Design Data and Safety Features of Commercial Nuclear Power Plants, Vol. II.
W74-07795 5G

Design Data and Safety Features of Commercial Nuclear Power Plants, Vol. III,
W74-07796 5G

Radionuclides in Ecosystems, Volume II.
W74-07799 5C

Iron-55 and Ruthenium-103 and -106 in the Brackish-Water Clam Rangia cuneata,
W74-07804 5A

Trace-Element Interactions Between River Water and Seawater,
W74-07805 5B

A Systems analysis Methodology for Predicting Dose to Man From a Radioactively Contaminated Terrestrial Environment,
W74-07809 5C

Modeling Radionuclides and Pesticides in Food Chains,
W74-07810 5B

Radiation Effects on Serum Proteins, Hematocrits, Electrophoretic Patterns and Protein Components in the Bluegill (Lepomis macrochirus),
W74-07816 5C

Effects of Chrome Radiation Exposure On Mosquitoes (Diptera: Culicidae). 1. Effects of Rearing in Sr-90 + Y-90 Solutions,
W74-07821 5C

Effects of Gamma Irradiation on the Reproductive Performance of Artermia as Determined by Individual Pair Matings,
W74-07822 5C

Effects of Gamma Irradiation on the Maintenance of Population Size in the Brine Shrimp, Artemia,
W74-07823 5C

Structure and Function of Hardwood Litter and Soil Subsystems After Chronic Gamma Irradiation, I. Mesofauna, Nitrogen, and Total Soil Respiration,
W74-07824 5C

Structure and Function of Hardwood Litter and Soil Subsystems After Chronic Gamma Irradiation. II. Microfungi,
W74-07825 5C

ADIOACTIVITY EFFECTS

Effects of Ionizing Radiation on Processes Influencing Tolerance of Tree Seedlings,
W74-07815 5C

Radiation Effects on Serum Proteins, Hematocrits, Electrophoretic Patterns and Protein Components in the Bluegill (Lepomis macrochirus),
W74-07816 5C

Sensitivity of Carp (Cyprinus carpio) Embryos to Acute Gamma Radiation,
W74-07817 5C

Effect of Radiation, Salinity and Temperature on the Ionic Regulation of the Blue Crab, Callinectes sapidus,
W74-07818 5C

Effects of Chrome Radiation Exposure On Mosquitoes (Diptera: Culicidae). 1. Effects of Rearing in Sr-90 + Y-90 Solutions,
W74-07821 5C

Effects of Gamma Irradiation on the Reproductive Performance of Artermia as Determined by Individual Pair Matings,
W74-07822 5C

Effects of Gamma Irradiation on the Maintenance of Population Size in the Brine Shrimp, Artemia,
W74-07823 5C

Structure and Function of Hardwood Litter and Soil Subsystems After Chronic Gamma Irradiation, I. Mesofauna, Nitrogen, and Total Soil Respiration,
W74-07824 5C

Structure and Function of Hardwood Litter and Soil Subsystems After Chronic Gamma Irradiation. II. Microfungi,
W74-07825 5C

RADIOECOLOGY

Radionuclides in Ecosystems, Volume II.
W74-07799 5C

Radioecology of the Plaice (Pleuronectes platessa L) in the Northeast Irish Sea,
W74-07802 5C

Accumulation of Calcium-45 in Developing Coho Salmon Eggs and Fry reared in varying concentrations of Stable Calcium,
W74-07808 5C

Effects of Ionizing Radiation on Processes Influencing Tolerance of Tree Seedlings,
W74-07815 5C

RADIOISOTOPES

The Transport of Radioisotopes by Fine Particulate Matter in Aquifers,
W74-07730 5B

Uranium-234,
W74-07790 5B

Radionuclides in Ecosystems, Volume II.
W74-07799 5C

Plutonium in North Atlantic Ocean Organisms; Ecological Relationships,
W74-07800 5C

Distribution of ZN, FE, MN, and SR in Marine Fishes of Different Feeding Habits,
W74-07801 5C

Iron-55 and Ruthenium-103 and -106 in the Brackish-Water Clam Rangia cuneata,
W74-07804 5A

Trace-Element Interactions Between River Water and Seawater,
W74-07805 5B

Trace Elements in Marine Shrimp,
W74-07806 5C

Biological Half-Lives for Zinc and Mercury in the Pacific Oyster, Crassostrea gigas,
W74-07807 5C

A Systems analysis Methodology for Predicting Dose to Man From a Radioactively Contaminated Terrestrial Environment,
W74-07809 5C

Transport of Radionuclides in Sediments,
W74-07814 5B

Thermoluminescent Dosimetry of AquatiR Organisms,
W74-07819 5C

Effect of Water-Soluble Decomposition Products of Herbaceous Plants on Uptake of Radioisotopes in Soil. (in Russian),
W74-08117 2G

RADIOPHOSPHORUS

Thermoluminescent Dosimetry of AquatiR Organisms,
W74-07819 5C

RAIN FORESTS

Structure and Function of Hardwood Litter and Soil Subsystems After Chronic Gamma Irradiation. II. Microfungi,
W74-07825 5C

RAINBOW TROUT

A Scanning Electron Microscopic Study of Secondary Lamellae and Chloride Cells of Rainbow Trout (Salmo gairdneri),
W74-08096 5C

RAINFALL

The Significance of Rainfall on Salt and Sodium Accumulations Under Irrigation,
W74-07743 3C

RAINFALL DISPOSITION

Precipitation Characteristics of the Northern New Jersey, New York City Metropolitan Area,
W74-07607 2B

RAINFALL-RUNOFF RELATIONSHIPS

Application of Remote Sensing to Hydrology--Final Technical Report,
W74-07940 2A

RATIONAL FORMULA

Hydrological Aspect of Surface Run-Off,
W74-07756 2A

RECLAIMED WATER

Sun Oil Develops Water Reuse Program,
W74-07882 5D

RECREATION

Capacity of Water-Based Recreation Systems Part I: The State of the Art - A Literature Review,
W74-07719 6B

A Summary of Quantity, Quality and Economic Methodology for Establishing Minimum Flows,
W74-07847 6B

RECREATION CAPACITY

Capacity of Water-Based Recreation Systems Part I: The State of the Art - A Literature Review,
W74-07719 6B

RECREATION FACILITIES

Capacity of Water-Based Recreation Systems Part I: The State of the Art - A Literature Review,
W74-07719 6B

RECYCLING

Optimal Timing and Sizing of a Conjunctive Urban Water Supply and Waste Water System with Nonlinear Programming,
W74-08010 5D

RED TIDE

Results of Red Tide Formation in Tokyo Bay,
W74-07770 5C

REFRACTION SEISMOLOGY

Pleistocene-Holocene Sediments Interpreted by Seismic Refraction and Wash-Bore Sampling, Plum Island-Castle Neck, Mass.,
W74-07875 2L

REGIONAL ANALYSIS
Economic Optimization and Simulation Techniques for Management of Regional Water Resource Systems,
W74-07714 6A

Appendices to Water Resources Management for Metropolitan Washington: Analysis of the Joint Interactions of Water and Sewage Service, Public Policy, and Land Development Patterns in an Expanding Metropolitan Area.
W74-07724 6B

REGIONAL DEVELOPMENT
Regional Water Authorities: Organizational Patterns-Purpose or Professional,
W74-07754 5G

The Columbia Interstate Compact: Politics of Water Resources in the Pacific Northwest,
W74-07846 6E

REGULATION
Groundwater Pollution Features of Federal and State Satutes and Regulations,
W74-07614 5G

Federal Laws and Regulations,
W74-07703 5G

Effluent Standards Strategy: Rejuvenation of an Old Game Plan,
W74-07769 5G

REMOTE SENSING
The Electrical Resistivity Method (Part I),
W74-07852 7B

Recent Advances in Log Evaluation,
W74-07853 8G

Solving Drilling Problems Utilizing Well Logs - A Case History,
W74-07898 8G

Research - - Targets and Developments, Regional Assessments,
W74-07903 7B

Application of Remote Sensing to Hydrology--Final Technical Report,
W74-07940 2A

Application of Satellite Data for Hydrologic Purposes (Ispol'zovaniye sputnikovoy informatsii dlya gidrologicheskikh tseley),
W74-08049 7B

REPRODUCTION
Sensitivity of Carp (Cyprinus carpio) Embryos to Acute Gamma Radiation,
W74-07817 5C

Effects of Gamma Irradiation on the Reproductive Performance of Artermia as Determined by Individual Pair Matings,
W74-07822 5C

Data on the Reproduction of the Striped Riffle Minnow (Alburnoides Teniatus Kesser) in the Zeravshan River, (in Russian),
W74-08104 2I

Gambusia in the Zeravshan River Basin, (in Russian),
W74-08105 2I

RESEARCH
The Role of Public Involvement in Water Resources Planning and Development, A Report with Readings on Research and Experimentation in Public Affairs Education.
W74-07610 6B

RESEARCH AND DEVELOPMENT
Active Research Tasks Report--Fiscal Year 1973.
W74-07651 5G

Water Resources Research in Virginia - Annual Report for Fiscal Year 1972.
W74-07842 9D

Reclamation Research in the Seventies--First Progress Report.
W74-07922 4A

The Role of Water Resources Research in the Energy Crisis,
W74-07966 6D

RESEARCH FACILITIES
Fractionation of Suspended and Colloidal Particles in Natural Water,
W74-07783 5A

An Evaluation of the Needs in Freshwater Research and Related Public Information Facilities,
W74-07838 6G

RESEARCH PRIORITIES
General Discussion and Conclusions-Need for Further Research,
W74-07689 5C

Metals Focus Shifts to Cadmium,
W74-07697 5B

RESERVOIR OPERATION
Optimization of Stochastic Storage Models Formulated by P.A.P. Moran, and Z. Kaczmarek (Optymalizaeja stochastycznych modeli retencjonwania podanych przes P.A.P. Morana i Z. Kaczmarka),
W74-07747 4A

RESERVOIR RELEASES
Selective Withdrawal From Beech Fork Lake, Beech Fork River, West Virginia,
W74-07914 8B

Transit Losses and Travel Times for Reservoir Releases, Upper Arkansas River Basin, Colorado,
W74-07931 4A

RESERVOIRS
A Ground-Water Monitoring Network for Kootenai Flats, Northern Idaho,
W74-07662 7A

Plankton Production and Water Quality in Spanish Reservoirs. First Report on a Research Project,
W74-08005 5C

Improved Dynamic Programing Procedures and Their Practical Application to Water Resource Systems,
W74-08013 6A

RESISTIVITY
Three-Dimensional Zone Model Log Interpretation,
W74-07735 8G

Porosity-Resistivity Cross-Plotting,
W74-07900 8G

Electric and Thermal Properties of Rocks,
W74-07906 8E

RESOURCE ALLOCATION
The State of the System (SOS) Model: Measuring Growth Limitations Using Geological Concepts,
W74-07958 6G

RESPIRATION
Primary Production and Respiration of the Phytoplankton of the Rivers Thames and Kennet at Reading,
W74-08132 5C

RETENTION
Influence of Dietary and Injected Selenium on Whole-Body Retention, Route of Excretion, and Tissue Retention of 75SeO3 (--) in the Rat,
W74-07708 5C

Reduction of Lead Absorption from the Intestine in Newborn Rats,
W74-07953 5C

RETENTION BASINS
A Simple Method for Retention Basin Design,
W74-07753 5D

RETRIEVABLE SURFACE STORAGE
Solid Forms for Savannah River Plant High-Level Waste,
W74-07787 5D

RETURN FLOWS
Characterization of Suspended Sediments in Water from Selected Watersheds as Related to Control Processes, Nutrient Contents, and Lake Eutrophication,
W74-07736 5B

REVERSE OSMOSIS
Reverse Osmosis Process and its Application, (In Japanese),
W74-07750 5D

Mine Drainage Pollution Control Via Reverse Osmosis,
W74-07881 5D

Water Treatment System,
W74-07979 5F

Cellulosic Reverse Osmosis Membranes Having High Flux and High Salt Rejection,
W74-08022 3A

System for Reversed Osmosis,
W74-08037 5D

Storage and Dispensing Apparatus for a Reverse Osmosis Water Purification System,
W74-08039 5D

Valve for Reverse Osmosis Purification and Storage System,
W74-08040 5D

Reverse Osmosis-Neutralization Process for Treating Mineral Contaminated Waters,
W74-08041 5D

REVIEWS
Mercury in the Environment, An Epidemiological and Toxicological Appraisal.
W74-07680 5C

Capacity of Water-Based Recreation Systems Part I: The State of the Art - A Literature Review,
W74-07719 6B

The Sulfate-Reducing Bacteria and Oilfield Bacterial Corrosion - A Review of the Current State-of-the-Art,
W74-07902 8G

Subsurface Exploration and Sampling of Soils for Civil Engineering Purposes,
W74-07905 8D

Prevention of Damage to Pipelines.
W74-07923 8A

RICE
Tolerance of Rice (Oryza Sativa L.) to Salt During Boot, Flowering, and Grain-Filling Stages,
W74-08080 3C

Effects of Drainage and Organic Amendments on the Reclamation of a Sodic Soil Cropped With Rice,
W74-08087 3C

Flood and Seepage Water Sampling Techniques in Rice Fields Under Different Water Management Practices,
W74-08090 5B

RIO GRANDE RIVER
An Analytical Interdisciplinary Evaluation of the Utilization of the Water Resources of the Rio Grande in New Mexico: Lower Rio Grande Region,
W74-07609 6B

RIPARIAN RIGHTS
Survey of Oregon's Water Laws,
W74-07611 6E

RIPUS
Acclimatization of Introduced Fish Species in the Eravninsk Lakes (Buryat Assr), (In Russian),
W74-08129 8I

RISKS
The Methodology of Bayesian Inference and Decision Making Applied to Extreme Hydrologic Events,
W74-07601 2A

Induced Safety Algorithm for Hydrologic Design under Uncertainty,
W74-08017 6A

RIVER BASINS
The Role of Public Involvement in Water Resources Planning and Development, A Report with Readings on Research and Experimentation in Public Affairs Education.
W74-07610 6B

RIVER FLOW
Hydrology and Structural Design (In Russian),
W74-07767 8B

The Effects of River Fluctuations Resulting from Hydroelectric Peaking on Selected Aquatic Invertebrates,
W74-07830 2I

RIVER FORECASTING
National Weather Service River Forecasting System,
W74-08057 4A

RIVER WATERS
Investigation of River Water for the Presence of Escherichia coli and Enterococcus, (in Russian),
W74-08004 5A

RIVERS
Quality of Surface Waters in the Colorado River Basin, Texas, 1966-72 Water Years,
W74-07670 5B

Hydrologic Response of Ice-Covered Streams,
W74-07832 2E

ROACH
Growth of the Caspian Roach in the Mingechaur Reservoir, (In Azerbaijarian),
W74-08123 2H

ROAD CONSTRUCTION
Carbonate Bonding of Taconite Tailings,
W74-07959 5G

ROCK PROPERTIES
The Electrical Resistivity Method (Part I),
W74-07852 7B

ROCKS
Methods of Mercurometric Investigations,
W74-07695 5A

Uranium, Thorium, and Lead Concentrations in Three Silicate Standards and a Method of Lead Isotopic Analysis,
W74-07947 2K

RODENTS
Polyacrylamide Gel Disc Electrophoresis of Rat Bile after Intravenous Administration of 52 MnC12, 64CuC12, 203HgC12 and 210 Pb(N03)2,
W74-07694 5C

Evaluation of Zinc Availability in Foodstuffs of Plant and Animal Origin,
W74-07706 5C

Influence of Dietary and Injected Selenium on Whole-Body Retention, Route of Excretion, and Tissue Retention of 75SeO3 (--) in the Rat,
W74-07708 5C

Reduction of Lead Absorption from the Intestine in Newborn Rats,
W74-07953 5C

ROTARY DRILLING
Improved Drilling Rates at Lower Costs,
W74-07901 8C

ROTATORIA
Studies on the Occurrence of Planktonic Rotatoria in Urban Waters and Their Relationship to Saprobism. (in German),
W74-08111 2I

ROTENONE
The Application of 'Rotenone' for the Extermination of the Indigenous Fish Stock in Waters Where Intensive Fish Farming is to be Introduced,
W74-08001 8I

RUNOFF
Alterations in the Hydrologic Cycle Induced by Urbanization in Northern New Castle County, Delaware: Magnitudes and Projections,
W74-07729 4C

Trends and Problems in Investigation of Long-Term Fluctuations of River Runoff (Napravleniya i zadachi issledovaniya mnogoletnikh kolebaniy rechnogo stoka),
W74-08051 2E

Quality of Drainage Water From a Heavy-Textured Soil,
W74-08088 5B

Hydrological Investigations in Forest.
W74-08140 4C

RUNOFF FORECASTING
Hydrological Aspect of Surface Run-Off,
W74-07756 2A

National Weather Service River Forecasting System,
W74-08057 4A

SACRAMENTO DELTA (CALIF)
Corrosive Effects of Southern California Potable Waters,
W74-07866 8G

SAFETY
Design Data and Safety Features of Commercial Nuclear Power Plants, Vol I,
W74-07794 5G

Design Data and Safety Features of Commercial Nuclear Power Plants, Vol. II.
W74-07795 5G

Design Data and Safety Features of Commercial Nuclear Power Plants, Vol. III,
W74-07796 5G

South Dakota Standards for Irrigation Pumps and Power Units,
W74-07895 8C

Prevention of Damage to Pipelines.
W74-07923 8A

SAGEBRUSH
Phreatophytes, A Bibliography, Revised.
W74-07829 3B

SALINE SOILS
An Oscillator Circuit for Automated Salinity Sensor Measurements,
W74-08074 2G

SALINE WATER
Effects of Colorado River Water Quality and Supply on Irrigated Agriculture,
W74-08014 3C

SALINE WATER INTRUSION
Hydrology and Chloride Contamination of the Principal Artesian Aquifer in Glynn County, Georgia,
W74-07919 2F

SALINITY
Heterogeneities in Salinity in a River Plume,
W74-07672 2L

The Influence of Temperature and Salinity on the Toxicity of Cadmium to the Fiddler Crab, Uca pugilator,
W74-07699 5C

The Significance of Rainfall on Salt and Sodium Accumulations Under Irrigation,
W74-07743 3C

Effect of Radiation, Salinity and Temperature on the Ionic Regulation of the Blue Crab, Callinectes sapidus,
W74-07818 5C

Location and Characteristics of the Interface Between Brine and Fresh Water from Geophysical Logs of Boreholes in the Upper Brazos River Basin, Texas,
W74-07859 8B

Influence of Temperature and Moisture Stress from Sodium Chloride Salinization on Okra Emergence,
W74-08073 3C

An Oscillator Circuit for Automated Salinity Sensor Measurements,
W74-08074 2G

Effect of Narrow Trenching in Harlingen Clay Soil on Plant Growth, Rooting Depth, and Salinity,
W74-08078 3F

SALINITY

Tolerance of Rice (Oryza Sativa L.) to Salt During Boot, Flowering, and Grain-Filling Stages,
W74-08080 3C

Effects of Drainage and Organic Amendments on the Reclamation of a Sodic Soil Cropped With Rice,
W74-08087 3C

Relationship Between Soil Oxygen Diffusion Rate and Yield of Oats in a Coastal Alluvial Soil at Critical Salinity Level,
W74-08094 3C

SALMON

Accumulation of Calcium-45 in Developing Coho Salmon Eggs and Fry reared in varying concentrations of Stable Calcium,
W74-07808 5C

SALMON RIVER (IDAHO)

Summary Report for a Methodology Study to Develop Evaluation Criteria for Wild and Scenic Rivers,
W74-07608 6B

SALMONELLA

Survival of Enteric Pathogens and Indicator Organisms in Natural Waters,
W74-07840 5A

SALT SOLUTIONS

Effect of Dilute Salt Solutions on Chernozem Soil Estimated Through the Hydration Properties of the Colloids,
W74-08135 2G

SALTS

Leaching Requirement Studies: Sensitivity of Alfalfa to Salinity of Irrigation and Drainage Waters,
W74-07774 3C

SAMPLING

USGS Completes Nationwide Reconnaissance of Metals in Streams.
W74-07698 5A

The Determination of Mercury in Air Samples and Biological Materials,
W74-07710 5A

The Determination of Heavy Metals in Domestic Sewage Treatment Plant Wastes,
W74-07763 5A

Seasonal and Spatial Changes in Primary Production and Nutrients in Lake Michigan,
W74-07773 5C

Variations in the Design of Depth Samplers for use in Groundwater Studies,
W74-07865 8G

Subsurface Exploration and Sampling of Soils for Civil Engineering Purposes,
W74-07905 8D

SAND

Sand Control in Oil and Gas Wells, Part I,
W74-07891 8B

SAND CONTROL

Sand Control, (Part 4), Combinations, Comparisons, and Costs,
W74-07851 8A

Sand Control in Oil and Gas Wells, Part I,
W74-07891 8B

SAND WAVES

Influence of Older Relief on the Location of Sand Waves in a Part of the Southern North Sea,
W74-07676 2J

SANDSTONE

Water Jet Cutting of Sedimentary Rock,
W74-07883 8B

SANDSTONES

Deformation Moduli of Water-Bearing Formations at Elevated Temperatures,
W74-07726 4B

SANITARY ENGINEERING

Leachate Treatment by Coagulation and Precipitation,
W74-08091 5D

SAPROBISM

Studies on the Occurrence of Planktonic Rotatoria in Urban Waters and Their Relationship to Saprobism. (in German),
W74-08111 2I

SATELLITES (ARTIFICIAL)

Pollution Monitoring in Lake Champlain Using ERTS-1 Imagery,
W74-08009 5A

Application of Satellite Data for Hydrologic Purposes (Ispol'zovaniye sputnikovoy informatsii dlya gidrologicheskikh tseley),
W74-08049 7B

SAVANNAH RIVER BASIN

Studies on Southeastern Aquatic Insects,
W74-07740 5C

SAVANNAH RIVER PLANT (SO

Geohydrology of the Buried Triassic Basin at the Savannah River Plant,
W74-07934 5B

SCALE PREVENTION

Prevention of Calcium Carbonate Scale Deposition in Mill Water Systems,
W74-07848 8G

SCALING

Prevention of Calcium Carbonate Scale Deposition in Mill Water Systems,
W74-07848 8G

Evaluation of Scaling Tendencies,
W74-07893 8G

SCARAB (PASTURE)

Environmental Stress in the Pasture Scarab Sericesthis nigrolineata Boisd.: Mortality in Larvae Caused by High Temperature,
W74-08146 5C

Environmental Stress in the Pasture Scarab Sericesthis nigrolineata Boisd.: II. Effects of Soil Moisture and Temperature on Survival of Firstinstar Larvae,
W74-08147 5C

SCINTILLATION METHOD

Determination of Counting Efficiency by 14C by Liquid Scintillation in Primary Production Measurements in a Lagoon Environment, (In French),
W74-08143 5A

SCREENS

Sand Control, (Part 4), Combinations, Comparisons, and Costs,
W74-07851 8A

Head Drop Across Bar Screens,
W74-08092 5D

SEA TEMPERATURE

Fluctuations in Gulf of Maine Sea Temperature and Specific Molluscan Abundance,
W74-08145 2I

SEA WATER

Gradient Analysis of Carbon Monoxide and Methane in Polluted and Other Nearshore Habitats,
W74-07984 5A

SEASONAL

Seasonal Changes of Benthos Algae of the Higher Part of Vorskla River, (In Russian),
W74-08142 5C

SEASONAOL

Seasonal Changes in Water Quality and Primary Productivity in Doe Valley Lake,
W74-07605 5C

SECONDARY RECOVERY (OIL)

Project Rio Blanco Spall Measurements Data Report,
W74-07797 4B

SEDIMENT CONTROL

Processes, Procedures, and Methods to Control Pollution Resulting from All Construction Activity.
W74-07942 5B

SEDIMENT DISTRIBUTION

Transport of Radionuclides in Sediments,
W74-07814 5B

SEDIMENT SORTING

Packing-Induced Radial Particle-Size Segregation: Influence on Hydrodynamic Dispersion and Water Transfer Measurements,
W74-07630 2G

SEDIMENT TRANSPORT

Observations and Analysis of Bottom Turbid Layers on the Oregon Continental Shelf,
W74-07632 2J

A Derivation of the Hydraulic Geometry of Steady-State Channels from Conservation Principles and Sediment Transport Laws,
W74-07633 2J

The Role of Sediment Gradation on Channel Armoring,
W74-07731 2J

Sediment Transport by Streams in the Upper Columbia River Basin, Washington, May 1969-June 1971,
W74-07911 2J

Patterns of Water Flow and Sediment Dispersion Adjacent to an Eroding Barrier Island,
W74-07920 2J

Ranger Submarine Slide, Northern Sebastian Vizcaino Bay, Baja California, Mexico,
W74-07938 2J

Tidal Currents and Zig-Zag Sand Shoals in a Wide Estuary Entrance,
W74-07939 2L

SEDIMENT YIELD

Sediment Transport by Streams in the Upper Columbia River Basin, Washington, May 1969-June 1971,
W74-07911 2J

EDIMENTARY ROCKS
Water Jet Cutting of Sedimentary Rock,
W74-07883 8B

EDIMENTARY STRUCTURES
Historic Flood Information for Northern California Streams from Geological and Botanical Evidence,
W74-07646 2E

EDIMENTATION
Historic Flood Information for Northern California Streams from Geological and Botanical Evidence,
W74-07646 2E

Geological Investigations,
W74-07657 5B

Methods and Practices for Controlling Water Pollution from Agricultural Nonpoint Sources.
W74-07941 5B

EDIMENTS
Characterization of Suspended Sediments in Water from Selected Watersheds as Related to Control Processes, Nutrient Contents, and Lake Eutrophication,
W74-07736 5B

Research to Determine the Environmental Response to the Deposition of Spoil on Salt Marshes Using Diked and Undiked Techniques.
W74-07990 6G

EED TREATMENT
Organo-Mercury Fungicide Treatment of Sugar-Beet Seed,
W74-07951 5B

EEPAGE
Flood and Seepage Water Sampling Techniques in Rice Fields Under Different Water Management Practices,
W74-08090 5B

EISMIC REGIONS
Earthquake Damage Costs in the Design of Water Resource Systems,
W74-08018 4A

EISMIC STUDIES
Pleistocene-Holocene Sediments Interpreted by Seismic Refraction and Wash-Bore Sampling, Plum Island-Castle Neck, Mass.,
W74-07875 2L

ELENIUM
Solvent Extraction of Selenium (IV) with 2-Thenoyltri-Fluoroacetone,
W74-07692 5A

Influence of Dietary and Injected Selenium on Whole-Body Retention, Route of Excretion, and Tissue Retention of 75SeO3 (--) in the Rat,
W74-07708 5C

Tissue Sulfhydryl Groups in Selenium-Deficient Rats and Lambs,
W74-07952 5B

ELF-PURIFICATION
Problems for Hydrobiological Investigation under Conditions of Complex Use of Water Resources (In Russian),
W74-07765 5F

ENSITIVITY STUDY
A Stochastic Model for the James,
W74-07843 5B

SEPARATION TECHNIQUES
Solvent Extraction of Selenium (IV) with 2-Thenoyltri-Fluoroacetone,
W74-07692 5A

Smelter Gases Yield Mercury,
W74-07956 5D

Pivotable Fluid Diverter for Recirulation System,
W74-08021 5D

Oil Recovery Apparatus,
W74-08033 5G

System for Reversed Osmosis,
W74-08037 5D

SERICESTHIS-NIGROLINEATA
Environmental Stress in the Pasture Scarab Sericesthis nigrolineata Boisd.: Mortality in Larvae Caused by High Temperature,
W74-08146 5C

Environmental Stress in the Pasture Scarab Sericesthis nigrolineata Boisd.: II. Effects of Soil Moisture and Temperature on Survival of Firstinstar Larvae,
W74-08147 5C

SEWAGE DISPOSAL
Using Sewage Effluent and Liquid Digested Sludge to Establish Grasses and Legumes on Bituminous Strip-Mine Spoils,
W74-07612 5D

Harbor Pollution from Large Ships,
W74-08006 5B

SEWAGE DISTRICTS
Regional Water Authorities: Organizational Patterns-Purpose or Professional,
W74-07754 5G

SEWAGE SLUDGE
Odors Emitted from Raw and Digested Sewage Sludge,
W74-07960 5D

SEWAGE TREATMENT
Part I - A Conceptual Model for a Terrestrial Ecosystem Perturbed with Sewage Effluent, with Special Reference to the Michigan State University Water Quality Management Project; Part II - A Personalized Bibliographi c Retrieval Package for Resource Scientists,
W74-07606 5D

BOD, Solids and Nutrient Removal by Foam Flotation,
W74-07742 5D

The Snodland-Ightham Regional Drainage Scheme: Design and Operation,
W74-07752 5D

Automation of the Control and Operation of Water Pollution Control Works,
W74-07758 5D

Redevelopment of Haven Sewage-Treatment Works, Colchester,
W74-07759 5D

Major Wastewater Treatment Plant to be Upgraded,
W74-07761 5D

The Determination of Heavy Metals in Domestic Sewage Treatment Plant Wastes,
W74-07763 5A

Pivotable Fluid Diverter for Recirulation System,
W74-08021 5D

Apparatus and Method for Treating Waste Liquid,
W74-08026 5D

Design and Simulation of Equalization Basins,
W74-08046 5D

Head Drop Across Bar Screens,
W74-08092 5D

SEWERS
Water Resources Management for Metropolitan Washington: Analysis of the Joint Interactions of Water and Sewage Service, Public Policy and Land Development Patterns in an Expanding Metropolitan Area.
W74-07723 6B

Appendices to Water Resources Management for Metropolitan Washington: Analysis of the Joint Interactions of Water and Sewage Service, Public Policy, and Land Development Patterns in an Expanding Metropolitan Area.
W74-07724 6B

The Design, Planning and Construction of a 45 inch Diameter Water Main Across a Congested Area of West Bromwich,
W74-07751 8A

SEXUAL VARIABILITY
Gambusia in the Zeravshan River Basin, (in Russian),
W74-08105 2I

SHALLOW WATER
Ecology of the Eulittoral Zone of Lakes,
W74-08003 5C

SHELTERBELTS
Ameliorative Effect of Field Shelterbelts Under Conditions in the Urals, (In Russian),
W74-08100 4A

SHIPS
Harbor Pollution from Large Ships,
W74-08006 5B

SHORE PROTECTION
Floating Breakwater for Attenuating Seas,
W74-08043 8B

SHORES
Ecology of the Eulittoral Zone of Lakes,
W74-08003 5C

SHRIMP
Trace Elements in Marine Shrimp,
W74-07806 5C

SILICA
Effect of Monosilicic Acid on Hydrolytic Reactions of Aluminum,
W74-07626 2G

Activated Silica in Wastewater Coagulation,
W74-07738 5D

Distribution of Phosphorus, Silica, Chlorophyll a, and Conductivity in Lake Michigan and Green Bay,
W74-08000 5C

SILICATES
Domestic Hot Water Systems, Silicate Treatment Inhibits Corrosion of Galvanized Steel and Copper Alloys,
W74-07850 8G

SIMILITUDE REQUIREMENTS
Axisymmetric Infiltrations,
W74-07839 2G

SIMULATION ANALYSIS
Economic Optimization and Simulation Techniques for Management of Regional Water Resource Systems,
W74-07714 6A

Test Results on Buoyant Jets Injected Horizontally in a Cross Flowing Stream,
W74-07766 8B

Error Analysis of Ecological Models,
W74-07811 5B

Application of Remote Sensing to Hydrology--Final Technical Report,
W74-07940 2A

The State of the System (SOS) Model: Measuring Growth Limitations Using Geological Concepts,
W74-07958 6G

Improved Dynamic Programing Procedures and Their Practical Application to Water Resource Systems,
W74-08013 6A

Induced Safety Algorithm for Hydrologic Design under Uncertainty,
W74-08017 6A

SINKS
Hydrology of Limestone Karst in Greenbrier County, West Virginia,
W74-07908 2F

Sources, Sinks, and Methods of Analysis of Organic Nitrogen Compounds in Fresh Water Systems,
W74-08008 5C

SITES
Optimum Drilling Sites for Ground-Water Development on the East Coast of Lanai Island,
W74-07734 4B

Environmental Statement Related to Construction and Operation of Barnwell Nuclear Fuel Plant.
W74-07792 5B

Final Environmental Statement Related to the Proposed Perry Nuclear Power Plant, Units 1 and 2.
W74-07793 5A

Design Data and Safety Features of Commercial Nuclear Power Plants, Vol I,
W74-07794 5G

Design Data and Safety Features of Commercial Nuclear Power Plants, Vol. II.
W74-07795 5G

Design Data and Safety Features of Commercial Nuclear Power Plants, Vol. III,
W74-07796 5G

SLUDGE DIGESTION
Mechanical-Biological Waste Water Purification Plant,
W74-08032 5D

SLUDGE TREATMENT
Using Sewage Effluent and Liquid Digested Sludge to Establish Grasses and Legumes on Bituminous Strip-Mine Spoils,
W74-07612 5D

Lime Stabilization of Primary Sludges,
W74-07760 5D

New Sludge Processing Plant of the Beeston and Stapleford Urban District Council.
W74-07779 5D

Odors Emitted from Raw and Digested Sewage Sludge,
W74-07960 5D

SLURRIES
Compensated Gamma Ray Densimeter Measures Slurry Densities in Flow,
W74-07877 8G

SMALL WATERSHEDS
Annual Peak Discharges from Small Drainage Areas in Montana, Through September 1972,
W74-07667 2E

SMELTERS
Smelter Gases Yield Mercury,
W74-07956 5D

SOCIAL ASPECTS
Social and Economic Factors in the Adoption by Industry of Water Pollution Control Measures in Minnesota,
W74-07834 5G

SOCIO-ECONOMIC MODEL
An Analytical Interdisciplinary Evaluation of the Utilization of the Water Resources of the Rio Grande in New Mexico: Lower Rio Grande Region,
W74-07609 6B

SOCKEYE SALMON
Effects of Crude Oil and Some of its Components on Young Coho and Sockeye Salmon,
W74-07613 5C

SODIC STEPPE AREAS
Relics of the Boggy Vegetation in Sodic Territories, (In Hungarian),
W74-08122 2H

SODIUM
The Significance of Rainfall on Salt and Sodium Accumulations Under Irrigation,
W74-07743 3C

Effect of the Moisture and Temperature on the Leaching of Ash Elements from Plant Residues (in Russian),
W74-08016 2I

Effects of Drainage and Organic Amendments on the Reclamation of a Sodic Soil Cropped With Rice,
W74-08087 3C

SODIUM ADSORPTION RATIO
The Significance of Rainfall on Salt and Sodium Accumulations Under Irrigation,
W74-07743 3C

SODIUM SULFITE
Corrosion by Waters,
W74-07890 8G

SOIL ANALYSIS
Vegetation and Soil Relationships in Southern Beaufort County, North Carolina,
W74-08150 2K

SOIL CHEMISTRY
Anion Adsorption by Allophanic Tropical Soils: I. Chloride Adsorption,
W74-07634 2G

Anion Adsorption by Allophanic Tropical Soils II. Sulfate Adsorption,
W74-07635 2G

Anion Adsorption by Allophanic Tropical Soils III. Phosphate Adsorption,
W74-07636 2G

An Oscillator Circuit for Automated Salinity Sensor Measurements,
W74-08074 2G

SOIL CONTAMINATION
Aerial Pollution and the Rapid Evolution of Copper Tolerance,
W74-07713 5B

Environmental Radioactivity,
W74-07791 5B

Structure and Function of Hardwood Litter and Soil Subsystems After Chronic Gamma Irradiation, I. Mesofauna, Nitrogen, and Total Soil Respiration,
W74-07824 5C

SOIL FORMATION
Delimitation of Weathering Zones in the Fiord Area of Eastern Baffin Island, Canada,
W74-07937 2I

SOIL HUMIDITY
Effect of Humidity and Temperature on Microbial Activity in Moor Peat Soils, (In Russian),
W74-08089 2G

Effectiveness of Mineral Fertilizers During Cotton Cultivating Depending on Soil Humidity, (In Azerbaijanian),
W74-08099 3F

SOIL MECHANICS
Subsurface Exploration and Sampling of Soils for Civil Engineering Purposes,
W74-07905 8D

SOIL MOISTURE
Soil Moisture Transport in Arid Site Vadose Zones,
W74-07780 2G

The Significance of Moisture Flow and Equilibria in Unsaturated Soils in Relation to the Design of Engineering Structures Built on Shallow Foundations in Australia,
W74-07899 8D

Influence of Temperature and Moisture Stress from Sodium Chloride Salinization on Okra Emergence,
W74-08073 3C

Effect of Temperature and Plant Water Stress on Photosynthesis Diffusion Resistance, and Leaf Water Potential in Spring Wheat,
W74-08075 3F

Sugarbeet Response to Irrigation as Measured with Growth Sensors,
W74-08079 3F

Studies of Re-Vegetation in Vehicle Tracks in Svalbard. (in Norwegian),
W74-08116 4A

Environmental Stress in the Pasture Scarab Sericesthis nigrolineata Boisd.: II. Effects of Soil Moisture and Temperature on Survival of Firstinstar Larvae,
W74-08147 5C

OIL MOISTURE SUCTION
Calculation of Capillary Rise from Groundwater Table into the Root Zone Under Steady-State Conditions, (In German),
W74-08139 2G

OIL PHYSICAL PROPERTIES
The Relationships Between Soil Water and Engineering Properties of the Clayey Soils, (In Japanese),
W74-07679 2G

Lime Grout Penetration and Associated Moisture Movements in Soil,
W74-07871 8D

OIL STABILIZATION
Lime Grout Penetration and Associated Moisture Movements in Soil,
W74-07871 8D

OIL SURVEYS
Subsurface Exploration and Sampling of Soils for Civil Engineering Purposes,
W74-07905 8D

OIL TEMPERATURE
Effect of Humidity and Temperature on Microbial Activity in Moor Peat Soils, (In Russian),
W74-08089 2G

Environmental Stress in the Pasture Scarab Sericesthis nigrolineata Boisd.: II. Effects of Soil Moisture and Temperature on Survival of Firstinstar Larvae,
W74-08147 5C

OIL TEXTURE
Effect of Narrow Trenching in Harlingen Clay Soil on Plant Growth, Rooting Depth, and Salinity,
W74-08078 3F

OIL TYPES
Subsurface Exploration and Sampling of Soils for Civil Engineering Purposes,
W74-07905 8D

OIL WATER
Distribution of Free Iron and Organic Carbon as Related to Available Water in Some Forested Sandy Soils,
W74-07622 2G

The Relationships Between Soil Water and Engineering Properties of the Clayey Soils, (In Japanese),
W74-07679 2G

Axisymmetric Infiltrations,
W74-07839 2G

Model for Estimating Soil Water, Plant, and Atmospheric Interrelations: II. Field Test of Model,
W74-08085 2G

OIL WATER MOVEMENT
Packing-Induced Radial Particle-Size Segregation: Influence on Hydrodynamic Dispersion and Water Transfer Measurements,
W74-07630 2G

Anion Exclusion and Coupling Effects in Nonsteady Transport Through Unsaturated Soils: II. Laboratory and Numerical Experiments,
W74-07631 2G

The Significance of Moisture Flow and Equilibria in Unsaturated Soils in Relation to the Design of Engineering Structures Built on Shallow Foundations in Australia,
W74-07899 8D

SOIL-WATER-PLANT RELATIONSHIPS
Model for Estimating Soil Water, Plant, and Atmospheric Interrelations: II. Field Test of Model,
W74-08085 2G

SOILS
Effect of Water-Soluble Decomposition Products of Herbaceous Plants on Uptake of Radioisotopes in Soil. (in Russian),
W74-08117 2G

SOILS (WATERLOGGED)
Correlations Between P, Fe and Mn Availability in Water-Logged Soil at Different Fertility Levels,
W74-08134 2G

SOLUBILITY
Investigations on the Problem of Solubility and Stability of Steroid Ovulation Inhibitors in Water, Waste Water and Activated Sludge, (In German),
W74-08133 5A

SOLVENT EXTRACTIONS
Solvent Extraction of Selenium (IV) with 2-Thenoyltri-Fluoroacetone,
W74-07692 5A

SONIC VELOCITY TESTS
Deformation Moduli of Water-Bearing Formations at Elevated Temperatures,
W74-07726 4B

SOUNDING
Influence of Older Relief on the Location of Sand Waves in a Part of the Southern North Sea,
W74-07676 2J

SOUTH CAROLINA
Solid Forms for Savannah River Plant High-Level Waste,
W74-07787 5D

Environmental Statement Related to Construction and Operation of Barnwell Nuclear Fuel Plant.
W74-07792 5B

Buried Triassic Basin in the Central Savannah River Area, South Carolina and Georgia,
W74-07916 2F

Geohydrology of the Buried Triassic Basin at the Savannah River Plant,
W74-07934 5B

SOUTH DAKOTA
An Ecological Study of the Missouri River Prior to Channelization,
W74-07744 2I

South Dakota Standards for Irrigation Pumps and Power Units,
W74-07895 8C

South Dakota Standards for Construction of Irrigation Wells in Shallow Unconsolidated Glacial Sediments,
W74-07896 8A

Potential Contribution of Desalting Systefs to Municipal Water Quality and Supply in South Dakota.
W74-08064 3A

SOUTHEAST U
Studies on Southeastern Aquatic Insects,
W74-07740 5C

SOUTHERN GREAT PLAINS
Regional Energy-Water Problems, Southern Plains,
W74-07976 6D

SOWING
Sowing of Ponds and Carp with Clostridium perfringens, (In Ukrainian),
W74-08076 5B

SPACERS
Using Improved Technology to Obtain Better Cement Jobs on Deep, Hot Liners,
W74-07878 8F

SPAIN
Plankton Production and Water Quality in Spanish Reservoirs. First Report on a Research Project,
W74-08005 5C

SPALL DATA
Project Rio Blanco Spall Measurements Data Report,
W74-07797 4B

SPECIES MIGRATION
The Freshwater Mollusks From the Dune Area North of the Hague,
W74-07996 2H

SPECTROPHOTOMETRY
Solvent Extraction of Selenium (IV) with 2-Thenoyltri-Fluoroacetone,
W74-07692 5A

Mercury Analysis by Atomic Absorption Spectrophotometry,
W74-07704 5A

Determination of Copper and Zinc in Biological Material,
W74-07712 5A

Determination of Mercury in Vegetation with Dithizone - A Single Extraction Procedure,
W74-07949 5A

SPECTROSCOPY
Methods of Mercurometric Investigations,
W74-07695 5A

Trace Metals in Atmospheric Particulates and Atomic Absorption Spectroscopy,
W74-07705 5A

The Determination of Heavy Metals in Domestic Sewage Treatment Plant Wastes,
W74-07763 5A

SPILLWAYS
Spillway Water-Surface Profiles,
W74-07913 8B

Outlet Works, Stilling Basin for Tallahala Dam, Tallahala Creek, Mississippi,
W74-07925 8B

Outlet Works Stilling Basins, Clinton and Fort Scott Dams, Wakarusa and Marmaton Rivers, Kansas,
W74-07930 8A

SPOIL BANKS
Research to Determine the Environmental Response to the Deposition of Spoil on Salt Marshes Using Diked and Undiked Techniques.
W74-07990 6G

SPOIL DISPOSAL
Research to Determine the Environmental Response to the Deposition of Spoil on Salt Marshes Using Diked and Undiked Techniques.
W74-07990 6G

SPRINKLER IRRIGATION
Hydrobiochemical Effects of Spraying Waste-Treatment Effluent in St. Petersburg, Florida,
W74-07978 5C

SQUAM LAKE (N
Determining a Recreational Lake's Tolerance for Development and Usage,
W74-07836 5A

STABILIZATION
Lime Grout Penetration and Associated Moisture Movements in Soil,
W74-07871 8D

STAGE-DISCHARGE RELATIONS
Estimating the Magnitude of Peak Discharges for Selected Flood Frequencies on Small Streams in East Texas,
W74-07664 2E

Spillway Water-Surface Profiles,
W74-07913 8B

STAINLESS STEEL
Corrosive Effects of Potable Water,
W74-07886 8G

STANDARDS
Hydrology and Structural Design (In Russian),
W74-07767 8B

Uranium, Thorium, and Lead Concentrations in Three Silicate Standards and a Method of Lead Isotopic Analysis,
W74-07947 2K

STATE GOVERNMENTS
State Organization for Water Resources Management,
W74-07733 6E

STATE WATER AGENCIES
State Organization for Water Resources Management,
W74-07733 6E

STATISTICAL METHODS
Hydrologic Models of the Great Lakes,
W74-07826 2H

Trends and Problems in Investigation of Long-Term Fluctuations of River Runoff (Napravleniya i zadachi issledovaniya mnogoletnikh kolebaniy rechnogo stoka),
W74-08051 2E

STATISTICAL MODELS
A Stochastic Model for the James,
W74-07843 5B

STEAM-ELECTRIC POWER GENERATION
Industrial Application of Whitford's Demand Forecasting Procedure,
W74-08015 6D

STEEL PIPES
The Design, Planning and Construction of a 45 inch Diameter Water Main Across a Congested Area of West Bromwich,
W74-07751 8A

STELLATE
Biological Characteristics of the Volga School of Beluga and Stellate Sturgeon, (In Russian),
W74-08126 2I

STEROID OVULATION
Investigations on the Problem of Solubility and Stability of Steroid Ovulation Inhibitors in Water, Waste Water and Activated Sludge, (In German),
W74-08133 5A

STILLING BASINS
Outlet Works, Stilling Basin for Tallahala Dam, Tallahala Creek, Mississippi,
W74-07925 8B

STOCHASTIC PROCESSES
Optimization of Stochastic Storage Models Formulated by P.A.P. Moran, and Z. Kaczmarek (Optymalizaeja stochastycznych modeli retencjonwania podanych przes P.A.P. Morana i Z. Kaczmarka),
W74-07747 4A

STONEFLIES
Studies on Southeastern Aquatic Insects,
W74-07740 5C

STORAGE REQUIREMENTS
A Simple Method for Retention Basin Design,
W74-07753 5D

STORAGE TANKS
A Water Quality Problem in Lobster Holding Tanks,
W74-07983 8I

Quality of Drinking Water on Ships in Relation to Sailing Conditions, (In Russian),
W74-08082 5B

STORM RUNOFF
Estimation of Imperviousness and Specific Curb Length for Forecasting Stormwater Quality and Quantity,
W74-07640 5B

A Streamflow Model for Metropolitan Planning and Design,
W74-07721 2A

A Simple Method for Retention Basin Design,
W74-07753 5D

Redevelopment of Haven Sewage-Treatment Works, Colchester,
W74-07759 5D

STORM SEWERS
A Streamflow Model for Metropolitan Planning and Design,
W74-07721 2A

STRATIFICATION
Results of Red Tide Formation in Tokyo Bay,
W74-07770 5C

A Prediction of Changes in the Thermal Cycle of a Stratified Lake Used to Cool a 1000 MW Power Plant,
W74-07998 5C

STRATIFIED FLOW
Selective Withdrawal From Beech Fork Lake, Beech Fork River, West Virginia,
W74-07914 8B

STREAM EROSION
Evolution of Meander Loops,
W74-07661 2J

STREAM STABILIZATION
The Role of Sediment Gradation on Channel Armoring,
W74-07731 2J

STREAMFLOW
A Streamflow Model for Metropolitan Planning and Design,
W74-07721 2A

Quantity and Quality of Surface Water in Marion County, Florida,
W74-08044 7C

Trends and Problems in Investigation of Long-Term Fluctuations of River Runoff (Napravleniya i zadachi issledovaniya mnogoletnikh kolebaniy rechnogo stoka),
W74-08051 2E

STREAMFLOW FORECASTING
National Weather Service River Forecasting System,
W74-08057 4A

STREPTOCOCCUS
Survival of Intestinal Bacteria in Oligotrophic Waters,
W74-07737 5C

STRESS
Influence of Temperature and Moisture Stress from Sodium Chloride Salinization on Okra Emergence,
W74-08073 3C

STRIP MINE WASTES
Using Sewage Effluent and Liquid Digested Sludge to Establish Grasses and Legumes on Bituminous Strip-Mine Spoils,
W74-07612 5D

STRIP MINES
Pollution Control,
W74-07970 6D

STRIPED BASS
Ecological Factors Affecting Anadromous Fishes of Lake Ponchartrain and Its Tributaries,
W74-07993 2H

STRIPED RIFFLE MINNOWS
Data on the Reproduction of the Striped Riffle Minnow (Alburnoides Teniatus Kesser) in the Zeravshan River, (in Russian),
W74-08104 2I

STRONTIUM
Distribution of ZN, FE, MN, and SR in Marine Fishes of Different Feeding Habits,
W74-07801 5C

STRUCTURAL DESIGN
Hydrology and Structural Design (In Russian),
W74-07767 8B

STRUCTURES
Induced Safety Algorithm for Hydrologic Design under Uncertainty,
W74-08017 6A

STURGEON (SHOVELNOSE)
An Ecological Study of the Missouri River Prior to Channelization,
W74-07744 2I

STURGEON (STELLATE)
Biological Characteristics of the Volga School of Beluga and Stellate Sturgeon, (In Russian),
W74-08126 2I

SUBMARINE LANDSLIDES
Ranger Submarine Slide, Northern Sebastian Vizcaino Bay, Baja California, Mexico,
W74-07938 2J

SUBSURFACE INVESTIGATIONS
The Electrical Resistivity Method (Part I),
W74-07852 7B

Subsurface Exploration and Sampling of Soils for Civil Engineering Purposes,
W74-07905 8D

SUBSURFACE MAPPING
Pleistocene-Holocene Sediments Interpreted by Seismic Refraction and Wash-Bore Sampling, Plum Island-Castle Neck, Mass.,
W74-07875 2L

SUGAR BEETS
Sugarbeet Response to Irrigation as Measured with Growth Sensors,
W74-08079 3F

SULFATE-REDUCING BACTERIA
The Sulfate-Reducing Bacteria and Oilfield Bacterial Corrosion - A Review of the Current State-of-the-Art,
W74-07902 8G

SUNFISHES
Radiation Effects on Serum Proteins, Hematocrits, Electrophoretic Patterns and Protein Components in the Bluegill (Lepomis macrochirus),
W74-07816 5C

SUPERCRITICAL FLOW
The Numerical Solution of Transient Supercritical Flow by the Method of Characteristics with a Technique for Simulating Bore Propagation,
W74-07732 8B

SURFACE-GROUNDWATER RELATIONSHIPS
An Analytical Interdisciplinary Evaluation of the Utilization of the Water Resources of the Rio Grande in New Mexico: Lower Rio Grande Region,
W74-07609 6B

A Ground-Water Monitoring Network for Kootenai Flats, Northern Idaho,
W74-07662 7A

Hydrologic Data for 1972, Broward County, Florida,
W74-07918 7C

SURFACE RUNOFF
Alterations in the Hydrologic Cycle Induced by Urbanization in Northern New Castle County, Delaware: Magnitudes and Projections,
W74-07729 4C

Hydrological Aspect of Surface Run-Off,
W74-07756 2A

Contribution to Water Pollution from Agricultural and Urban Sources in the Coachella Valley,
W74-07757 5B

SURFACE WATERS
Water Resources Data for Nebraska, 1972: Part I. Surface-Water Records,
W74-07647 7C

Water Resources of Lehigh County, Pennsylvania,
W74-07649 4A

Geology and Water Resources of the Wharton Tract and the Mullica River Basin in Southern New Jersey,
W74-07668 4B

Water Resources of the Little River Basin, Louisiana,
W74-07671 4A

Quality of Surface Water in Illinois, 1966-1971,
W74-07678 5A

USGS Completes Nationwide Reconnaissance of Metals in Streams.
W74-07698 5A

Water in the Okanogan River Basin, Washington,
W74-07907 3B

Quantity and Quality of Surface Water in Marion County, Florida,
W74-08044 7C

Present Problems in the Study of Surface-Water Quality (Aktual'nyye problemy issledovaniya kachestva poverkhnostnykh vod),
W74-08050 5G

Problem of Assessing Effects of Human Activity on Surface-Water Resources (K probleme otsenki vliyaniya deyatel'nosti cheloveka na resursy poverkhnostnykh vod),
W74-08053 4A

SURFACTANTS
Improved Drilling Rates at Lower Costs,
W74-07901 8C

SURVEYS
Research - - Targets and Developments, Regional Assessments,
W74-07903 7B

Industrial Liquid Waste Surveys: Training Manual.
W74-07988 5G

A Systems Approach to Assessment of Rural Water Supply Program Effectiveness,
W74-08012 6B

SUSPENDED LOAD
Fractionation of Suspended and Colloidal Particles in Natural Water,
W74-07783 5A

SUSPENDED SOLIDS
Characterization of Suspended Sediments in Water from Selected Watersheds as Related to Control Processes, Nutrient Contents, and Lake Eutrophication,
W74-07736 5B

BOD, Solids and Nutrient Removal by Foam Flotation,
W74-07742 5D

SWEETPOTATO
'Hill-Top Irrigation,' A New System for Early Sweetpotato Planting, (In Spanish),
W74-08136 3F

SYSTEMATICS
Studies on Southeastern Aquatic Insects,
W74-07740 5C

A Preliminary Check-List of the Marine Algae of the Moss Landing Jetty: An Annotated Floristic Compilation,
W74-07981 5C

SYSTEMS ANALYSIS
Analytical Techniques for Planning Complex Water Resource Systems.
W74-07722 6A

Design Data and Safety Features of Commercial Nuclear Power Plants, Vol I,
W74-07794 5G

A Systems analysis Methodology for Predicting Dose to Man From a Radioactively Contaminated Terrestrial Environment,
W74-07809 5C

Modeling Radionuclides and Pesticides in Food Chains,
W74-07810 5B

Error Analysis of Ecological Models,
W74-07811 5B

Process Control Model for Oxygen Regeneration of Polluted Rivers, Phases IV and V, and Spacially and Temporally Distributed Discharge of Effluents in Estuaries,
W74-07837 5B

A Systems Approach to Assessment of Rural Water Supply Program Effectiveness,
W74-08012 6B

SYSTEMS ENGINEERING
Analytical Techniques for Planning Complex Water Resource Systems.
W74-07722 6A

TACONITE TAILINGS
Carbonate Bonding of Taconite Tailings,
W74-07959 5G

TAKYR SOILS
Ways of Increasing the Production of Takyr Soils of the Tedzhen Delta, (In Russian),
W74-08098 3F

TAMARISK
Phreatophytes, A Bibliography, Revised.
W74-07829 3B

TANNERY HAIR
The Removal of Soluble Mercury from Waste Water by Complexing Techniques,
W74-07845 5D

TELEMETRY
A Data Acquisition System for Ecological Field Studies,
W74-07989 7B

TEMPERATURE
The Influence of Temperature and Salinity on the Toxicity of Cadmium to the Fiddler Crab, Uca pugilator,
W74-07699 5C

Effect of Temperature and Plant Water Stress on Photosynthesis Diffusion Resistance, and Leaf Water Potential in Spring Wheat,
W74-08075 3F

TEMPERATURE DISTRIBUTION
Hydrologic Response of Ice-Covered Streams,
W74-07832 2E

TEMPORAL DISTRIBUTION
Precipitation Characteristics of the Northern New Jersey, New York City Metropolitan Area,
W74-07607 2B

TENNESSEE
Survival of Enteric Pathogens and Indicator Organisms in Natural Waters,
W74-07840 5A

TENNESSEE RIVER VALLEY
Application of Remote Sensing to Hydrology--Final Technical Report,
W74-07940 2A

TENSILE STRENGTH
Corrosion Resistant Cements,
W74-07887 8F

TERTIARY TREATMENT
Inorganic Nitrogen Removal in a Combined Tertiary Treatment-Marine Aquaculture System - II. Algal Bioassays,
W74-07777 5C

TEST WELLS
Location and Characteristics of the Interface Between Brine and Fresh Water from Geophysical Logs of Boreholes in the Upper Brazos River Basin, Texas,
W74-07859 8B

TESTACEA
Testacea (Protozoa: Sarcodina) as Indicators of Water Quality in Western Montana,
W74-07718 5A

TESTING
Progress in Ecological Research at Edgewood Arsenal, Maryland: Fiscal Years 1971 and 1972,
W74-07986 5C

TETRAETHYL LEAD
The LD(50) Value of Tetraethyl Lead,
W74-07700 5C

TEXAS
Estimating the Magnitude of Peak Discharges for Selected Flood Frequencies on Small Streams in East Texas,
W74-07664 2E

Quality of Surface Waters in the Colorado River Basin, Texas, 1966-72 Water Years,
W74-07670 5B

Location and Characteristics of the Interface Between Brine and Fresh Water from Geophysical Logs of Boreholes in the Upper Brazos River Basin, Texas,
W74-07859 8B

Down-Hole Motors for Improved Drilling,
W74-07880 8C

Data on Fresh-Water Inflow, April 14-July 28, 1973, For Analog-Model Study of the Houston Ship Channel, Houston, Texas,
W74-07921 7C

Industrial Application of Whitford's Demand Forecasting Procedure,
W74-08015 6D

TEXAS WATER PLAN
Economic Optimization and Simulation Techniques for Management of Regional Water Resource Systems,
W74-07714 6A

Analytical Techniques for Planning Complex Water Resource Systems.
W74-07722 6A

TEXTBOOK
Environmental Radioactivity,
W74-07791 5B

THAILAND
A Systems Approach to Assessment of Rural Water Supply Program Effectiveness,
W74-08012 6B

THERMAL CONDUCTIVITY
Deformation Moduli of Water-Bearing Formations at Elevated Temperatures,
W74-07726 4B

Electric and Thermal Properties of Rocks,
W74-07906 8E

THERMAL POLLUTION
Hydrologic Response of Ice-Covered Streams,
W74-07832 2E

Environmental Stress in the Pasture Scarab Sericesthis nigrolineata Boisd.: Mortality in Larvae Caused by High Temperature,
W74-08146 5C

THERMAL POWERPLANTS
Pollution Control,
W74-07970 6D

Regional Energy-Water Problems Northeast,
W74-07971 6D

THERMAL PRECIPITATION
Evaluation of Scaling Tendencies,
W74-07893 8G

THERMAL STRATIFICATION
An Investigation of the Water Quality and Productivity of Polson Bay, Flathead Lake, Montana,
W74-07717 5C

THERMAL STRESS
Environmental Stress in the Pasture Scarab Sericesthis nigrolineata Boisd.: Mortality in Larvae Caused by High Temperature,
W74-08146 5C

THERMAL STUDIES
Research - - Targets and Developments, Regional Assessments,
W74-07903 7B

THERMOCLINE
Using Improved Technology to Obtain Better Cement Jobs on Deep, Hot Liners,
W74-07878 8F

THERMOELECTRIC POWER
Hydrologic Response of Ice-Covered Streams,
W74-07832 2E

THERMOLUMINESCENT DOSIMETRY
Thermoluminescent Dosimetry of AquatiR Organisms,
W74-07819 5C

THERMOPLASTIC PIPE
Performance and Selection of Materials for Potable Hot Water Service,
W74-07855 8G

TIDES
Patterns of Water Flow and Sediment Dispersion Adjacent to an Eroding Barrier Island,
W74-07920 2J

Tidal Currents and Zig-Zag Sand Shoals in a Wide Estuary Entrance,
W74-07939 2L

TOLEDO CLAY SOILS
Quality of Drainage Water From a Heavy-Textured Soil,
W74-08088 5B

TOOL JOINTS
Drill Pipe Failures: Where Do We Go From Here,
W74-07869 8G

TORDON
The Fate and Effects of Pesticides in the Aquatic Environment of the Flathead Lake Drainage Area,
W74-07835 5C

TOXICITY
Effects of Crude Oil and Some of its Components on Young Coho and Sockeye Salmon,
W74-07613 5C

Mercury in the Environment, An Epidemiological and Toxicological Appraisal
W74-07680 5C

Symptoms and Signs of Intoxication,
W74-07684 5C

Inorganic Mercury-Relation Between Exposure and Effects,
W74-07686 5C

Organic Mercury Compounds-Relation Between Exposure and Effects,
W74-07687 5C

General Discussion and Conclusions-Need for Further Research,
W74-07689 5C

The Distribution of Lead in Human Deciduous Teeth,
W74-07691 5C

The Influence of Temperature and Salinity on the Toxicity of Cadmium to the Fiddler Crab, Uca pugilator,
W74-07699 5C

The LD(50) Value of Tetraethyl Lead,
W74-07700 5C

Tetraethyl Lead Dose Response Curve for Mortality in Laboratory Rats,
W74-07701 5C

Effect of Ascorbic Acid on Cadmium Toxicity in the Young Coturnix,
W74-07707 5C

Toxicity of an Algal Complex on Freshwater Fauna: 1. Action on Some Benthic Animals and Fishes. (in French),
W74-08108 5C

Toxicity of an Algal Complex on Freshwater Fauna: 2. Action on Lymnaea Spp. (in French).
W74-08109 5C

TRACE ELEMENTS
Trace Metals Investigations,
W74-07655 5B

Trace Metals in Atmospheric Particulates and Atomic Absorption Spectroscopy,
W74-07705 5A

Analysis of Trace Metal Particulates in Atmospheric Samples Using X-Ray Fluorescence,
W74-07709 5A

Trace-Element Interactions Between River Water and Seawater,
W74-07805 5B

Iron and Associated Trace Mineral Problems in Man and Animals,
W74-07950 2K

TRACERS
Tracers in Mud Improve DST, Wireline Test Accuracy,
W74-07856 8G

TRAINING
Annual Report '72 - '73.
W74-07602 9A

Industrial Liquid Waste Surveys: Training Manual.
W74-07988 5G

RANSFER
Transport and Transformation of Mercury in Nature and Possible Routes of Exposure,
W74-07682 5B

Metabolism,
W74-07683 5B

RANSPORT DEPLETION
Soil Moisture Transport in Arid Site Vadose Zones,
W74-07780 2G

REATMENT FACILITIES
Pricing of Industrial Wastewater Treatment Service,
W74-07727 5D

The Treatment of Waste Water from Industries and Commerce in Public Purification Plants (in German),
W74-07748 5D

The Snodland-Ightham Regional Drainage Scheme: Design and Operation,
W74-07752 5D

A Simple Method for Retention Basin Design,
W74-07753 5D

Redevelopment of Haven Sewage-Treatment Works, Colchester,
W74-07759 5D

Lime Stabilization of Primary Sludges,
W74-07760 5D

Major Wastewater Treatment Plant to be Upgraded,
W74-07761 5D

The Severn Scheme of the Bristol Waterworks Company.
W74-07772 5F

Head Drop Across Bar Screens,
W74-08092 5D

TREES
Effects of Ionizing Radiation on Processes Influencing Tolerance of Tree Seedlings,
W74-07815 5C

TREES (STANDS)
Effect of Climatic and Phytocenotic Factors on Annual Increment of Trees in Stands, (In Russian),
W74-08127 2I

TRICHOPTERA
Studies on Southeastern Aquatic Insects,
W74-07740 5C

Trichoptera in the Reservation Area Heiliges Meer in Westphalia,
W74-07997 2I

TRICLADIUM-VARIUM
Tricladium varium, An Aquatic Hyphomycete on Wood in Water-Cooling Towers,
W74-08011 2I

TRINITY RIVER BASIN (TEX
Industrial Application of Whitford's Demand Forecasting Procedure,
W74-08015 6D

TRITIATED WATER
Mathematical Model of Tritiated and Stable Water Movement in an Old-Field Ecosystem,
W74-07812 5B

Chromosome Aberrations in Chironomus Riparius developing in Different Concentrations of Tritiated Water,
W74-07820 5C

TRITIUM
Soil Moisture Transport in Arid Site Vadose Zones,
W74-07780 2G

Tritium Distribution in the Nuclear Industry - The Requirements for Control Strategies,
W74-07784 5B

Chemical Engineering Division, Waste Management Programs, Quarterly Report, July-September 1973,
W74-07788 5D

The Technology of Tritium Fixation and Storage,
W74-07789 5D

Mathematical Model of Tritiated and Stable Water Movement in an Old-Field Ecosystem,
W74-07812 5B

Transport of Radionuclides in Sediments,
W74-07814 5B

Chromosome Aberrations in Chironomus Riparius developing in Different Concentrations of Tritiated Water,
W74-07820 5C

TURBIDITY CURRENTS
Observations and Analysis of Bottom Turbid Layers on the Oregon Continental Shelf,
W74-07632 2J

TURBINES
Down-Hole Motors for Improved Drilling,
W74-07880 8C

South Dakota Standards for Irrigation Pumps and Power Units,
W74-07895 8C

TURBULENT FLOW
Test Results on Buoyant Jets Injected Horizontally in a Cross Flowing Stream,
W74-07766 8B

TYBEE ISLAND (GA)
Patterns of Water Flow and Sediment Dispersion Adjacent to an Eroding Barrier Island,
W74-07920 2J

UNDERGROUND WASTE DISPOSAL
Polluted Groundwater: Some Causes, Effects, Controls, and Monitoring.
W74-07615 5B

Geohydrology of the Buried Triassic Basin at the Savannah River Plant,
W74-07934 5B

Injection Wells Pose a Potential Threat.
W74-08072 5B

UNITED KINGDOM
Regional Water Authorities: Organizational Patterns-Purpose or Professional,
W74-07754 5G

Automation of the Control and Operation of Water Pollution Control Works,
W74-07758 5D

UNITED KINGDOM (BEESTON-STAPLEFORD)
New Sludge Processing Plant of the Beeston and Stapleford Urban District Council.
W74-07779 5D

UNITED KINGDOM (BRISTOL)
The Severn Scheme of the Bristol Waterworks Company.
W74-07772 5F

UNITED KINGDOM (BROMWICH)
The Design, Planning and Construction of a 45 inch Diameter Water Main Across a Congested Area of West Bromwich,
W74-07751 8A

UNITED KINGDOM (COLCHESTER)
Redevelopment of Haven Sewage-Treatment Works, Colchester,
W74-07759 5D

UNITED KINGDOM (LIVERPOOL BAY)
Chemical Evidence for the Dispersal of River Mersey Run-off in Liverpool Bay,
W74-07674 5B

UNITED KINGDOM (SNODLAND-CROUCH)
The Snodland-Ightham Regional Drainage Scheme: Design and Operation,
W74-07752 5D

UNITED KINGDOM (THAMES ESTUARY)
A Simple, Segmented Prism Model of Tidal Mixing in Well-Mixed Estuaries,
W74-07673 2L

UNITED KINGDOM (THAMES-KENNET RIVERS)
Primary Production and Respiration of the Phytoplankton of the Rivers Thames and Kennet at Reading,
W74-08132 5C

UNITED STATES
Problems for Hydrobiological Investigation under Conditions of Complex Use of Water Resources (In Russian),
W74-07765 5F

UNIVERSITIES
Annual Report '72 - '73.
W74-07602 9A

Water Resources Research in Virginia - Annual Report for Fiscal Year 1972.
W74-07842 9D

UNSATURATED FLOW
Nitrogen Transformations in Soil During Leaching: I. Theoretical Considerations,
W74-07619 5B

Nitrogen Transformation in Soil During Leaching: II. Steady State Nitrification and Nitrate Reduction,
W74-07620 5B

Nitrogen Transformations in Soil During Leaching: III. Nitrate Reduction in Soil Columns,
W74-07621 5B

Nitrogen Transformations During Continuous Leaching,
W74-07623 5B

UNSTEADY FLOW
The Numerical Solution of Transient Supercritical Flow by the Method of Characteristics with a Technique for Simulating Bore Propagation,
W74-07732 8B

URANIUM
Uranium-234,
W74-07790 5B

URBAN HYDROLOGY
Estimation of Imperviousness and Specific Curb Length for Forecasting Stormwater Quality and Quantity,
W74-07640 5B

Alterations in the Hydrologic Cycle Induced by Urbanization in Northern New Castle County, Delaware: Magnitudes and Projections,
W74-07729 4C

URBAN RUNOFF
Alterations in the Hydrologic Cycle Induced by Urbanization in Northern New Castle County, Delaware: Magnitudes and Projections,
W74-07729 4C

Contribution to Water Pollution from Agricultural and Urban Sources in the Coachella Valley,
W74-07757 5B

URBAN WATERS
Studies on the Occurrence of Planktonic Rotatoria in Urban Waters and Their Relationship to Saprobism. (in German),
W74-08111 2I

URBANIZATION
Innovation: A Case Study,
W74-07720 6B

A Streamflow Model for Metropolitan Planning and Design,
W74-07721 2A

USSR
Problems for Hydrobiological Investigation under Conditions of Complex Use of Water Resources (In Russian),
W74-07765 5F

Hydrological Forecasting and Water Management (In Russian),
W74-07768 4A

Automatic Pumping Installations for Livestock Sections,
W74-07864 8C

International Cooperation of Hydrologists (Mezhdunarodnoye sotrudnichestvo gidrologov),
W74-08047 7A

Present Problems in the Study of Surface-Water Quality (Aktual'nyye problemy issledovaniya kachestva poverkhnostnykh vod),
W74-08050 5G

Trends and Problems in Investigation of Long-Term Fluctuations of River Runoff (Napravleniya i zadachi issledovaniya mnogoletnikh kolebaniy rechnogo stoka),
W74-08051 2E

Problem of Assessing Effects of Human Activity on Surface-Water Resources (K probleme otsenki vliyaniya deyatel'nosti cheloveka na resursy poverkhnostnykh vod),
W74-08053 4A

State Record Keeping on Water and Its Usage and Hydrologic Calculations and Forecasts (Gosudarstvennyy uchet vod i ikh ispol'zovaniya i gidrologicheskiye raschety i prognozy),
W74-08054 7A

Problem of Rational Use and Conservation of Water Resources and Goals of Hydrology (Problema ratsional'nogo ispol'zovaniya i okhrany vodnykh resursov i zadachi gidrologii),
W74-08055 6B

All-Union Hydrologic Congresses (Vsesoyuznyye gidrologicheskiye syezdy),
W74-08056 6E

USSR (AMU-DAR'YA DELTA)
Regularities of the Growth of the Body and Brain of the Common Carp in Bodies of Waters of the Amu-Dar'ya Delta, (in Russian),
W74-08106 2I

USSR (BURYAT ASSR)
Acclimatization of Introduced Fish Species in the Eravninsk Lakes (Buryat Assr), (In Russian),
W74-08129 8I

USSR (COMMANDER ISLANDS)
Zooplankton of Fresh and Brackish Waters of the Bering Island (Commander Islands). (in Russian),
W74-08114 2I

USSR (CRIMEA)
Ground Beetles (Coleoptera, Carabidae) from the Boggy Areas of the Crimea, (in Russian),
W74-08103 2I

USSR (DONETS-DONBAS CANAL)
Species Composition of Epiphytic Bacteria of Green Filamentous Algae in the Northern Donets-Donbas Canal, (in Russian),
W74-08112 5C

USSR (KHATANGA RIVER BASIN)
Results and Prospects of Investigating Fishes and Their Food Resources of the Khatanga River Basin, (In Russian),
W74-08130 8I

USSR (KURA RIVER)
Growth of the Caspian Roach in the Mingechaur Reservoir, (In Azerbaijarian),
W74-08123 2H

USSR (LAKE BAYKAL)
Application of Satellite Data for Hydrologic Purposes (Ispol'zovaniye sputnikovoy informatsii dlya gidrologicheskikh tseley),
W74-08049 7B

USSR (LAKE SEVAN-ARMENIA)
Present and Future of Lake Sevan (Sovremennoye sostoyaniye i budushcheye ozera Sevan),
W74-08048 2H

USSR (LAKE UCHUM)
Treatment of Children with Chronic Hepatoangiocholecystitis at the Lake Uchum Health Resort,
W74-08102 2I

USSR (MORSHIN SPRING)
Use of Morshin Mineral Water in Disease of the Liver and Biliary Tracts in Children, (in Ukrainian),
W74-08101 2I

USSR (NEMUNAS RIVER DELTA)
Study of Mesh Fish Barriers in the Polder Systems of the Nemunas River Delta, (In Russian),
W74-08125 8I

USSR (NURA RIVER)
Sanitary-Hygienic Evaluation of the Water Quality of the Nura Water Conduit of the Tselinograd District (In Russian),
W74-08052 5A

USSR (TAIMIR)
Invertebrate Fauna of the Bodies of Water of the Stationary 'Agapa' (Western Taimir) (in Russian),
W74-08110 2I

USSR (TEDYHEN DELTA)
Ways of Increasing the Production of Takyr Soils of the Tedzhen Delta. (In Russian),
W74-08098 3F

USSR (URALS)
Ameliorative Effect of Field Shelterbelts Under Conditions in the Urals, (In Russian),
W74-08100 4A

USSR (VORSKLA RIVER)
Seasonal Changes of Benthos Algae of the Higher Part of Vorskla River, (In Russian),
W74-08142 5C

USSR (ZERAVSHAN RIVER)
Data on the Reproduction of the Striped Riffle Minnow (Alburnoides Teniatus Kesser) in the Zeravshan River, (in Russian),
W74-08104 2I

Gambusia in the Zeravshan River Basin, (in Russian),
W74-08105 2I

UTAH
Hydrologic Reconnaissance of the Northern Great Salt Lake Desert and Summary Hydrologic Reconnaissance of Northwestern Utah,
W74-07665 2F

UTILITIES
Water Resources Management for Metropolitan Washington: Analysis of the Joint Interactions of Water and Sewage Service, Public Policy and Land Development Patterns in an Expanding Metropolitan Area.
W74-07723 6B

Appendices to Water Resources Management for Metropolitan Washington: Analysis of the Joint Interactions of Water and Sewage Service, Public Policy, and Land Development Patterns in an Expanding Metropolitan Area.
W74-07724 6B

VALVES
Valve Installation, Operation and Maintenance,
W74-07867 8C

VAN DER WAALS FORCES
The Transport of Radioisotopes by Fine Particulate Matter in Aquifers,
W74-07730 5B

VEGETATION
Coastal Vegetation of Delaware,
W74-07616 2L

Determination of Mercury in Vegetation with Dithizone - A Single Extraction Procedure,
W74-07949 5A

Vegetation and Soil Relationships in Southern Beaufort County, North Carolina,
W74-08150 2K

GETATION ESTABLISHMENT
Using Sewage Effluent and Liquid Digested Sludge to Establish Grasses and Legumes on Bituminous StripMine Spoils,
W74-07612 5D

GETATION RE-ESTABLISHMENT
Studies of Re-Vegetation in Vehicle Tracks in Svalbard. (in Norwegian),
W74-08116 4A

GETATION ZONES
Zonation of Mosses on the Banks of the Novy Cepsky Pond. (in Czech.),
W74-08119 2H

NTURI DEVICE
Apparatus for Aerating Water,
W74-08023 5D

BRATIONS
Flow-Induced Vibration of Vertical-Lift Gate,
W74-08058 8C

RGINIA
Aquatic Invertebrate Recovery in the Clinch River Following Hazardous Spills and Floods,
W74-07841 5C

Water Resources Research in Virginia - Annual Report for Fiscal Year 1972.
W74-07842 9D

A Stochastic Model for the James,
W74-07843 5B

OLCANIC SOILS
Anion Adsorption by Allophanic Tropical Soils: I. Chloride Adsorption,
W74-07634 2G

Anion Adsorption by Allophanic Tropical Soils: II. Sulfate Adsorption,
W74-07635 2G

Anion Adsorption by Allophanic Tropical Soils: III. Phosphate Adsorption,
W74-07636 2G

OLUMETRIC EFFICIENCY
Positive Displacement Pumps,
W74-07874 8C

ALLEYE
Acclimatization of Introduced Fish Species in the Eravninsk Lakes (Buryat Assr), (In Russian),
W74-08129 8I

ALNUT
Effect of the Stand Density of Walnut Forests on Surface Runoff and Soil Erosion on the Spurs of the Southwestern Slope of the Darvaza Range, (In Russian),
W74-08137 4D

ASH-BORE SAMPLING
Pleistocene-Holocene Sediments Interpreted by Seismic Refraction and Wash-Bore Sampling, Plum Island-Castle Neck, Mass.,
W74-07875 2L

ASHINGTON
A Similarity Solution for Steady-State Gravitational Circulation in Fjords,
W74-07675 2L

Characterization of Suspended Sediments in Water from Selected Watersheds as Related to Control Processes, Nutrient Contents, and Lake Eutrophication,
W74-07736 5B

Survival of Intestinal Bacteria in Oligotrophic Waters,
W74-07737 5C

Soil Moisture Transport in Arid Site Vadose Zones,
W74-07780 2G

A Study of Pollutant Discharges from Reactor Operations Utilizing Ultracentrifugation Techniques,
W74-07782 5A

A Summary of Quantity, Quality and Economic Methodology for Establishing Minimum Flows,
W74-07847 6B

Water in the Okanogan River Basin, Washington,
W74-07907 3B

Sediment Transport by Streams in the Upper Columbia River Basin, Washington, May 1969-June 1971,
W74-07911 2J

WASTE DISPOSAL
Cartmen Devises Technique for Disposing of 3.5 Million Gallons of Liquid Discards Annually.
W74-07762 5D

Social and Economic Factors in the Adoption by Industry of Water Pollution Control Measures in Minnesota,
W74-07834 5G

WASTE DISPOSAL WELLS
Reconnaissance of the Water Resources in the Vicinity of Proposed Deep-Well Injection Sites in Southeast Dade County, Florida,
W74-07915 5B

Injection Wells Pose a Potential Threat.
W74-08072 5B

WASTE MANAGEMENT
Chemical Engineering Division, Waste Management Programs, Quarterly Report, July-September 1973,
W74-07788 5D

WASTE REUSE
Sun Oil Develops Water Reuse Program,
W74-07882 5D

WASTE STORAGE
Solid Forms for Savannah River Plant High-Level Waste,
W74-07787 5D

The Technology of Tritium Fixation and Storage,
W74-07789 5D

WASTE TREATMENT
Treatment Methods for Heavy Metal-Containing Liquid Waste (In Japanese),
W74-07745 5D

Cartmen Devises Technique for Disposing of 3.5 Million Gallons of Liquid Discards Annually.
W74-07762 5D

Industrial Waste Processing Apparatus,
W74-08035 5D

WASTE WATER DISPOSAL
Irrigation of Citrus with Citrus Waste Water,
W74-07603 5D

Part I - A Conceptual Model for a Terrestrial Ecosystem Perturbed with Sewage Effluent, with Special Reference to the Michigan State University Water Quality Management Project; Part II - A Personalized Bibliographi c Retrieval Package for Resource Scientists,
W74-07606 5D

Chemical Engineering Division, Waste Management Programs, Quarterly Report, July-September 1973,
W74-07788 5D

Hydrobiochemical Effects of Spraying Waste-Treatment Effluent in St. Petersburg, Florida,
W74-07978 5C

WASTE WATER TREATMENT
Pricing of Industrial Wastewater Treatment Service,
W74-07727 5D

Activated Silica in Wastewater Coagulation,
W74-07738 5D

Adsorption from Aqueous Solution,
W74-07739 5D

Oxygenation of Aqueous Bodies Using Liquid Oxygen-Loxination,
W74-07741 5D

BOD, Solids and Nutrient Removal by Foam Flotation,
W74-07742 5D

Treatment Methods for Heavy Metal-Containing Liquid Waste (In Japanese),
W74-07745 5D

The Treatment of Waste Water from Industries and Commerce in Public Purification Plants (in German),
W74-07748 5D

Reverse Osmosis Process and its Application, (In Japanese),
W74-07750 5D

The Snodland-Ightham Regional Drainage Scheme: Design and Operation,
W74-07752 5D

Lime Stabilization of Primary Sludges,
W74-07760 5D

Major Wastewater Treatment Plant to be Upgraded,
W74-07761 5D

Experimental Study of the Protective Ability of Water-Treatment Plants with Respect to some Substances of Caprolactam Production (In Russian),
W74-07771 5D

Inorganic Nitrogen Removal in a Combined Tertiary Treatment-Marine Aquaculture System - II. Algal Bioassays,
W74-07777 5C

New Sludge Processing Plant of the Beeston and Stapleford Urban District Council.
W74-07779 5D

Chemical Engineering Division, Waste Management Programs, Quarterly Report, July-September 1973,
W74-07788 5D

Coagulant Recovery and Reuse in Water Reclamation Systems,
W74-07844 5D

The Removal of Soluble Mercury from Waste Water by Complexing Techniques,
W74-07845 5D

Sun Oil Develops Water Reuse Program,
W74-07882 5D

Odors Emitted from Raw and Digested Sewage Sludge,
W74-07960 5D

Water Treatment System,
W74-07979 5F

Optimal Timing and Sizing of a Conjunctive Urban Water Supply and Waste Water System with Nonlinear Programming,
W74-08010 5D

Process and Apparatus for the Purification of a Natural Body of Water,
W74-08019 5D

Pivotable Fluid Diverter for Recirulation System,
W74-08021 5D

Process for Treating Water Contaminated with Hexavalent Chromium,
W74-08024 5D

Apparatus and Method for Treating Waste Liquid,
W74-08026 5D

Submerged Turbine Aerator,
W74-08027 5D

Wastewater Treatment Using Electrolysis with Activated Carbon Cathode,
W74-08028 5D

Method of Treating Waste Water Containing Ligninsulfonate,
W74-08029 5D

Electrolytic Flotation Apparatus,
W74-08030 5D

Mechanical-Biological Waste Water Purification Plant,
W74-08032 5D

Wastewater Treatment,
W74-08034 5D

Industrial Waste Processing Apparatus,
W74-08035 5D

Storage and Dispensing Apparatus for a Reverse Osmosis Water Purification System,
W74-08039 5D

Valve for Reverse Osmosis Purification and Storage System,
W74-08040 5D

Reverse Osmosis-Neutralization Process for Treating Mineral Contaminated Waters,
W74-08041 5D

Mathematical Model for Post Aeration,
W74-08045 5D

Design and Simulation of Equalization Basins,
W74-08046 5D

Commercial Desalting Plant Data and Analysis, Volumes I-VI,
W74-08061 3A

Nitrogen Removal by Soil Mechanisms,
W74-08081 5D

Head Drop Across Bar Screens,
W74-08092 5D

WATER ALLOCATION
Economic Optimization and Simulation Techniques for Management of Regional Water Resource Systems,
W74-07714 6A

WATER ALLOCATION (POLICY)
Management Priorities: Now and the Future,
W74-07755 6B

WATER BALANCE
Hydrologic Models of the Great Lakes,
W74-07826 2H

WATER CHEMISTRY
Chemical Engineering Division, Waste Management Programs, Quarterly Report, July-September 1973,
W74-07788 5D

Present Problems in the Study of Surface-Water Quality (Aktual'nyye problemy issledovaniya kachestva poverkhnostnykh vod),
W74-08050 5G

Ionic Activity Coefficients in Water Solutions Calculated by Means of Nomographs,
W74-08093 2K

WATER CIRCULATION
A Simple, Segmented Prism Model of Tidal Mixing in Well-Mixed Estuaries,
W74-07673 2L

Chemical Evidence for the Dispersal of River Mersey Run-off in Liverpool Bay,
W74-07674 5B

A Similarity Solution for Steady-State Gravitational Circulation in Fjords,
W74-07675 2L

A Numerical Study of the Steady Circulation in an Open Bay,
W74-07924 2L

WATER CONSERVATION
Problem of Rational Use and Conservation of Water Resources and Goals of Hydrology (Problema ratsional'nogo ispol'zovaniya i okhrany vodnykh resursov i zadachi gidrologii),
W74-08055 6B

WATER CONSUMPTION
The Role of Water in the Energy Crisis.
W74-07961 6D

WATER DEMAND
An Analytical Interdisciplinary Evaluation of the Utilization of the Water Resources of the Rio Grande in New Mexico: Lower Rio Grande Region,
W74-07609 6B

The Role of Water in the Energy Crisis.
W74-07961 6D

The Role of Water in the Energy Crisis,
W74-07962 6D

Economic Aspects of Resource Use with Special Reference to Energy and Water,
W74-07964 6D

Environmental Aspects of Energy-Water Relationships,
W74-07965 6D

The Role of Water Resources Research in the Energy Crisis,
W74-07966 6D

Energy Production,
W74-07967 6D

Municipal and Industrial Water Supply,
W74-07968 6D

Agricultural Water Supply,
W74-07969 6D

Pollution Control,
W74-07970 6D

Regional Energy-Water Problems Northeast,
W74-07971 6D

Regional Energy-Water Problems South Atlantic Gulf,
W74-07972 6D

Regional Energy-Water Problems, Ohio-Great Lakes.
W74-07973 6D

Regional Energy-Water Problems, Missouri River,
W74-07974 6D

Regional Energy-Water Problems, Pacific Northwest,
W74-07975 6D

Regional Energy-Water Problems, Southern Plains,
W74-07976 6D

Regional Energy-Water Problems--Colorado River-Great Basin,
W74-07977 6D

Industrial Application of Whitford's Demand Forecasting Procedure,
W74-08015 6D

WATER JETS
Water Jet Cutting of Sedimentary Rock,
W74-07883 8B

WATER LAW
Survey of Oregon's Water Laws,
W74-07611 6E

WATER LEVELS
Ground-Water Levels in Observation Wells in Kansas, 1966-70,
W74-07650 7C

A Ground-Water Monitoring Network for Kootenai Flats, Northern Idaho,
W74-07662 7A

WATER LOSS
Transit Losses and Travel Times for Reservoir Releases, Upper Arkansas River Basin, Colorado,
W74-07931 4A

WATER MANAGEMENT
The Role of Water in the Energy Crisis.
W74-07961 6D

WATER MANAGEMENT (APPLIED)
Regional Water Authorities: Organizational Patterns-Purpose or Professional,
W74-07754 5G

Management Priorities: Now and the Future,
W74-07755 6B

Hydrological Forecasting and Water Management (In Russian),
W74-07768 4A

WATER PERMITS
Survey of Oregon's Water Laws,
W74-07611 6E

ATER POLLUTION
Mercury in the Environment, An Epidemiological and Toxicological Appraisal.
W74-07680 5C

The Environmental Context,
W74-07696 5C

Interdisciplinary Monitoring of the New York Bight,
W74-07764 5A

Tritium Distribution in the Nuclear Industry - The Requirements for Control Strategies,
W74-07784 5B

Environmental Radioactivity,
W74-07791 5B

Iodine-129 Levels in Milk and Water Near a Nuclear Fuel Reprocessing Plant,
W74-07798 5B

Iron-55 and Ruthenium-103 and -106 in the Brackish-Water Clam Rangia cuneata,
W74-07804 5A

Determining a Recreational Lake's Tolerance for Development and Usage,
W74-07836 5A

ATER POLLUTION CONTROL
Groundwater Pollution Features of Federal and State Satutes and Regulations,
W74-07614 5G

Polluted Groundwater: Some Causes, Effects, Controls, and Monitoring.
W74-07615 5B

Active Research Tasks Report--Fiscal Year 1973.
W74-07651 5G

Oxygenation of Aqueous Bodies Using Liquid Oxygen-Loxination,
W74-07741 5D

Automation of the Control and Operation of Water Pollution Control Works,
W74-07758 5D

Effluent Standards Strategy: Rejuvenation of an Old Game Plan,
W74-07769 5G

Social and Economic Factors in the Adoption by Industry of Water Pollution Control Measures in Minnesota,
W74-07834 5G

Processes, Procedures, and Methods to Control Pollution from Mining Activities.
W74-07927 5G

Methods and Practices for Controlling Water Pollution from Agricultural Nonpoint Sources.
W74-07941 5B

Processes, Procedures, and Methods to Control Pollution Resulting from All Construction Activity.
W74-07942 5B

Multi-Unit Apparatus for Collecting Oil from the Surface of a Body of Water,
W74-08020 5G

Apparatus for Aerating Water,
W74-08023 5D

Method and Apparatus for Aerating Bodies of Water,
W74-08031 5G

Oil Recovery Apparatus,
W74-08033 5G

Present Problems in the Study of Surface-Water Quality (Aktual'nyye problemy issledovaniya kachestva poverkhnostnykh vod),
W74-08050 5G

Pollution Control and Erection of Sewage Plants: Technical Feasibilities, Future Demands, (In German),
W74-08138 5G

WATER POLLUTION CONTROL ACT
Groundwater Issue Merits More Federal Protection, Groundwater Pollution and Conservation,
W74-07854 5G

WATER POLLUTION EFFECTS
Polluted Groundwater: Some Causes, Effects, Controls, and Monitoring.
W74-07615 5B

Chester River Study, Volumes I, II, and III.
W74-07653 5B

Biochemical Investigations,
W74-07654 5B

Inorganic Mercury-Relation Between Exposure and Effects,
W74-07686 5C

Organic Mercury Compounds-Relation Between Exposure and Effects,
W74-07687 5C

Radionuclides in Ecosystems, Volume II.
W74-07799 5C

Trace Elements in Marine Shrimp,
W74-07806 5C

Effects of Chrome Radiation Exposure On Mosquitoes (Diptera: Culicidae). 1. Effects of Rearing in Sr-90 + Y-90 Solutions,
W74-07821 5C

WATER POLLUTION SOURCES
Polluted Groundwater: Some Causes, Effects, Controls, and Monitoring.
W74-07615 5B

Chester River Study, Volumes I, II, and III.
W74-07653 5B

Biochemical Investigations,
W74-07654 5B

Hydrogeologic Investigation of a Sanitary Landfill in Stratified Glacial Drift,
W74-07728 5B

The Transport of Radioisotopes by Fine Particulate Matter in Aquifers,
W74-07730 5B

Accumulation Phenomenon Which takes Place in a Mussel (Mytilus galloprovincialis LMK) Grown in an Artificially Polluted Environment, Verification of a Simplified Model of the Dynamic Equilibrium of Metal Ripartition Between Mussels and Sea-Water, Note II-Pollution from Copper, (Fenomeno di Accumulo Nel Mitilo (Mytilus galloprovincia-Lis LMK) Stabulato in Ambiente Artificialmente Inquinato. Verifica di un Modello Semplificato per L'equilibr io Dinamico di Ripartizione del Metalli fra Mitilo e Acqua Marina, Nota II: Inquinamento da rame),
W74-07746 5C

Tritium Distribution in the Nuclear Industry - The Requirements for Control Strategies,
W74-07784 5B

Economic Evaluation of the Effect of Selected Crop Practices on Nonagricultural Uses of Water,
W74-07828 5B

Pollution Monitoring in Lake Champlain Using ERTS-1 Imagery,
W74-08009 5A

Groundwater Pollution and Conservation.
W74-08071 5B

Quality of Drainage Water From a Heavy-Textured Soil,
W74-08088 5B

Flood and Seepage Water Sampling Techniques in Rice Fields Under Different Water Management Practices,
W74-08090 5B

WATER PURIFICATION
The Treatment of Waste Water from Industries and Commerce in Public Purification Plants (in German),
W74-07748 5D

Water Treatment System,
W74-07979 5F

Process and Apparatus for the Purification of a Natural Body of Water,
W74-08019 5D

Pivotable Fluid Diverter for Recirulation System,
W74-08021 5D

System for Reversed Osmosis,
W74-08037 5D

Method and Equipment for Desalination of Liquids,
W74-08038 3A

Storage and Dispensing Apparatus for a Reverse Osmosis Water Purification System,
W74-08039 5D

Valve for Reverse Osmosis Purification and Storage System,
W74-08040 5D

WATER QUALITY
Seasonal Changes in Water Quality and Primary Productivity in Doe Valley Lake,
W74-07605 5C

Estimation of Imperviousness and Specific Curb Length for Forecasting Stormwater Quality and Quantity,
W74-07640 5B

Carbon Measurements in Water Quality Monitoring,
W74-07641 5A

Quality of Surface Waters in the Colorado River Basin, Texas, 1966-72 Water Years,
W74-07670 5B

Quality of Surface Water in Illinois, 1966-1971,
W74-07678 5A

Determining a Recreational Lake's Tolerance for Development and Usage,
W74-07836 5A

WATER QUALITY

Coliforms are an Inadequate Index of Water Quality,
W74-07885 5A

Bacteriological Water Quality Data, Beach Areas, Gatineau Park Lakes, National Capital Commission, 1973,
W74-07932 5B

Ground-Water Quality Models: What They Can and Cannot Do,
W74-07933 5B

A Water Quality Problem in Lobster Holding Tanks,
W74-07983 8I

Theory and Application of Continuous Monitoring for Chemical Research in Natural Water Systems,
W74-07985 5A

Plankton Production and Water Quality in Spanish Reservoirs. First Report on a Research Project,
W74-08005 5C

Effects of Colorado River Water Quality and Supply on Irrigated Agriculture,
W74-08014 3C

Industrial Application of Whitford's Demand Forecasting Procedure,
W74-08015 6D

Quantity and Quality of Surface Water in Marion County, Florida,
W74-08044 7C

Present Problems in the Study of Surface-Water Quality (Aktual'nyye problemy issledovaniya kachestva poverkhnostnykh vod),
W74-08050 5G

Preliminary Study to Investigate Feasibility of Desalting Ground Water in North Dakota,
W74-08066 3A

WATER QUALITY ACT

Federal Laws and Regulations,
W74-07703 5G

WATER QUALITY CONTROL

Innovation: A Case Study,
W74-07720 6B

Contribution to Water Pollution from Agricultural and Urban Sources in the Coachella Valley,
W74-07757 5B

Leaching Requirement Studies: Sensitivity of Alfalfa to Salinity of Irrigation and Drainage Waters,
W74-07774 3C

Multi-Unit Apparatus for Collecting Oil from the Surface of a Body of Water,
W74-08020 5G

Method and Apparatus for Aerating Bodies of Water,
W74-08031 5G

Water Treatment Mud Decanting Tank,
W74-08042 5F

WATER QUALITY MODELS

Ground-Water Quality Models: What They Can and Cannot Do,
W74-07933 5B

WATER QUALITY STANDARDS

Effluent Standards Strategy: Rejuvenation of an Old Game Plan,
W74-07769 5G

A Summary of Quantity, Quality and Economic Methodology for Establishing Minimum Flows,
W74-07847 6B

Petroleum Systems Reliability Analysis, A Program for Prevention of Oil Spills Using an Engineering Approach to a Study of Offshore and Onshore Crude Oil Petroleum Systems, Volume II - Appendices,
W74-07957 5G

Sanitary-Hygienic Evaluation of the Water Quality of the Nura Water Conduit of the Tselinograd District (In Russian),
W74-08052 5A

WATER REQUIREMENTS

Economic Optimization and Simulation Techniques for Management of Regional Water Resource Systems,
W74-07714 6A

WATER RESOURCE DEVELOPMENT

A Bill to Authorize the Secretary of the Interior to Engage in Feasibility Investigations of Certain Potential Water Resource Developments.
W74-07943 6E

WATER RESOURCES

World's Greatest Source of Fresh Water,
W74-07643 2H

Geology and Groundwater Resources of the Hangman Creek Drainage Basin, Idaho-Washington,
W74-07644 4A

Water Resources of Lehigh County, Pennsylvania,
W74-07649 4A

Geology and Water Resources of the Wharton Tract and the Mullica River Basin in Southern New Jersey,
W74-07668 4B

Water Resources of the Little River Basin, Louisiana,
W74-07671 4A

Analytical Techniques for Planning Complex Water Resource Systems.
W74-07722 6A

Water in the Okanogan River Basin, Washington,
W74-07907 3B

The Role of Water in the Energy Crisis.
W74-07961 6D

Problem of Assessing Effects of Human Activity on Surface-Water Resources (K probleme otsenki vliyaniya deyatel'nosti cheloveka na resursy poverkhnostnykh vod),
W74-08053 4A

State Record Keeping on Water and Its Usage and Hydrologic Calculations and Forecasts (Gosudarstvennyy uchet vod i ikh ispol'zovaniya i gidrologicheskiye raschety i prognozy),
W74-08054 7A

Problem of Rational Use and Conservation of Water Resources and Goals of Hydrology (Problema ratsional'nogo ispol'zovaniya i ok hrany vodnykh resursov i zadachi gidrologii),
W74-08055 6

All-Union Hydrologic Congresse (Vsesoyuznyye gidrologicheskiye syezdy),
W74-08056 6

WATER RESOURCES DEVELOPMENT

An Analytical Interdisciplinary Evaluation o the Utilization of the Water Resources of th Rio Grande in New Mexico: Lower Rio Grand Region,
W74-07609 6

The Role of Public Involvement in Wate Resources Planning and Development, A Re port with Readings on Research and Experi mentation in Public Affairs Education.
W74-07610 6

Reclamation Research in the Seventies--Firs Progress Report.
W74-07922 4

WATER RESOURCES INSTITUTE

Annual Report '72 - '73.
W74-07602 9

Water Resources Research in Virginia - Annua Report for Fiscal Year 1972.
W74-07842 9

WATER REUSE

Irrigation of Citrus with Citrus Waste Water,
W74-07603 5

Using Sewage Effluent and Liquid Digested Sludge to Establish Grasses and Legumes on Bituminous Strip-Mine Spoils,
W74-07612 5

The Chemical/Physical and Microbiological Characteristics of Typical Bath and Laundry Waste Waters,
W74-07663 5

Coagulant Recovery and Reuse in Water Recla mation Systems,
W74-07844 5

Sun Oil Develops Water Reuse Program,
W74-07882 5

Hydrobiochemical Effects of Spraying Waste Treatment Effluent in St. Petersburg, Florida,
W74-07978 5C

WATER SOURCES

Optimal Timing and Sizing of a Conjunctive Urban Water Supply and Waste Water System with Nonlinear Programming,
W74-08010 5D

WATER SUPPLY

The Severn Scheme of the Bristol Waterworks Company.
W74-07772 5F

Automatic Pumping Installations for Livestock Sections,
W74-07864 8C

Estimated Use of Water in Florida, 1970,
W74-07917 6D

Optimal Timing and Sizing of a Conjunctive Urban Water Supply and Waste Water System with Nonlinear Programming,
W74-08010 5D

Effects of Colorado River Water Quality and Supply on Irrigated Agriculture,
W74-08014 3C

The Potential of Desalting for Industrial Water Supplies in Northeastern Wyoming,
W74-08062 3A

Improving Municipal Water Supplies in Arizona by Desalting,
W74-08063 3A

Potential Contribution of Desalting Systefs to Municipal Water Quality and Supply in South Dakota.
W74-08064 3A

The Future Role of Desalting in Nevada,
W74-08065 3A

Pollution Control and Erection of Sewage Plants: Technical Feasibilities, Future Demands, (In German),
W74-08138 5G

ATER SUPPLY DEVELOPMENT
A Systems Approach to Assessment of Rural Water Supply Program Effectiveness,
W74-08012 6B

ATER SYSTEM OPERATION
Domestic Water Systems, Nonchemical Factors in Corrosion Control,
W74-07849 8G

ATER TEMPERATURE
Effect of Radiation, Salinity and Temperature on the Ionic Regulation of the Blue Crab, Callinectes sapidus,
W74-07818 5C

A Prediction of Changes in the Thermal Cycle of a Stratified Lake Used to Cool a 1000 MW Power Plant,
W74-07998 5C

Fluctuations in Gulf of Maine Sea Temperature and Specific Molluscan Abundance,
W74-08145 2I

ATER TREATMENT
Water Quality and Treatment of Domestic Groundwater Supplies,
W74-07637 5F

Experimental Study of the Protective Ability of Water-Treatment Plants with Respect to some Substances of Caprolactam Production (In Russian),
W74-07771 5D

The Severn Scheme of the Bristol Waterworks Company.
W74-07772 5F

Water Treatment System,
W74-07979 5F

Process and Apparatus for the Purification of a Natural Body of Water,
W74-08019 5D

Submerged Turbine Aerator,
W74-08027 5D

Method and Equipment for Desalination of Liquids,
W74-08038 3A

Water Treatment Mud Decanting Tank,
W74-08042 5F

ATER UTILIZATION
Estimated Use of Water in Florida, 1970,
W74-07917 6D

State Record Keeping on Water and Its Usage and Hydrologic Calculations and Forecasts (Gosudarstvennyy uchet vod i ikh ispol'zovaniya i gidrologicheskiye raschety i prognozy),
W74-08054 7A

Problem of Rational Use and Conservation of Water Resources and Goals of Hydrology (Problema ratsional'nogo ispol'zovaniya i okhrany vodnykh resursov i zadachi gidrologii),
W74-08055 6B

WATER WELLS
Wells and Pumping Systems for Domestic Water Supplies,
W74-07638 8B

Planning a Domestic Groundwater Supply System,
W74-07639 4B

Ground-Water Levels in Observation Wells in Kansas, 1966-70,
W74-07650 7C

Variations in the Design of Depth Samplers for use in Groundwater Studies,
W74-07865 8G

WATERBORNE DISEASES
Water Treatment System,
W74-07979 5F

WATERSHEDS (BASINS)
Drainage Area and River Mileage of Nebraska Streams: Part 1--Salt and Weeping Water Creeks, Big and Little Nemaha Rivers, and Minor Streams in Southeastern Nebraska,
W74-07669 2E

Application of Remote Sensing to Hydrology--Final Technical Report,
W74-07940 2A

WEATHER MODIFICATION
Project Skywater 1972 Annual Report.
W74-07928 3B

WEATHER PATTERNS
Precipitation Characteristics of the Northern New Jersey, New York City Metropolitan Area,
W74-07607 2B

WEATHERING
Effect of Monosilicic Acid on Hydrolytic Reactions of Aluminum,
W74-07626 2G

Delimitation of Weathering Zones in the Fiord Area of Eastern Baffin Island, Canada,
W74-07937 2J

WELL CASINGS
Casing Potential Logging Related to Vertilog Corrosion Logging,
W74-07868 8G

Using Improved Technology to Obtain Better Cement Jobs on Deep, Hot Liners,
W74-07878 8F

WELL CONSTRUCTION STANDARDS
South Dakota Standards for Construction of Irrigation Wells in Shallow Unconsolidated Glacial Sediments,
W74-07896 8A

WELL DATA
Project Rio Blanco Spall Measurements Data Report,
W74-07797 4B

Recent Advances in Log Evaluation,
W74-07853 8G

Petroleum Systems Reliability Analysis, A Program for Prevention of Oil Spills Using an Engineering Approach to a Study of Offshore and Onshore Crude Oil Petroleum Systems, Volume II - Appendices,
W74-07957 5G

WELL LOGGING
Recent Advances in Log Evaluation,
W74-07853 8G

WELL REGULATIONS
Irrigation Well Construction.
W74-07897 8A

WELL SCREENS
Sand Control in Oil and Gas Wells, Part I,
W74-07891 8B

WELL STIMULATION
Dissolution of a Porous Matrix by a Slowly Reacting Acid,
W74-07860 8B

WELLS
Sand Control, (Part 4), Combinations, Comparisons, and Costs,
W74-07851 8A

Groundwater Issue Merits More Federal Protection, Groundwater Pollution and Conservation,
W74-07854 5G

Dissolution of a Porous Matrix by a Slowly Reacting Acid,
W74-07860 8B

Automatic Pumping Installations for Livestock Sections,
W74-07864 8C

Variations in the Design of Depth Samplers for use in Groundwater Studies,
W74-07865 8G

Sand Control in Oil and Gas Wells, Part I,
W74-07891 8B

South Dakota Standards for Construction of Irrigation Wells in Shallow Unconsolidated Glacial Sediments,
W74-07896 8A

Solving Drilling Problems Utilizing Well Logs - A Case History,
W74-07898 8G

WEST GERMANY
Investigations on the Occurrence of Phenol-Decomposing Microorganisms in Waters and Sediments. (in German),
W74-08115 5C

WEST GERMANY (RHINE LOWLAND)
The Moss Vegetation of the Forests in the Rhine Lowland Between Basel and Mannheim, (In German),
W74-08131 2I

WEST GERMANY (UPPER RHINE VALLEY)
Phytosociological Observations in Inundation Zone Farmlands in the Northern Upper Rhine Valley, (In German),
W74-08121 2I

WEST GERMANY (WESTPHALIA)
Trichoptera in the Reservation Area Heiliges Meer in Westphalia,
W74-07997 2I

WEST VIRGINIA
Hydrology of Limestone Karst in Greenbrier County, West Virginia,
W74-07908 2F

Selective Withdrawal From Beech Fork Lake, Beech Fork River, West Virginia,
W74-07914 8B

WETLANDS
Coastal Vegetation of Delaware,
W74-07616 2L

WHARTON TRACT (NJ)
Geology and Water Resources of the Wharton Tract and the Mullica River Basin in Southern New Jersey,
W74-07668 4B

WHEAT
Effect of Temperature and Plant Water Stress on Photosynthesis Diffusion Resistance, and Leaf Water Potential in Spring Wheat,
W74-08075 3F

WILD RIVERS
Summary Report for a Methodology Study to Develop Evaluation Criteria for Wild and Scenic Rivers,
W74-07608 6B

WIND
Ameliorative Effect of Field Shelterbelts Under Conditions in the Urals, (In Russian),
W74-08100 4A

WINDSCALE PLANT
Radioecology of the Plaice (Pleuronectes platessa L) in the Northeast Irish Sea,
W74-07802 5C

WINTERGREEN LAKE (MICH)
Environmental Control of Nitrogen Fixation in Lakes, I. In situ Nitrogen Fixation by Free Living Blue-Green Algae, and II. Nitrogen Fixation by the Duckweed-Algal Association,
W74-07716 5C

WIRELINE TESTS
Tracers in Mud Improve DST, Wireline Test Accuracy,
W74-07856 8G

WISCONSIN
Investigation of the Sediments and Potential Manganese Nodule Resources of Green Bay, Wisconsin,
W74-07652 2J

WITHDRAWAL
Selective Withdrawal From Beech Fork Lake, Beech Fork River, West Virginia,
W74-07914 8B

Estimated Use of Water in Florida, 1970,
W74-07917 6D

WYOMING
The Potential of Desalting for Industrial Water Supplies in Northeastern Wyoming,
W74-08062 3A

X-RAY FLUORESCENCE
Analysis of Trace Metal Particulates in Atmospheric Samples Using X-Ray Fluorescence,
W74-07709 5A

XEROPHYTES
Phreatophytes, A Bibliography, Revised.
W74-07829 3B

ZINC
Fixation of Zinc by Clay Minerals,
W74-07629 2G

Liver Zinc in Carcinoma,
W74-07690 5C

Evaluation of Zinc Availability in Foodstuffs of Plant and Animal Origin,
W74-07706 5C

Determination of Copper and Zinc in Biological Material,
W74-07712 5A

Distribution of ZN, FE, MN, and SR in Marine Fishes of Different Feeding Habits,
W74-07801 5C

Concentrations of Manganese, Iron, and Zinc in Juveniles of Five Estuarine-Dependent Fishes,
W74-07803 5C

Biological Half-Lives for Zinc and Mercury in the Pacific Oyster, Crassostrea gigas,
W74-07807 5C

Zinc/Phosphate Combinations Control Corrosion in Potable Water Distribution Systems,
W74-07894 8G

Endogenous Zinc Excretion and 65Zinc Metabolism in Holstein Calves Fed Intermediate to High But Nontoxic Zinc Levels in Practical Diets,
W74-07954 5C

Antagonistic Effect of Arginine on Zinc Metabolism in Chicks,
W74-07955 5C

ZOOPLANKTON
An Investigation of the Water Quality and Productivity of Polson Bay, Flathead Lake, Montana,
W74-07717 5C

Zooplankton of Fresh and Brackish Waters of the Bering Island (Commander Islands). (in Russian),
W74-08114 2I

AUTHOR INDEX

DULLAH, M. I.
hemical Evidence for the Dispersal of River lersey Run-off in Liverpool Bay,
/74-07674 5B

COMAZZO, M. A.
igh Temperature Electrodialysis, Phase III,
/74-08069 3A

igh Temperature Electrodialysis, Phase IV,
/74-08070 3A

AMS, W. M.
ptimum Drilling Sites for Ground-Water evelopment on the East Coast of Lanai land,
/74-07734 4B

hree-Dimensional Zone Model Log Interpreta-on,
/74-07735 8G

KI, S. B.
olvent Extraction of Selenium (IV) with 2-henoyltri-Fluoroacetone,
/74-07692 5A

BERTSON, M. L.
ptimal Conjunctive Use Model for Indus asin,
/74-08059 4B

BRECHT, J. C.
lterations in the Hydrologic Cycle Induced by rbanization in Northern New Castle County, elaware: Magnitudes and Projections,
/74-07729 4C

BREGTS, E. E.
nfluence of Temperature and Moisture Stress om Sodium Chloride Salinization on Okra mergence,
/74-08073 3C

ESSI, J.
ecovery, Residual Effects, and Fate of litrogen Fertilizer Sources in a Semiarid Re-ion,
/74-08086 5B

LEN, F. J. JR.
etroleum Systems Reliability Analysis, A Pro-ram for Prevention of Oil Spills Using an En-ineering Approach to a Study of Offshore and nshore Crude Oil Petroleum Systems, olume II - Appendices,
/74-07957 5G

BARUCH, R.
pplication of Remote Sensing to Hydrology--inal Technical Report,
/74-07940 2A

BURGEY, J. W. JR.
Study of Pollutant Discharges from Reactor perations Utilizing Ultracentrifugation echniques,
/74-07782 5A

AN'EV, N. M.
anitary-Hygienic Evaluation of the Water uality of the Nura Water Conduit of the selinograd District (In Russian),
/74-08052 5A

DERSON, D. O.
egional Energy-Water Problems, Missouri iver,
/74-07974 6D

ANDERSON, E. A.
National Weather Service River Forecasting System,
W74-08057 4A

ANDERSON, W.
Quantity and Quality of Surface Water in Marion County, Florida,
W74-08044 7C

ANGELOVIC, J. W.
Effect of Radiation, Salinity and Temperature on the Ionic Regulation of the Blue Crab, Callinectes sapidus,
W74-07818 5C

ARDAKANI, M. S.
A Kinetic Study of Ammonium and Nitrite Oxidation in a Soil Field Plot,
W74-07625 5B

ARMENGOL, J.
Plankton Production and Water Quality in Spanish Reservoirs. First Report on a Research Project,
W74-08005 5C

AUSTIN, E. P.
Electrolytic Flotation Apparatus,
W74-08030 5D

AUSTIN, R. S.
An Oscillator Circuit for Automated Salinity Sensor Measurements,
W74-08074 2G

AVDEEVA, V. A.
Investigation of River Water for the Presence of Escherichia coli and Enterococcus, (in Russian),
W74-08004 5A

AVERY, D. D.
The LD(50) Value of Tetraethyl Lead,
W74-07700 5C

Tetraethyl Lead Dose Response Curve for Mortality in Laboratory Rats,
W74-07701 5C

AYOUB, G. M.
Test Results on Buoyant Jets Injected Horizontally in a Cross Flowing Stream,
W74-07766 8B

BACON, E. J.
Seasonal Changes in Water Quality and Primary Productivity in Doe Valley Lake,
W74-07605 5C

BAILIE, R. E.
Commercial Desalting Plant Data and Analysis, Volumes I-VI,
W74-08061 3A

BAIMURATOV, A. B.
Regularities of the Growth of the Body and Brain of the Common Carp in Bodies of Waters of the Amu-Dar'ya Delta, (in Russian),
W74-08106 2I

BALLOFFET, A.
Dam Collapse Wave in a River,
W74-08060 2E

BALLOFFET, A. F.
Dam Collapse Wave in a River,
W74-08060 2E

BALOGH, M.
Relics of the Boggy Vegetation in Sodic Territories, (In Hungarian),
W74-08122 2H

BANDYOPADHYAY, M.
Hydrological Aspect of Surface Run-Off,
W74-07756 2A

BANSAL, P. P.
Earthquake Damage Costs in the Design of Water Resource Systems,
W74-08018 4A

BARD, H. E.
A Stochastic Model for the James,
W74-07843 5B

BARKER, J. L.
Water Resources of Lehigh County, Pennsylvania,
W74-07649 4A

BARTLETT, D. S.
Coastal Vegetation of Delaware,
W74-07616 2L

BASTIEN, J. A. P.
Bacteriological Water Quality Data, Beach Areas, Gatineau Park Lakes, National Capital Commission, 1973,
W74-07932 5B

BATH, T. D.
Oxygenation of Aqueous Bodies Using Liquid Oxygen-Loxination,
W74-07741 5D

BATTEN, C. E.
The Chemical/Physical and Microbiological Characteristics of Typical Bath and Laundry Waste Waters,
W74-07663 5B

BEARDEN, H. W.
Hydrologic Data for 1972, Broward County, Florida,
W74-07918 7C

BEASLEY, A. E.
Prevention of Calcium Carbonate Scale Deposition in Mill Water Systems,
W74-07848 8G

BEAUCHAMP, M.
Bacteriological Water Quality Data, Beach Areas, Gatineau Park Lakes, National Capital Commission, 1973,
W74-07932 5B

BECKER, E. R.
BOD, Solids and Nutrient Removal by Foam Flotation,
W74-07742 5D

BECKETT, P.
The Columbia Interstate Compact: Politics of Water Resources in the Pacific Northwest,
W74-07846 6E

BEETON, A. M.
Distribution of Phosphorus, Silica, Chlorophyll a, and Conductivity in Lake Michigan and Green Bay,
W74-08000 5C

BEN-DAVID, S.
An Analytical Interdisciplinary Evaluation of the Utilization of the Water Resources of the Rio Grande in New Mexico: Lower Rio Grande Region,
W74-07609 6B

BERNHARDT, H.
The Use of Algal Assays for Determining the Effect of Iron and Phosphorus Compounds on the Growth of Various Algal Species,
W74-07776 5C

BERNSTEIN, L.
Leaching Requirement Studies: Sensitivity of Alfalfa to Salinity of Irrigation and Drainage Waters,
W74-07774 3C

BEYER, H.
Trichoptera in the Reservation Area Heiliges Meer in Westphalia,
W74-07997 2I

BIGGAR, J. W.
Flood and Seepage Water Sampling Techniques in Rice Fields Under Different Water Management Practices,
W74-08090 5B

Nitrogen Transformation in Soil During Leaching: II. Steady State Nitrification and Nitrate Reduction,
W74-07620 5B

Nitrogen Transformations in Soil During Leaching: I. Theoretical Considerations,
W74-07619 5B

Nitrogen Transformations in Soil During Leaching: III. Nitrate Reduction in Soil Columns,
W74-07621 5B

BILLUPS, N. B.
Collection, Detection, Identification, and Quantitation of Human Effluents,
W74-07912 5A

BIRGE, W. J.
Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality-Phase I,
W74-07715 5C

BLACK, S. W.
South Dakota Standards for Construction of Irrigation Wells in Shallow Unconsolidated Glacial Sediments,
W74-07896 8A

South Dakota Standards for Irrigation Pumps and Power Units,
W74-07895 8C

BLANC, F. C.
Leachate Treatment by Coagulation and Precipitation,
W74-08091 5D

BLAYLOCK, B. G.
Chromosome Aberrations in Chironomus Riparius developing in Different Concentrations of Tritiated Water,
W74-07820 5C

BOGARDI, I.
Induced Safety Algorithm for Hydrologic Design under Uncertainty,
W74-08017 6A

BOHAN, J. P.
Selective Withdrawal From Beech Fork Lake, Beech Fork River, West Virginia,
W74-07914 8B

BOLYSHEV, N. N.
Effect of the Moisture and Temperature on the Leaching of Ash Elements from Plant Residues (in Russian),
W74-08016 2I

BOMBARDIERI, C. C.
Gypsum-Cement Blend Works Well in Permafrost Areas,
W74-07884 8F

BOOTH, R. S.
A Systems analysis Methodology for Predicting Dose to Man From a Radioactively Contaminated Terrestrial Environment,
W74-07809 5C

BOSE, B.
Hydrological Aspect of Surface Run-Off,
W74-07756 2A

BOWEN, V. T.
Plutonium in North Atlantic Ocean Organisms; Ecological Relationships,
W74-07800 5C

BOYER, S. J.
Delimitation of Weathering Zones in the Fiord Area of Eastern Baffin Island, Canada,
W74-07937 2J

BRADFORD, G. R.
Contribution to Water Pollution from Agricultural and Urban Sources in the Coachella Valley,
W74-07757 5B

BRADLEY, R. F.
Solid Forms for Savannah River Plant High-Level Waste,
W74-07787 5D

BRADSHAW, A. D.
Aerial Pollution and the Rapid Evolution of Copper Tolerance,
W74-07713 5B

BRAY, D. T.
Storage and Dispensing Apparatus for a Reverse Osmosis Water Purification System,
W74-08039 5D

Valve for Reverse Osmosis Purification and Storage System,
W74-08040 5D

BRESLER, E.
Anion Exclusion and Coupling Effects in Nonsteady Transport Through Unsaturated Soils: II. Laboratory and Numerical Experiments,
W74-07631 2G

BRICE, J. C.
Evolution of Meander Loops,
W74-07661 2J

BROADBENT, F. E.
Nitrogen Transformations During Continuous Leaching,
W74-07623 5B

BRODERIUS, M. A.
Tissue Sulfhydryl Groups in Selenium-Deficient Rats and Lambs,
W74-07952 5B

BROEKER, M. E.
Ground-Water Levels in Observation Wells in Kansas, 1966-70,
W74-07650 7C

BROOKS, J. H.
Concentrations of Manganese, Iron, and Zinc in Juveniles of Five Estuarine-Dependent Fishes,
W74-07803 5C

BROOKS, R. H.
Axisymmetric Infiltrations,
W74-07839 2

BROWN, B. M.
Cellulosic Reverse Osmosis Membranes Ha
ing High Flux and High Salt Rejection,
W74-08022 3

BROWN, D. G.
Influence of Dietary and Injected Selenium
Whole-Body Retention, Route of Excretio
and Tissue Retention of 75SeO3 (--) in the Rat
W74-07708 5

BROWN, D. P.
Hydrobiochemical Effects of Spraying Wast
Treatment Effluent in St. Petersburg, Florida,
W74-07978 5

BROWNELL, L. E.
Soil Moisture Transport in Arid Site Vado
Zones,
W74-07780 2

BRUST, R. A.
Effects of Chrome Radiation Exposure
Mosquitoes (Diptera: Culicidae). 1. Effects
Rearing in Sr-90 + Y-90 Solutions,
W74-07821 5

BRUSVEN, M. A.
The Effects of River Fluctuations Resulti
from Hydroelectric Peaking on Selecte
Aquatic Invertebrates,
W74-07830

BRUTSAERT, W.
An Analytical Interdisciplinary Evaluation
the Utilization of the Water Resources of t
Rio Grande in New Mexico: Lower Rio Gran
Region,
W74-07609 6

BURGER, L. L.
The Technology of Tritium Fixation a
Storage,
W74-07789 5

BURGESS, D. E.
The Design, Planning and Construction of a 4
inch Diameter Water Main Across a Congeste
Area of West Bromwich,
W74-07751 8

BURK, R. F.
Influence of Dietary and Injected Selenium
Whole-Body Retention, Route of Excretio
and Tissue Retention of 75SeO3 (--) in the Rat
W74-07708 5

BURKE, J. C.
Plutonium in North Atlantic Ocean Organism
Ecological Relationships,
W74-07800 5

BURPO, C. E.
Evaluation of Zinc Availability in Foodstuffs
Plant and Animal Origin,
W74-07706 5

BUTORAC, A.
Variations in Potassium Content of Alfal
Grown on Pseudogley Soil Depending
Mineral Fertilizing, (In Serbo-Creation),
W74-08097 3

BYFORD, W. J.
Organo-Mercury Fungicide Treatment
Sugar-Beet Seed,
W74-07951 5

BLE, L. W.
Ground-Water Resources of Montgomery County, Indiana,
W74-07645 2F

IRNS, J. JR.
Aquatic Invertebrate Recovery in the Clinch River Following Hazardous Spills and Floods,
W74-07841 5C

LLANDER, R. A.
Hydraulics of Culvert Outlets,
W74-07749 8B

MPBELL, R. L. JR.
Recent Advances in Log Evaluation,
W74-07853 8G

RLILE, B. L.
Characterization of Suspended Sediments in Water from Selected Watersheds as Related to Control Processes, Nutrient Contents, and Lake Eutrophication,
W74-07736 5B

RROLL, K. G.
The Distribution of Lead in Human Deciduous Teeth,
W74-07691 5C

RTWRIGHT, K.
Analysis of Liquid-Waste Injection Wells in Illinois by Mathematical Models,
W74-07604 5B

SSIN, J. M.
Interdisciplinary Monitoring of the New York Bight,
W74-07764 5A

STON, V. N. D.
Influence of Older Relief on the Location of Sand Waves in a Part of the Southern North Sea,
W74-07676 2J

VAGNARO, J. B.
Drought Hardening in Onions: I. Influence of Presowing Treatments on Vegetative Behavior and Yield, (In Spanish),
W74-08148 3F

Drought Hardening in Onions: II. Analysis of Growth, (In Spanish),
W74-08149 3F

AMPLIN, J. B. F.
The Transport of Radioisotopes by Fine Particulate Matter in Aquifers,
W74-07730 5B

AUDHRY, M. T.
Optimal Conjunctive Use Model for Indus Basin,
W74-08059 4B

EBOTARYOV, A. I.
Hydrology and Structural Design (In Russian),
W74-07767 8B

EBOTINA, M. YA.
Effect of Water-Soluble Decomposition Products of Herbaceous Plants on Uptake of Radioisotopes in Soil. (in Russian),
W74-08117 2G

EN, B. H. H.
Coagulant Recovery and Reuse in Water Reclamation Systems,
W74-07844 5D

CHENG, H. H.
Characterization of Suspended Sediments in Water from Selected Watersheds as Related to Control Processes, Nutrient Contents, and Lake Eutrophication,
W74-07736 5B

CHERDYNTSEV, V. V.
Uranium-234,
W74-07790 5B

CHEREMISINOFF, N. P.
Corrosion Resistance of Piping and Construction Materials,
W74-07888 8G

CHEREMISINOFF, P. N.
Corrosion Resistance of Piping and Construction Materials,
W74-07888 8G

CHERKAVSKIY, S. K.
State Record Keeping on Water and Its Usage and Hydrologic Calculations and Forecasts (Gosudarstvennyy uchet vod i ikh ispol'zovaniya i gidrologicheskiye raschety i prognozy),
W74-08054 7A

CHERRY, R. N.
Hydrobiochemical Effects of Spraying Waste-Treatment Effluent in St. Petersburg, Florida,
W74-07978 5C

CHIERICI MAGNETTI, PAOLA
Study on the Periphytic Colonizations of a Lateral Environment of the River Po(Italy), (In Italian),
W74-07702 2I

CHUEVA, L. S.
Treatment of Children with Chronic Hepatoangiocholecystitis at the Lake Uchum Health Resort,
W74-08102 2I

CICHOWSKI, M.
Environmental Control of Nitrogen Fixation in Lakes, I. In situ Nitrogen Fixation by Free Living Blue-Green Algae, and II. Nitrogen Fixation by the Duckweed-Algal Association,
W74-07716 5C

CIKRT, M.
Polyacrylamide Gel Disc Electrophoresis of Rat Bile after Intravenous Administration of 52 MnC12, 64CuC12, 203HgC12 and 210 Pb(N03)2,
W74-07694 5C

CLARK, C. D.
Survey of Oregon's Water Laws,
W74-07611 6E

CLARK, J. W.
Pollution Control,
W74-07970 6D

CLASEN, J.
The Use of Algal Assays for Determining the Effect of Iron and Phosphorus Compounds on the Growth of Various Algal Species,
W74-07776 5C

CLEARY, E. J.
Effluent Standards Strategy: Rejuvenation of an Old Game Plan,
W74-07769 5G

CLERE, L. T.
Sun Oil Develops Water Reuse Program,
W74-07882 5D

COLBECK, S. C.
Isua, Greenland: Glaciological Investigations During 1973,
W74-07910 2C

COLE, E.
Dam Collapse Wave in a River,
W74-08060 2E

COLEMAN, B. W.
Antagonistic Effect of Arginine on Zinc Metabolism in Chicks,
W74-07955 5C

COLEMAN, D. C.
Structure and Function of Hardwood Litter and Soil Subsystems After Chronic Gamma Irradiation, I. Mesofauna, Nitrogen, and Total Soil Respiration,
W74-07824 5C

Structure and Function of Hardwood Litter and Soil Subsystems After Chronic Gamma Irradiation. II. Microfungi,
W74-07825 5C

COLEMAN, N. T.
Anion Adsorption by Allophanic Tropical Soils: I. Chloride Adsorption,
W74-07634 2G

Anion Adsorption by Allophanic Tropical Soils: II. Sulfate Adsorption,
W74-07635 2G

Anion Adsorption by Allophanic Tropical Soils: III. Phosphate Adsorption,
W74-07636 2G

COLLINS, M. A.
Industrial Application of Whitford's Demand Forecasting Procedure,
W74-08015 6D

CONLEY, W. H.
Part I - A Conceptual Model for a Terrestrial Ecosystem Perturbed with Sewage Effluent, with Special Reference to the Michigan State University Water Quality Management Project; Part II - A Personalized Bibliographi c Retrieval Package for Resource Scientists,
W74-07606 5D

CONWAY, R. W.
Apparatus for Aerating Water,
W74-08023 5D

COOLEY, A. M.
Preliminary Study to Investigate Feasibility of Desalting Ground Water in North Dakota,
W74-08066 3A

COOLEY, B. B.
Tracers in Mud Improve DST, Wireline Test Accuracy,
W74-07856 8G

CORDELL, H. K.
Capacity of Water-Based Recreation Systems Part I: The State of the Art - A Literature Review,
W74-07719 6B

COSTELLO, L. S.
Estimation of Imperviousness and Specific Curb Length for Forecasting Stormwater Quality and Quantity,
W74-07640 5B

COTHERN, C. R.
Analysis of Trace Metal Particulates in Atmospheric Samples Using X-Ray Fluorescence,
W74-07709 5A

COTTON, P.
Automation of the Control and Operation of Water Pollution Control Works,
W74-07758 5D

COWLEY, G. T.
Structure and Function of Hardwood Litter and Soil Subsystems After Chronic Gamma Irradiation, I. Mesofauna, Nitrogen, and Total Soil Respiration,
W74-07824 5C

Structure and Function of Hardwood Litter and Soil Subsystems After Chronic Gamma Irradiation. II. Microfungi,
W74-07825 5C

COX, R. G.
Spillway Water-Surface Profiles,
W74-07913 8B

CREEL, B. J.
An Analytical Interdisciplinary Evaluation of the Utilization of the Water Resources of the Rio Grande in New Mexico: Lower Rio Grande Region,
W74-07609 6B

CRICHTON, O. W.
Coastal Vegetation of Delaware,
W74-07616 2L

CROSBY, J. W. III
A Summary of Quantity, Quality and Economic Methodology for Establishing Minimum Flows,
W74-07847 6B

CROSS, F. A.
Concentrations of Manganese, Iron, and Zinc in Juveniles of Five Estuarine-Dependent Fishes,
W74-07803 5C

CROSS, H. A.
The LD(50) Value of Tetraethyl Lead,
W74-07700 5C

Tetraethyl Lead Dose Response Curve for Mortality in Laboratory Rats,
W74-07701 5C

CROSSMAN, J. S.
Aquatic Invertebrate Recovery in the Clinch River Following Hazardous Spills and Floods,
W74-07841 5C

CROUSE, F. W.
Collection, Detection, Identification, and Quantitation of Human Effluents,
W74-07912 5A

CROUZET, P.
Determination of Counting Efficiency by 14C by Liquid Scintillation in Primary Production Measurements in a Lagoon Environment, (In French),
W74-08143 5A

CRUTCHFIELD, J.
A Summary of Quantity, Quality and Economic Methodology for Establishing Minimum Flows,
W74-07847 6B

CRYSDALE, R. A.
Capacity of Water-Based Recreation Systems Part I: The State of the Art - A Literature Review,
W74-07719 6B

CSANADY, G. T.
Big Eddies and Mixing Processes in the Great Lakes,
W74-07926 5B

DAIBER, F. C.
Coastal Vegetation of Delaware,
W74-07616 2L

DALY, J. C.
Iodine-129 Levels in Milk and Water Near a Nuclear Fuel Reprocessing Plant,
W74-07798 5B

DANIEL, W. H.
Multi-Unit Apparatus for Collecting Oil from the Surface of a Body of Water,
W74-08020 5G

DATTA, B.
Effect of Dilute Salt Solutions on Chernozem Soil Estimated Through the Hydration Properties of the Colloids,
W74-08135 2G

DAVIDSON, B.
Process Control Model for Oxygen Regeneration of Polluted Rivers, Phases IV and V, and Spacially and Temporally Distributed Discharge of Effluents in Estuaries,
W74-07837 5B

DAVIDSON, E. S.
Geohydrology and Water Resources of the Tucson Basin, Arizona,
W74-07648 2F

DAVIDSON, R. L.
Environmental Stress in the Pasture Scarab Sericesthis nigrolineata Boisd.: II. Effects of Soil Moisture and Temperature on Survival of Firstinstar Larvae,
W74-08147 5C

Environmental Stress in the Pasture Scarab Sericesthis nigrolineata Boisd.: Mortality in Larvae Caused by High Temperature,
W74-08146 5C

DAVIS, E. M.
Effect of Radiation, Salinity and Temperature on the Ionic Regulation of the Blue Crab, Callinectes sapidus,
W74-07818 5C

DAVIS, J. T.
Ecological Factors Affecting Anadromous Fishes of Lake Ponchartrain and Its Tributaries,
W74-07993 2H

DAVIS, R. G.
Sugarbeet Response to Irrigation as Measured with Growth Sensors,
W74-08079 3F

DAVIS, R. K.
Economic Aspects of Resource Use with Special Reference to Energy and Water,
W74-07964 6D

DE LIS, B. R.
Drought Hardening in Onions: I. Influence of Presowing Treatments on Vegetative Behavior and Yield, (In Spanish),
W74-08148 3F

Drought Hardening in Onions: II. Analysis of Growth, (In Spanish),
W74-08149 3F

DE MAESENEER, J.
Limnological Observations on the 'National Watersportbaan Georges Nachez' at Ghent in 1968, 1969, 1970 and 1971,
W74-08113 5C

DEAN, R. B.
Lime Stabilization of Primary Sludges,
W74-07760 5D

DELEVAUX, M. H.
Uranium, Thorium, and Lead Concentrations in Three Silicate Standards and a Method of Lead Isotopic Analysis,
W74-07947 2K

DEMIN, A. I.
Acclimatization of Introduced Fish Species in the Eravninsk Lakes (Buryat Assr), (In Russian),
W74-08129 8I

DEMIN, N. A.
Sanitary-Hygienic Evaluation of the Water Quality of the Nura Water Conduit of the Tselinograd District (In Russian),
W74-08052 5A

DEPRIMO, M. J.
Odors Emitted from Raw and Digested Sewage Sludge,
W74-07960 5D

DESBRANDES, R.
37 Ways to Improve Your Well Completions,
W74-07870 8G

DILLON, C. P.
Corrosion by Waters,
W74-07890 8G

DION, N. P.
A Ground-Water Monitoring Network for Kootenai Flats, Northern Idaho,
W74-07662 7A

DITTRICH, T. R.
Analysis of Trace Metal Particulates in Atmospheric Samples Using X-Ray Fluorescence,
W74-07709 5A

DOERKSEN, H. R.
The Columbia Interstate Compact: Politics of Water Resources in the Pacific Northwest,
W74-07846 6E

DOHERTY, T. F.
The Determination of Mercury in Air Samples and Biological Materials,
W74-07710 5A

DOIG, M. T.
A Note Concerning the Environmental Acceptability of Nitrilotriacetic Acid (NTA): The Effect of NTA on the Growth of Gymnodinium breve,
W74-07775 5C

DONOHUE, G. L.
Harbor Pollution from Large Ships,
W74-08006 5B

DORMANDY, T. L.
Liver Zinc in Carcinoma,
W74-07690 5C

DOSE, B. E.
Energy Production,
W74-07967 6D

DOTTI, MILVIA
Study on the Periphytic Colonizations of a Lateral Environment of the River Po(Italy), (In Italian),
W74-07702 2I

OW, R. L.
Fluctuations in Gulf of Maine Sea Temperature and Specific Molluscan Abundance,
W74-08145 2I

RACUP, J. A.
Optimal Timing and Sizing of a Conjunctive Urban Water Supply and Waste Water System with Nonlinear Programming,
W74-08010 5D

UONG, T. P.
Environmental Control of Nitrogen Fixation in Lakes, I. In situ Nitrogen Fixation by Free Living Blue-Green Algae, and II. Nitrogen Fixation by the Duckweed-Algal Association,
W74-07716 5C

UTKA, B. J.
Coliforms are an Inadequate Index of Water Quality,
W74-07885 5A

YER, K. R.
A Simple, Segmented Prism Model of Tidal Mixing in Well-Mixed Estuaries,
W74-07673 2L

ZHABAROV, I.
Effect of the Stand Density of Walnut Forests on Surface Runoff and Soil Erosion on the Spurs of the Southwestern Slope of the Darvaza Range, (In Russian),
W74-08137 4D

ZHUMAEV, O. M.
Ways of Increasing the Production of Takyr Soils of the Tedzhen Delta, (In Russian),
W74-08098 3F

ARLE, J. E.
Reconnaissance of the Water Resources in the Vicinity of Proposed Deep-Well Injection Sites in Southeast Dade County, Florida,
W74-07915 5B

BERHARDT, L. L.
Modeling Radionuclides and Pesticides in Food Chains,
W74-07810 5B

DGERTON, B. R.
Using Sewage Effluent and Liquid Digested Sludge to Establish Grasses and Legumes on Bituminous Strip-Mine Spoils,
W74-07612 5D

GAN, W. G.
Interdisciplinary Monitoring of the New York Bight,
W74-07764 5A

ILERS, R. G.
Design and Simulation of Equalization Basins,
W74-08046 5D

Mathematical Model for Post Aeration,
W74-08045 5D

ISENBUD, M.
Environmental Radioactivity,
W74-07791 5B

LLIN, R. I.
Collection, Detection, Identification, and Quantitation of Human Effluents,
W74-07912 5A

LLIS, S. P.
The Photosensitizing Action of Carcinogens. I. The Action of 2-Naphthylamine on Escherichia Coli K-12 and Paramecium Caudatum,
W74-08095 5C

ELLYETT, C. D.
Research - - Targets and Developments, Regional Assessments,
W74-07903 7B

ELMORE, G. R. JR.
State Organization for Water Resources Management,
W74-07733 6E

ENGEL, D. W.
Effect of Radiation, Salinity and Temperature on the Ionic Regulation of the Blue Crab, Callinectes sapidus,
W74-07818 5C

ENGELBERT, E. A.
The Political-Social Aspects of Energy-Water Relationships,
W74-07963 6D

ESHCHEKOV, O. G.
Ways of Increasing the Production of Takyr Soils of the Tedzhen Delta, (In Russian),
W74-08098 3F

EUZEBY, J.
Toxicity of an Algal Complex on Freshwater Fauna: 2. Action on Lymnaea Spp. (in French).
W74-08109 5C

EVANS, B.
Effect of Bentonitic Fluid Properties on Drilling Rate,
W74-07879 8B

EVANS, N. A.
Regional Energy-Water Problems--Colorado River-Great Basin,
W74-07977 6D

EVANS, V.
Corrosion Resistant Cements,
W74-07887 8F

EVENSON, D. E.
Ground-Water Quality Models: What They Can and Cannot Do,
W74-07933 5B

FABIAN, R. V. JR.
Determining a Recreational Lake's Tolerance for Development and Usage,
W74-07836 5A

FAIRCHILD, W. D.
The Role of Water in the Energy Crisis,
W74-07962 6D

FARQUHAR, G. B.
The Sulfate-Reducing Bacteria and Oilfield Bacterial Corrosion - A Review of the Current State-of-the-Art,
W74-07902 8G

FARQUHAR, G. J.
Infiltration and Landfill Behavior,
W74-08083 5B

FARRAND, R. L.
Collection, Detection, Identification, and Quantitation of Human Effluents,
W74-07912 5A

FARRELL, J. B.
Lime Stabilization of Primary Sludges,
W74-07760 5D

FAULKNER, G. L.
Quantity and Quality of Surface Water in Marion County, Florida,
W74-08044 7C

FAUST, A. R.
Phytoplankton Community Structure and Nutrient Relationships in Lake Carl Blackwell, Oklahoma,
W74-07992 2H

FELTES, R. M.
Petroleum Systems Reliability Analysis, A Program for Prevention of Oil Spills Using an Engineering Approach to a Study of Offshore and Onshore Crude Oil Petroleum Systems, Volume II - Appendices,
W74-07957 5G

FIDELI, I.
Corrosion Resistance of Piping and Construction Materials,
W74-07888 8G

FINCHER, D. R.
Coupon Corrosion Rates Versus Hydrogen Probe Activity,
W74-07857 8G

FINE, L. O.
The Significance of Rainfall on Salt and Sodium Accumulations Under Irrigation,
W74-07743 3C

FISCHER, L. K.
Environmental Aspects of Energy-Water Relationships,
W74-07965 6D

FLIPPO, H. N. JR.
Water Resources of Lehigh County, Pennsylvania,
W74-07649 4A

FOLQUER, F.
'Hill-Top Irrigation,' A New System for Early Sweetpotato Planting, (In Spanish),
W74-08136 3F

FONTENOT, B. J.
Ecological Factors Affecting Anadromous Fishes of Lake Ponchartrain and Its Tributaries,
W74-07993 2H

FOOTE, R. Q.
Petroleum Systems Reliability Analysis, A Program for Prevention of Oil Spills Using an Engineering Approach to a Study of Offshore and Onshore Crude Oil Petroleum Systems, Volume II - Appendices,
W74-07957 5G

FORNES, A. O.
Coastal Vegetation of Delaware,
W74-07616 2L

FORNS, J. M.
Biological Investigations,
W74-07656 5B

FORSTER, W. O.
Effects of Gamma Irradiation on the Maintenance of Population Size in the Brine Shrimp, Artemia,
W74-07823 5C

Effects of Gamma Irradiation on the Reproductive Performance of Artermia as Determined by Individual Pair Matings,
W74-07822 5C

Trace-Element Interactions Between River Water and Seawater,
W74-07805 5B

FOSSUM, G. O.
Preliminary Study to Investigate Feasibility of Desalting Ground Water in North Dakota,
W74-08066 3A

FOSTER, J. H.
Major Wastewater Treatment Plant to be Upgraded,
W74-07761 5D

FOX, M. R. S.
Effect of Ascorbic Acid on Cadmium Toxicity in the Young Coturnix,
W74-07707 5C

FRANCOIS, L. E.
Leaching Requirement Studies: Sensitivity of Alfalfa to Salinity of Irrigation and Drainage Waters,
W74-07774 3C

FRANK, A. B.
Effect of Temperature and Plant Water Stress on Photosynthesis Diffusion Resistance, and Leaf Water Potential in Spring Wheat,
W74-08075 3F

FRANK, M. L.
Sensitivity of Carp (Cyprinus carpio) Embryos to Acute Gamma Radiation,
W74-07817 5C

FRANKEL, R. J.
A Systems Approach to Assessment of Rural Water Supply Program Effectiveness,
W74-08012 6B

FRASER, G. S.
Sediment Distribution in a Beach Ridge Complex and its Application to Artificial Beach Replenishment,
W74-07666 2J

FREY, J. C.
Regional Energy-Water Problems, Ohio-Great Lakes.
W74-07973 6D

FREY, R. H.
Determining a Recreational Lake's Tolerance for Development and Usage,
W74-07836 5A

FRIBERG, L.
General Discussion and Conclusions-Need for Further Research,
W74-07689 5C

Inorganic Mercury-Relation Between Exposure and Effects,
W74-07686 5C

FRITZ, J. C.
Iron and Associated Trace Mineral Problems in Man and Animals,
W74-07950 2K

FROEBE, H. A.
Phytosociological Observations in Inundation Zone Farmlands in the Northern Upper Rhine Valley, (In German),
W74-08121 2I

FROMM, P. O.
A Scanning Electron Microscopic Study of Secondary Lamellae and Chloride Cells of Rainbow Trout (Salmo gairdneri),
W74-08096 5C

FRY, B. E. JR.
Effect of Ascorbic Acid on Cadmium Toxicity in the Young Coturnix,
W74-07707 5C

GAIGALAS, K. S.
Study of Mesh Fish Barriers in the Polder Systems of the Nemunas River Delta, (In Russian),
W74-08125 8I

GAINES, J. L.
Use of Fluorescent Dye Tracers in Mobile Bay,
W74-07642 5B

GAMBLE, J. F.
Models of Matter Flow in a Southern Mixed Hardwood Forest in Florida: Preliminary Results,
W74-07813 5B

GANS, P.
Some Novel Complexes of Chromium(I),
W74-07946 5A

GARETH JONES, E. B.
Tricladium varium, An Aquatic Hyphomycete on Wood in Water-Cooling Towers,
W74-08011 2I

GARLAND, C. F.
Submerged Turbine Aerator,
W74-08027 5D

GARNER, W.
Oxygenation of Aqueous Bodies Using Liquid Oxygen-Loxination,
W74-07741 5D

GASKIN, D. A.
Application of Electrical Energy to Culvert Icing Problems--A Laboratory Study,
W74-07909 8C

GAUFIN, A. R.
The Fate and Effects of Pesticides in the Aquatic Environment of the Flathead Lake Drainage Area,
W74-07835 5C

An Investigation of the Water Quality and Productivity of Polson Bay, Flathead Lake, Montana,
W74-07717 5C

GAYDOS, M. W.
Water Resources of the Little River Basin, Louisiana,
W74-07671 4A

GEBHARD, T. G. JR
An Analytical Interdisciplinary Evaluation of the Utilization of the Water Resources of the Rio Grande in New Mexico: Lower Rio Grande Region,
W74-07609 6B

GEBHARDT, H.
Anion Adsorption by Allophanic Tropical Soils: I. Chloride Adsorption,
W74-07634 2G

Anion Adsorption by Allophanic Tropical Soils: II. Sulfate Adsorption,
W74-07635 2G

Anion Adsorption by Allophanic Tropical Soils: III. Phosphate Adsorption,
W74-07636 2G

GENTRY, R. P.
Endogenous Zinc Excretion and 65Zinc Metabolism in Holstein Calves Fed Intermediate to High But Nontoxic Zinc Levels in Practical Diets,
W74-07954 5C

GERING, T. J.
Chemical Engineering Division, Waste Manag ment Programs, Quarterly Report, July-Se tember 1973,
W74-07788

GEVREY, J.
Toxicity of an Algal Complex on Freshwa Fauna: 1. Action on Some Benthic Animals a Fishes. (in French),
W74-08108

Toxicity of an Algal Complex on Freshwa Fauna: 2. Action on Lymnaea Spp. (in Frenc
W74-08109

GIBB, J. P.
Planning a Domestic Groundwater Supp System,
W74-07639

Water Quality and Treatment of Domes Groundwater Supplies,
W74-07637

Wells and Pumping Systems for Domes Water Supplies,
W74-07638

GIESEL, W.
Calculation of Capillary Rise from Grou water Table into the Root Zone Under Stead State Conditions, (In German),
W74-08139

GLATER, R. A. B.
Lead Detection in Living Plant Tissue Usin New Histochemical Method,
W74-07711

GLICKMAN, M.
Positive Displacement Pumps,
W74-07874

GLOOSCHENKO, W. A.
Trace Elements in Marine Shrimp,
W74-07806

GLORIOD, T. L.
Selective Withdrawal From Beech Fork Lak Beech Fork River, West Virginia,
W74-07914

GOETZ, C. Z.
Hydrobiochemical Effects of Spraying Was Treatment Effluent in St. Petersburg, Florida
W74-07978

GOLDMAN, J. C.
Inorganic Nitrogen Removal in a Combin Tertiary Treatment-Marine Aquacultu System - II. Algal Bioassays,
W74-07777

GOLDSTEIN, R. A.
Documentation of Prosper - A Model of A mosphere-Soil-Plant Water Flow,
W74-07785

GONZALEZ, C. L.
Effect of Narrow Trenching in Harlingen Cl Soil on Plant Growth, Rooting Depth, a Salinity,
W74-08078

GOODYEAR, S.
Iodine-129 Levels in Milk and Water Near Nuclear Fuel Reprocessing Plant,
W74-07798

RYACHEVA, Y. Y.
utomatic Pumping Installations for Livestock
ections,
74-07864 8C

W, A. J.
ua, Greenland: Glaciological Investigations
uring 1973,
74-07910 2C

AHAM, P. H.
stimation of Imperviousness and Specific
urb Length for Forecasting Stormwater Quali-
and Quantity,
74-07640 5B

AY, K. E.
ffect of Bentonitic Fluid Properties on
illing Rate,
74-07879 8B

ENWAY, A. R.
ecipitation Characteristics of the Northern
ew Jersey, New York City Metropolitan
ea,
74-07607 2B

GG, D. O.
ydrology and Chloride Contamination of the
incipal Artesian Aquifer in Glynn County,
eorgia,
74-07919 2F

OMOVA, V. S.
ffect of the Moisture and Temperature on the
aching of Ash Elements from Plant Residues
Russian),
74-08016 2I

SECLOSE, I. L.
lors Emitted from Raw and Digested Sewage
udge,
74-07960 5D

MMER, R. H.
ntagonistic Effect of Arginine on Zinc
etabolism in Chicks,
74-07955 5C

NES, D. L.
covery, Residual Effects, and Fate of
trogen Fertilizer Sources in a Semiarid Re-
n,
74-08086 5B

ST, R. J.
mpensated Gamma Ray Densimeter Mea-
es Slurry Densities in Flow,
74-07877 8G

ET, A.
nkton Production and Water Quality in
anish Reservoirs. First Report on a Research
oject,
74-08005 5C

EINOV, R. K.
ectiveness of Mineral Fertilizers During
tton Cultivating Depending on Soil Humidi-
(In Azerbaijanian),
74-08099 3F

HRIE, J. E.
ects of Chrome Radiation Exposure On
squitoes (Diptera: Culicidae). 1. Effects of
aring in Sr-90 + Y-90 Solutions,
74-07821 5C

AN, F. M.
ter Treatment System,
4-07979 5F

HAGUE, S. M. E.
Some Novel Complexes of Chromium(I),
W74-07946 5A

HAIR, M. E.
Interdisciplinary Monitoring of the New York Bight,
W74-07764 5A

HALL, E. D.
Design and Simulation of Equalization Basins,
W74-08046 5D

Mathematical Model for Post Aeration,
W74-08045 5D

HALL, W. A.
Optimal Conjunctive Use Model for Indus Basin,
W74-08059 4B

The Role of Water Resources Research in the Energy Crisis,
W74-07966 6D

HAMELINK, J. L.
Factors Controlling the Dynamics of Non-Ionic Synthetic Organic Chemicals in Aquatic Environments,
W74-07831 5B

HAMILTON, J.
Summary Report for a Methodology Study to Develop Evaluation Criteria for Wild and Scenic Rivers,
W74-07608 6B

HAMMON, G. A.
Capacity of Water-Based Recreation Systems Part I: The State of the Art - A Literature Review,
W74-07719 6B

HANKS, R. J.
Model for Estimating Soil Water, Plant, and Atmospheric Interrelations: I. Description and Sensitivity,
W74-08084 2G

Model for Estimating Soil Water, Plant, and Atmospheric Interrelations: II. Field Test of Model,
W74-08085 2G

HANSEN, L. H.
Effect of Establishment Method, Variety, and Seeding Rate on the Production and Quality of Alfalfa Under Dryland and Irrigation,
W74-08077 3F

HARDING, T. P.
Energy Production,
W74-07967 6D

HARDWICK, J. D.
Flow-Induced Vibration of Vertical-Lift Gate,
W74-08058 8C

HARLAND, B. F.
Effect of Ascorbic Acid on Cadmium Toxicity in the Young Coturnix,
W74-07707 5C

HARLETT, J. C.
Observations and Analysis of Bottom Turbid Layers on the Oregon Continental Shelf,
W74-07632 2J

HARMESON, R. H.
Quality of Surface Water in Illinois, 1966-1971,
W74-07678 5A

HARRIS, W. F.
Effects of Ionizing Radiation on Processes Influencing Tolerance of Tree Seedlings,
W74-07815 5C

HARRISON, D. P.
The Dispersion of Continuously Injected Effluents in Open Channels,
W74-07833 5B

HARRISS, R. C.
Trace Elements in Marine Shrimp,
W74-07806 5C

HARTSHORN, G. S.
Vegetation and Soil Relationships in Southern Beaufort County, North Carolina,
W74-08150 2K

HATCH, G. B.
Evaluation of Scaling Tendencies,
W74-07893 8G

HATHAWAY, S. W.
Lime Stabilization of Primary Sludges,
W74-07760 5D

HATTERSLEY, R.
Regional Water Authorities: Organizational Patterns-Purpose or Professional,
W74-07754 5G

HATTORI, A.
Results of Red Tide Formation in Tokyo Bay,
W74-07770 5C

HAURY, A. G.
Equipment and Instrumentation,
W74-07660 5B

HAYES, J. P.
Bacteriological Water Quality Data, Beach Areas, Gatineau Park Lakes, National Capital Commission, 1973,
W74-07932 5B

HEDDLESON, F. A.
Design Data and Safety Features of Commercial Nuclear Power Plants, Vol I,
W74-07794 5G

Design Data and Safety Features of Commercial Nuclear Power Plants, Vol. III,
W74-07796 5G

HEIDARI, M.
Analysis of Liquid-Waste Injection Wells in Illinois by Mathematical Models,
W74-07604 5B

HEILMAN, M. D.
Effect of Narrow Trenching in Harlingen Clay Soil on Plant Growth, Rooting Depth, and Salinity,
W74-08078 3F

HEINRICH, C. A.
Data on Fresh-Water Inflow, April 14-July 28, 1973, For Analog-Model Study of the Houston Ship Channel, Houston, Texas,
W74-07921 7C

HELLEY, E. J.
Historic Flood Information for Northern California Streams from Geological and Botanical Evidence,
W74-07646 2E

HENDERSON, D. W.
Flood and Seepage Water Sampling Techniques in Rice Fields Under Different Water Management Practices,
W74-08090 5B

HENLEY, L. M.
Quality of Surface Water in Illinois, 1966-1971,
W74-07678 5A

HENRY, R. L.
Water Jet Cutting of Sedimentary Rock,
W74-07883 8B

HENSON, E. B.
Pollution Monitoring in Lake Champlain Using ERTS-1 Imagery,
W74-08009 5A

HENTHORNE, M.
Finding Answers to Corrosion Problems,
W74-07863 8G

HERNANDEZ, L. JR.
Lead Detection in Living Plant Tissue Using a New Histochemical Method,
W74-07711 5A

HESTER, N. C.
Sediment Distribution in a Beach Ridge Complex and its Application to Artificial Beach Replenishment,
W74-07666 2J

HILL, R. D.
Mine Drainage Pollution Control Via Reverse Osmosis,
W74-07881 5D

Reverse Osmosis-Neutralization Process for Treating Mineral Contaminated Waters,
W74-08041 5D

HIRSHON, B. E.
Method and Apparatus for Aerating Bodies of Water,
W74-08031 5G

HJELJORD, O.
Studies of Re-Vegetation in Vehicle Tracks in Svalbard. (in Norwegian),
W74-08116 4A

HOEKSTRA, W. G.
Antagonistic Effect of Arginine on Zinc Metabolism in Chicks,
W74-07955 5C

HOEY, G. R.
Influence of Water Quality on the Corrosion and Electrochemical Behavior of Mild Steel in Synthetic Acid Mine Waters,
W74-07876 8G

HOLSEN, H.
Investigations on the Problem of Solubility and Stability of Steroid Ovulation Inhibitors in Water, Waste Water and Activated Sludge, (In German),
W74-08133 5A

HOLTON, R. L.
Effects of Gamma Irradiation on the Maintenance of Population Size in the Brine Shrimp, Artemia,
W74-07823 5C

Effects of Gamma Irradiation on the Reproductive Performance of Artermia as Determined by Individual Pair Matings,
W74-07822 5C

HOLZER, T. L.
Hydrogeologic Investigation of a Sanitary Landfill in Stratified Glacial Drift,
W74-07728 5B

HORNBURG, C. D.
Commercial Desalting Plant Data and Analysis, Volumes I-VI,
W74-08061 3A

HOUSE, P. W.
The State of the System (SOS) Model: Measuring Growth Limitations Using Geological Concepts,
W74-07958 6G

HOWARD, C. M.
Influence of Temperature and Moisture Stress from Sodium Chloride Salinization on Okra Emergence,
W74-08073 3C

HOYT, J. W.
Harbor Pollution from Large Ships,
W74-08006 5B

HSUEH, YA.
A Numerical Study of the Steady Circulation in an Open Bay,
W74-07924 2L

HUANG, P. M.
Effect of Monosilicic Acid on Hydrolytic Reactions of Aluminum,
W74-07626 2G

HUBER, R. D.
Optimum Drilling Sites for Ground-Water Development on the East Coast of Lanai Island,
W74-07734 4B

HUGHES, L. S.
Quality of Surface Waters in the Colorado River Basin, Texas, 1966-72 Water Years,
W74-07670 5B

HULL, H. L.
Solid Forms for Savannah River Plant High-Level Waste,
W74-07787 5D

HUMOLLER, F. L.
Determination of Copper and Zinc in Biological Material,
W74-07712 5A

HUTTON, J. T.
A Data Acquisition System for Ecological Field Studies,
W74-07989 7B

HVORSLEV, M. J.
Subsurface Exploration and Sampling of Soils for Civil Engineering Purposes,
W74-07905 8D

HWANG, J. Y.
Trace Metals in Atmospheric Particulates and Atomic Absorption Spectroscopy,
W74-07705 5A

HYPES, W. D.
The Chemical/Physical and Microbiological Characteristics of Typical Bath and Laundry Waste Waters,
W74-07663 5B

IBRAGIMOV, SH. R.
Growth of the Caspian Roach in the Mingechaur Reservoir, (In Azerbaijarian),
W74-08123 2H

ICHIKI, M.
Method of Treating Waste Water Containing Ligninsulfonate,
W74-08029 5D

INGLES, O. G.
Lime Grout Penetration and Associat
Moisture Movements in Soil,
W74-07871

ISAACSON, R. E.
Soil Moisture Transport in Arid Site Vado
Zones,
W74-07780

ISHIHARA, T.
Treatment Methods for Heavy Metal-Conta
ing Liquid Waste (In Japanese),
W74-07745

ISHII, M.
Method of Treating Waste Water Containi
Ligninsulfonate,
W74-08029

ISTOMIN, V. YE.
Electric and Thermal Properties of Rocks,
W74-07906

ITURRIAGA, R.
Investigations on the Occurrence of Phen
Decomposing Microorganisms in Waters a
Sediments. (in German),
W74-08115

JACKSON, J. P.
A Streamflow Model for Metropolitan Planni
and Design,
W74-07721

JACOBSEN, S. E.
Earthquake Damage Costs in the Design
Water Resource Systems,
W74-08018

JAMES, L. D.
Regional Energy-Water Problems South Atl
tic Gulf,
W74-07972

JAMES, R. V.
Packing-Induced Radial Particle-Size Segre
tion: Influence on Hydrodynamic Dispersi
and Water Transfer Measurements,
W74-07630

JAMISON, G. G.
Drainage Area and River Mileage of Nebras
Streams: Part 1--Salt and Weeping Wa
Creeks, Big and Little Nemaha Rivers, a
Minor Streams in Southeastern Nebraska,
W74-07669

Water Resources Data for Nebraska, 1972: P
I. Surface-Water Records,
W74-07647

JANICKI, K.
Environmental Factors of Leukemia Morbidi
(In Polish),
W74-07999

JASSAL, N. S.
Studies on the Influence of Irrigation and D
ferent Doses of N, P and K on the Flower
Behaviour and Absorption of Nutrient E
ments in Muskmelon (Cucumis melo L.),
W74-08144

JEFFERIES, D. F.
Radioecology of the Plaice (Pleuronect
platessa L) in the Northeast Irish Sea,
W74-07802

JELLINEK, H. H. G.
Adhesion of Ice Frozen from Dilute Electrol
Solutions,
W74-07618

ENNINGS, C. D.
Iron-55 and Ruthenium-103 and -106 in the Brackish-Water Clam Rangia cuneata,
W74-07804 5A

ENSEN, J. B.
A Preliminary Check-List of the Marine Algae of the Moss Landing Jetty: An Annotated Floristic Compilation,
W74-07981 5C

OHNSON, L. C.
Characterization of Suspended Sediments in Water from Selected Watersheds as Related to Control Processes, Nutrient Contents, and Lake Eutrophication,
W74-07736 5B

OHNSON, M. V.
Annual Peak Discharges from Small Drainage Areas in Montana, Through September 1972,
W74-07667 2E

OHNSON, W. C.
Sugarbeet Response to Irrigation as Measured with Growth Sensors,
W74-08079 3F

OHNSTONE, D. L.
Survival of Intestinal Bacteria in Oligotrophic Waters,
W74-07737 5C

ONES, W. K.
Hydrology of Limestone Karst in Greenbrier County, West Virginia,
W74-07908 2F

ORDAN, C. F.
Mathematical Model of Tritiated and Stable Water Movement in an Old-Field Ecosystem,
W74-07812 5B

OST, J. J.
Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality-Phase I,
W74-07715 5C

ABULOV, S. K.
Growth Feature of Introduced Plants in Connection with Their Adaptation to Drought. (in Russian),
W74-08118 2I

ADDAH, M. T.
Tolerance of Rice (Oryza Sativa L.) to Salt During Boot, Flowering, and Grain-Filling Stages,
W74-08080 3C

AESLER, R. L.
Aquatic Invertebrate Recovery in the Clinch River Following Hazardous Spills and Floods,
W74-07841 5C

ANGAS, J.
Smelter Gases Yield Mercury,
W74-07956 5D

ANNANGARA, D. W. W.
On Some Aspects of the Parasites of Ceylonese Fresh Water Crabs,
W74-08002 2I

APKOVA, A. G.
Investigation of River Water for the Presence of Escherichia coli and Enterococcus, (in Russian),
W74-08004 5A

KARASEVA, L. I.
Investigation of River Water for the Presence of Escherichia coli and Enterococcus, (in Russian),
W74-08004 5A

KARAUSHEV, A. V.
Present Problems in the Study of Surface-Water Quality (Aktual'nyye problemy issledovaniya kachestva poverkhnostnykh vod),
W74-08050 5G

KARDOS, L. T.
Using Sewage Effluent and Liquid Digested Sludge to Establish Grasses and Legumes on Bituminous Strip-Mine Spoils,
W74-07612 5D

KAWAHATA, M.
Wastewater Treatment Using Electrolysis with Activated Carbon Cathode,
W74-08028 5D

KAYE, S. V.
A Systems analysis Methodology for Predicting Dose to Man From a Radioactively Contaminated Terrestrial Environment,
W74-07809 5C

KELLOCK, R. W.
The Snodland-Ightham Regional Drainage Scheme: Design and Operation,
W74-07752 5D

KELLY, J. A.
Sources, Sinks, and Methods of Analysis of Organic Nitrogen Compounds in Fresh Water Systems,
W74-08008 5C

KELLY, T. E.
Zinc/Phosphate Combinations Control Corrosion in Potable Water Distribution Systems,
W74-07894 8G

KEMP, G. D.
Electrolytic Flotation Apparatus,
W74-08030 5D

KENNEDY, J. F.
Hydrologic Response of Ice-Covered Streams,
W74-07832 2E

KERR, F. F.
South Dakota Standards for Construction of Irrigation Wells in Shallow Unconsolidated Glacial Sediments,
W74-07896 8A

KETCHUM, L. H. JR.
Activated Silica in Wastewater Coagulation,
W74-07738 5D

KEYS, W. S.
Location and Characteristics of the Interface Between Brine and Fresh Water from Geophysical Logs of Boreholes in the Upper Brazos River Basin, Texas,
W74-07859 8B

KHOPKAR, S. M.
Solvent Extraction of Selenium (IV) with 2-Thenoyltri-Fluoroacetone,
W74-07692 5A

KING, P. H.
Coagulant Recovery and Reuse in Water Reclamation Systems,
W74-07844 5D

KINRADE, J.
The Determination of Heavy Metals in Domestic Sewage Treatment Plant Wastes,
W74-07763 5A

KIRCHNER, M.
Investigations on the Problem of Solubility and Stability of Steroid Ovulation Inhibitors in Water, Waste Water and Activated Sludge, (In German),
W74-08133 5A

KISE, M. A.
Zinc/Phosphate Combinations Control Corrosion in Potable Water Distribution Systems,
W74-07894 8G

KISELEVA, E. V.
Data on the Reproduction of the Striped Riffle Minnow (Alburnoides Teniatus Kesser) in the Zeravshan River, (in Russian),
W74-08104 2I

Gambusia in the Zeravshan River Basin, (in Russian),
W74-08105 2I

KITTREDGE, J. S.
The Effects of Crude Oil Pollution on the Behavior of Marine Invertebrates,
W74-07987 5C

KITTRICK, J. A.
Characterization of Suspended Sediments in Water from Selected Watersheds as Related to Control Processes, Nutrient Contents, and Lake Eutrophication,
W74-07736 5B

KLEMAS, V.
Coastal Vegetation of Delaware,
W74-07616 2L

KLINE, J. R.
Mathematical Model of Tritiated and Stable Water Movement in an Old-Field Ecosystem,
W74-07812 5B

KLJUCEC, N. M.
Gypsum-Cement Blend Works Well in Permafrost Areas,
W74-07884 8F

KNAUER, G. A.
Trace Elements in Marine Shrimp,
W74-07806 5C

KNIGHT, R. J.
Uranium, Thorium, and Lead Concentrations in Three Silicate Standards and a Method of Lead Isotopic Analysis,
W74-07947 2K

KO, C-A.
Geology and Groundwater Resources of the Hangman Creek Drainage Basin, Idaho-Washington,
W74-07644 4A

KOL'NER, R. YU.
Use of Morshin Mineral Water in Disease of the Liver and Biliary Tracts in Children, (in Ukrainian),
W74-08101 2I

KOMAMURA, M.
The Relationships Between Soil Water and Engineering Properties of the Clayey Soils, (In Japanese),
W74-07679 2G

KOMAR, P. D.
Observations and Analysis of Bottom Turbid Layers on the Oregon Continental Shelf,
W74-07632 2J

KOMAROV, V. D.
Hydrological Forecasting and Water Management (In Russian),
W74-07768 4A

KOMIN, G. E.
Effect of Climatic and Phytocenotic Factors on Annual Increment of Trees in Stands, (In Russian),
W74-08127 2I

KOO, R. C. J.
Irrigation of Citrus with Citrus Waste Water,
W74-07603 5D

KORZUN, V. I.
Problem of Rational Use and Conservation of Water Resources and Goals of Hydrology (Problema ratsional'nogo ispol'zovaniya i okhrany vodnykh resursov i zadachi gidrologii),
W74-08055 6B

KOSTIAL, K.
Reduction of Lead Absorption from the Intestine in Newborn Rats,
W74-07953 5C

KOVZEL', A. G.
International Cooperation of Hydrologists (Mezhdunarodnoye sotrudnichestvo gidrologov),
W74-08047 7A

KOWALCZEWSKI, A.
Primary Production and Respiration of the Phytoplankton of the Rivers Thames and Kennet at Reading,
W74-08132 5C

KRISHNA, SHRI
Correlations Between P, Fe and Mn Availability in Water-Logged Soil at Different Fertility Levels,
W74-08134 2G

KRITSKIY, S. N.
Trends and Problems in Investigation of Long-Term Fluctuations of River Runoff (Napravleniya i zadachi issledovaniya mnogoletnikh kolebaniy rechnogo stoka),
W74-08051 2E

KRUEGER, C. R.
Effect of Establishment Method, Variety, and Seeding Rate on the Production and Quality of Alfalfa Under Dryland and Irrigation,
W74-08077 3F

KRUTCHKOFF, R. G.
A Stochastic Model for the James,
W74-07843 5B

KUBINSKI, A. M.
Survival of Intestinal Bacteria in Oligotrophic Waters,
W74-07737 5C

KUIJPER, W. J.
The Freshwater Mollusks From the Dune Area North of the Hague,
W74-07996 2H

KULIKOV, N. V.
Effect of Water-Soluble Decomposition Products of Herbaceous Plants on Uptake of Radioisotopes in Soil. (in Russian),
W74-08117 2G

KULLEN, B. J.
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W74-07788 5D

KULM, L. D.
Observations and Analysis of Bottom Turbid Layers on the Oregon Continental Shelf,
W74-07632 2J

KUPFERMAN, S.
Heterogeneities in Salinity in a River Plume,
W74-07672 2L

KUPRIYANOV, V. V.
Application of Satellite Data for Hydrologic Purposes (Ispol'zovaniye sputnikovoy informatsii dlya gidrologicheskikh tseley),
W74-08049 7B

KUPYROV, V. N.
Organic Water Impurities and Evaluation of Methods for their Removal in Water Mains (In Russian),
W74-07862 5D

LABADIE, J. W.
Optimal Conjunctive Use Model for Indus Basin,
W74-08059 4B

LACK, T. J.
Primary Production and Respiration of the Phytoplankton of the Rivers Thames and Kennet at Reading,
W74-08132 5C

LAMARCHE, V. C. JR.
Historic Flood Information for Northern California Streams from Geological and Botanical Evidence,
W74-07646 2E

LAMMERS, W. T.
Fractionation of Suspended and Colloidal Particles in Natural Water,
W74-07783 5A

LANCE, J. C.
Nitrogen Removal by Soil Mechanisms,
W74-08081 5D

LANE, R. W.
Domestic Hot Water Systems, Silicate Treatment Inhibits Corrosion of Galvanized Steel and Copper Alloys,
W74-07850 8G

LANG, W. H. JR.
Porosity-Resistivity Cross-Plotting,
W74-07900 8G

LANSFORD, R. R.
An Analytical Interdisciplinary Evaluation of the Utilization of the Water Resources of the Rio Grande in New Mexico: Lower Rio Grande Region,
W74-07609 6B

LANYON, R. F.
A Streamflow Model for Metropolitan Planning and Design,
W74-07721 2A

LAPERRIERE, J. D.
Laboratory Rearing Experiments on Artifically Propagated Inconnu (Stenodus Leucichthys),
W74-07725 8I

LAROSA, P. J.
Carbonate Bonding of Taconite Tailings,
W74-07959 5G

LARSON, T. E.
Domestic Hot Water Systems, Silicate Treatment Inhibits Corrosion of Galvanized Steel and Copper Alloys,
W74-07850 8G

Quality of Surface Water in Illinois 1966-1971,
W74-07678 5A

LASTOCHKINA, K. O.
Experimental Study of the Protective Ability of Water-Treatment Plants with Respect to some Substances of Caprolactam Production (In Russian),
W74-07771 5D

LATYPOVA, Z. V.
Experimental Study of the Hazard Due to Chlorinated Quinones and their Safety Levels in Water Bodies (In Russian),
W74-07778 5C

LAUFER, A.
Anion Exclusion and Coupling Effects in Nonsteady Transport Through Unsaturated Soils: II. Laboratory and Numerical Experiments,
W74-07631 2G

LECLERCQ, P. J.
Axisymmetric Infiltrations,
W74-07839 2G

LEHMAN, W. F.
Tolerance of Rice (Oryza Sativa L.) to Salt During Boot, Flowering, and Grain-Filling Stages,
W74-08080 3C

LEITZ, F. B.
High Temperature Electrodialysis, Phase I,
W74-08067 3A

High Temperature Electrodialysis, Phase II,
W74-08068 3A

High Temperature Electrodialysis, Phase III,
W74-08069 3A

High Temperature Electrodialysis, Phase IV,
W74-08070 3A

LEONARD, R. L.
Pricing of Industrial Wastewater Treatment Service,
W74-07727 5D

LERMAN, A.
Transport of Radionuclides in Sediments,
W74-07814 5B

LESCINSKY, J. B.
Water Resources of Lehigh County, Pennsylvania,
W74-07649 4A

LEVITZ, N. M.
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W74-07788 5D

LEWICKE, C. K.
Groundwater Issue Merits More Federal Protection, Groundwater Pollution and Conservation,
W74-07854 5G

LICHWA, J.
The Determination of Heavy Metals in Domestic Sewage Treatment Plant Wastes,
W74-07763 5A

LIGGETT, J. A.
Oxygen Depletion Model for Cayuga Lake,
W74-08007 5C

LINCOLN, D. A.
Corrosive Effects of Potable Water,
W74-07886 8G

LIND, A. O.
Pollution Monitoring in Lake Champlain Using ERTS-1 Imagery,
W74-08009 5A

LINDSEY, R. A.
Casing Potential Logging Related to Vertilog Corrosion Logging,
W74-07868 8G

LINDSTEDT, G.
Methods of Analysis,
W74-07681 5A

LITTLE, W. C.
The Role of Sediment Gradation on Channel Armoring,
W74-07731 2J

LIVINGSTON, R. K.
Transit Losses and Travel Times for Reservoir Releases, Upper Arkansas River Basin, Colorado,
W74-07931 4A

LLOYD, J. W.
The Hydrogeology and Utilization of Brines in El Salado, Chile,
W74-07936 4A

LOWMAN, F. G.
Trace-Element Interactions Between River Water and Seawater,
W74-07805 5B

LUCIUK, G. M.
Effect of Monosilicic Acid on Hydrolytic Reactions of Aluminum,
W74-07626 2G

LUDWICK, J. C.
Tidal Currents and Zig-Zag Sand Shoals in a Wide Estuary Entrance,
W74-07939 2L

LUGO, A. E.
Models of Matter Flow in a Southern Mixed Hardwood Forest in Florida: Preliminary Results,
W74-07813 5B

LUK'YANCHIKOV, F. V.
Results and Prospects of Investigating Fishes and Their Food Resources of the Khatanga River Basin, (In Russian),
W74-08130 8I

LUXMOORE, R. J.
Documentation of Prosper - A Model of Atmosphere-Soil-Plant Water Flow,
W74-07785 2A

LYONS, T. C.
Ground-Water Quality Models: What They Can and Cannot Do,
W74-07933 5B

MACAGNO, E. O.
Hydrologic Response of Ice-Covered Streams,
W74-07832 2E

MACCARY, L. M.
Location and Characteristics of the Interface Between Brine and Fresh Water from Geophysical Logs of Boreholes in the Upper Brazos River Basin, Texas,
W74-07859 8B

MACKENZIE, J. F.
A Prediction of Changes in the Thermal Cycle of a Stratified Lake Used to Cool a 1000 MW Power Plant,
W74-07998 5C

MACPHEE, C.
The Effects of River Fluctuations Resulting from Hydroelectric Peaking on Selected Aquatic Invertebrates,
W74-07830 2I

MADERAK, M. L.
Quality of Surface Waters in the Colorado River Basin, Texas, 1966-72 Water Years,
W74-07670 5B

MAFFETT, P. A.
The Determination of Mercury in Air Samples and Biological Materials,
W74-07710 5A

MAHLER, D. J.
Determination of Copper and Zinc in Biological Material,
W74-07712 5A

MAIER, W. J.
Carbon Measurements in Water Quality Monitoring,
W74-07641 5A

MAJORI, L.
Accumulation Phenomenon Which takes Place in a Mussel (Mytilus galloprovincialis LMK) Grown in an Artificially Polluted Environment, Verification of a Simplified Model of the Dynamic Equilibrium of Metal Ripartition Between Mussels and Sea-Water, Note II-Pollution from Copper, (Fenomeno di Accumulo Nel Mitilo (Mytilus galloprovincia-Lis LMK) Stabulato in Ambiente Artificialmente Inquinato. Verifica di un Modello Semplificato per L'equilibr io Dinamico di Ripartizione del Metalli fra Mitilo e Acqua Marina, Nota II: Inquinamento da rame),
W74-07746 5C

MALLON, H. J.
Estimation of Imperviousness and Specific Curb Length for Forecasting Stormwater Quality and Quantity,
W74-07640 5B

MALONE, T. F.
The Environmental Context,
W74-07696 5C

MAMEDOV, G. A.
Effectiveness of Mineral Fertilizers During Cotton Cultivating Depending on Soil Humidity, (In Azerbaijanian),
W74-08099 3F

MANKIN, J. B.
Documentation of Prosper - A Model of Atmosphere-Soil-Plant Water Flow,
W74-07785 2A

MAR, B. W.
A Summary of Quantity, Quality and Economic Methodology for Establishing Minimum Flows,
W74-07847 6B

MARGALEF, R.
Plankton Production and Water Quality in Spanish Reservoirs. First Report on a Research Project,
W74-08005 5C

MARINE, I. W.
Buried Triassic Basin in the Central Savannah River Area, South Carolina and Georgia,
W74-07916 2F

Geohydrology of the Buried Triassic Basin at the Savannah River Plant,
W74-07934 5B

MARR, J. J.
Coupon Corrosion Rates Versus Hydrogen Probe Activity,
W74-07857 8G

MARSHALL, I.
Electrolytic Flotation Apparatus,
W74-08030 5D

MARTIN, C. D.
A Data Acquisition System for Ecological Field Studies,
W74-07989 7B

MARTIN, D. F.
A Note Concerning the Environmental Acceptability of Nitrilotriacetic Acid (NTA): The Effect of NTA on the Growth of Gymnodinium breve,
W74-07775 5C

MARTIN, J. W.
Structure and Function of Hardwood Litter and Soil Subsystems After Chronic Gamma Irradiation. II. Microfungi,
W74-07825 5C

MASON, B. B.
Biodegradation of Nitrilotriacetate (NTA) in Soils,
W74-07624 5B

MATUSZEK, J. M.
Iodine-129 Levels in Milk and Water Near a Nuclear Fuel Reprocessing Plant,
W74-07798 5B

MAWER, P. A.
Improved Dynamic Programing Procedures and Their Practical Application to Water Resource Systems,
W74-08013 6A

MAYER, P. G.
The Role of Sediment Gradation on Channel Armoring,
W74-07731 2J

MCCARTHY, J. H. JR.
An Instrumental Technique for the Determination of Sub-Microgram Concentrations of Mercury in Soils, Rocks, and Gas,
W74-07948 2K

MCCLIN, R.
Trace-Element Interactions Between River Water and Seawater,
W74-07805 5B

MCCONNELL, H. L.
Carbon Measurements in Water Quality Monitoring,
W74-07641 5A

MCGARVEY, R. J.
Carbonate Bonding of Taconite Tailings,
W74-07959 5G

MCGINNES, P. R.
Determination of the Fate of Polynuclear Aromatic Hydrocarbons in Natural Water Systems,
W74-07827 5A

MCHUGH, J. B.
Determination of Mercury in Vegetation with Dithizone - A Single Extraction Procedure,
W74-07949 5A

MCKINNEY, I.
Prevention of Calcium Carbonate Scale Deposition in Mill Water Systems,
W74-07848 8G

MCLAREN, A. D.
A Kinetic Study of Ammonium and Nitrite Oxidation in a Soil Field Plot,
W74-07625 5B

MCLEAN, E. O.
Quality of Drainage Water From a Heavy-Textured Soil,
W74-08088 5B

MCNEAL, B. L.
Characterization of Suspended Sediments in Water from Selected Watersheds as Related to Control Processes, Nutrient Contents, and Lake Eutrophication,
W74-07736 5B

MCNELLIS, J. M.
Ground-Water Levels in Observation Wells in Kansas, 1966-70,
W74-07650 7C

MCPHEARSON, R. M. JR.
Use of Fluorescent Dye Tracers in Mobile Bay,
W74-07642 5B

MCPHERSON, M. B.
Innovation: A Case Study,
W74-07720 6B

MEADE, T. L.
A Water Quality Problem in Lobster Holding Tanks,
W74-07983 8I

MEHDIZADEH, P.
Drill Pipe Failures: Where Do We Go From Here,
W74-07869 8G

MEHRAN, M.
Flood and Seepage Water Sampling Techniques in Rice Fields Under Different Water Management Practices,
W74-08090 5B

MELESHKO, G. I.
Organic Water Impurities and Evaluation of Methods for their Removal in Water Mains (In Russian),
W74-07862 5D

MELSHEIMER, E. S.
Outlet Works Stilling Basins, Clinton and Fort Scott Dams, Wakarusa and Marmaton Rivers, Kansas,
W74-07930 8A

MEMMEDOVA, S. E.
Growth of the Caspian Roach in the Mingechaur Reservoir, (In Azerbaijarian),
W74-08123 2H

MENKEL', M. F.
Trends and Problems in Investigation of Long-Term Fluctuations of River Runoff (Napravleniya i zadachi issledovaniya mnogoletnikh kolebaniy rechnogo stoka),
W74-08051 2E

MEREDITH, D. D.
Hydrologic Models of the Great Lakes,
W74-07826 2H

MEYER, F. W.
Reconnaissance of the Water Resources in the Vicinity of Proposed Deep-Well Injection Sites in Southeast Dade County, Florida,
W74-07915 5B

MEYER, R. P.
Investigation of the Sediments and Potential Manganese Nodule Resources of Green Bay, Wisconsin,
W74-07652 2J

MICHALSON, E. L.
Summary Report for a Methodology Study to Develop Evaluation Criteria for Wild and Scenic Rivers,
W74-07608 6B

MICHEL, S.
Toxicity of an Algal Complex on Freshwater Fauna: 1. Action on Some Benthic Animals and Fishes. (in French),
W74-08108 5C

Toxicity of an Algal Complex on Freshwater Fauna: 2. Action on Lymnaea Spp. (in French).
W74-08109 5C

MICHELSEN, D. L.
The Removal of Soluble Mercury from Waste Water by Complexing Techniques,
W74-07845 5D

MICHENER, D. W.
Quality of Drainage Water From a Heavy-Textured Soil,
W74-08088 5B

MIHAJLOVIC, I.
The Application of 'Rotenone' for the Extermination of the Indigenous Fish Stock in Waters Where Intensive Fish Farming is to be Introduced,
W74-08001 8I

MILLER, H. M.
Metals Focus Shifts to Cadmium,
W74-07697 5B

MILLER, M. W.
Foam Fractionation of Mercury(II) Nitro Complexes,
W74-07945 5A

MILLER, W. J.
Endogenous Zinc Excretion and 65Zinc Metabolism in Holstein Calves Fed Intermediate to High But Nontoxic Zinc Levels in Practical Diets,
W74-07954 5C

MINGELGRIN, U.
The Surface Catalyzed Hydrolysis of Parathion on Kaolinite,
W74-07628 5B

MINNING, R. C.
The Electrical Resistivity Method (Part I),
W74-07852 7B

MISRA, C.
Nitrogen Transformation in Soil During Leaching: II. Steady State Nitrification and Nitrate Reduction,
W74-07620 5B

Nitrogen Transformations in Soil During Leaching: I. Theoretical Considerations,
W74-07619 5B

Nitrogen Transformations in Soil During Leaching: III. Nitrate Reduction in Soil Columns,
W74-07621 5B

MITOSEK, H. T.
Optimization of Stochastic Storage Models Formulated by P A P Moran, and Z Kaczmarek (Optymalizacja stochastycznych modeli retencjonwania podanych przez P A P Morana i Z. Kaczmarka),
W74-07747 4A

MOCHALKIN, L. S.
Ameliorative Effect of Field Shelterbelts Under Conditions in the Urals, (In Russian),
W74-08100 4A

MOE, D. L.
South Dakota Standards for Construction of Irrigation Wells in Shallow Unconsolidated Glacial Sediments,
W74-07896 8A

MOHLER, E. F. JR.
Sun Oil Develops Water Reuse Program,
W74-07882 5D

MOHR, C. H.
Down-Hole Motors for Improved Drilling,
W74-07880 8C

MOISEYENKO, U. I.
Electric and Thermal Properties of Rocks,
W74-07906 8E

MOLOF, A. H.
Wastewater Treatment,
W74-08034 5D

MONCRIEF, L. W.
Capacity of Water-Based Recreation Systems Part I: The State of the Art - A Literature Review,
W74-07719 6B

MONKMAN, J. L.
The Determination of Mercury in Air Samples and Biological Materials,
W74-07710 5A

MONRO, J. C.
National Weather Service River Forecasting System,
W74-08057 4A

MOORE, C. V.
Effects of Colorado River Water Quality and Supply on Irrigated Agriculture,
W74-08014 3C

MOORE, F. K.
A Prediction of Changes in the Thermal Cycle of a Stratified Lake Used to Cool a 1000 MW Power Plant,
W74-07998 5C

MOORE, J. R.
Investigation of the Sediments and Potential Manganese Nodule Resources of Green Bay, Wisconsin,
W74-07652 2J

MOREALE, A.
Adsorption of Fenuron and Monuron (Substituted Ureas) by Two Montmorillonite Clays,
W74-07627 5B

MORGAN, C. L.
Investigation of the Sediments and Potential Manganese Nodule Resources of Green Bay, Wisconsin,
W74-07652 2J

MORI, K.
Reverse Osmosis Process and its Application, (In Japanese),
W74-07750 5D

MORIN, O. J.
Commercial Desalting Plant Data and Analysis, Volumes I-VI,
W74-08061 3A

MORROW, J. E.
Effects of Crude Oil and Some of its Components on Young Coho and Sockeye Salmon,
W74-07613 5C

MUELLER-HAECKEL, A.
Experiments on the Movement Behavior of Unicellular Algae in Flowing Water,
W74-08120 2I

MULVIHILL, M. E.
Optimal Timing and Sizing of a Conjunctive Urban Water Supply and Waste Water System with Nonlinear Programming,
W74-08010 5D

MUNSON, T. O.
Biochemical Investigations,
W74-07654 5B

MURZAKAEV, V. G.
Experimental Study of the Hazard Due to Chlorinated Quinones and their Safety Levels in Water Bodies (In Russian),
W74-07778 5C

MUSGRAVE, B. C.
Tritium Distribution in the Nuclear Industry - The Requirements for Control Strategies,
W74-07784 5B

MYERS, J. R.
Performance and Selection of Materials for Potable Hot Water Service,
W74-07855 8G

MYERS, T. L.
Solving Drilling Problems Utilizing Well Logs - A Case History,
W74-07898 8G

MYKTYTYUK, P. V.
Sowing of Ponds and Carp with Clostridium perfringens, (In Ukrainian),
W74-08076 5B

NANDPURI, K. S.
Studies on the Influence of Irrigation and Different Doses of N, P and K on the Flowering Behaviour and Absorption of Nutrient Elements in Muskmelon (Cucumis melo L.),
W74-08144 3F

NARAYANAN, A. S.
Economic Evaluation of the Effect of Selected Crop Practices on Nonagricultural Uses of Water,
W74-07828 5B

NEATHERY, M. W.
Endogenous Zinc Excretion and 65Zinc Metabolism in Holstein Calves Fed Intermediate to High But Nontoxic Zinc Levels in Practical Diets,
W74-07954 5C

NEEDLEMAN, H.
The Distribution of Lead in Human Deciduous Teeth,
W74-07691 5C

NEELY, W. C.
The Photosensitizing Action of Carcinogens. I. The Action of 2-Naphthylamine on Escherichia Coli K-12 and Paramecium Caudatum,
W74-08095 5C

NEFF, C. H.
Domestic Hot Water Systems, Silicate Treatment Inhibits Corrosion of Galvanized Steel and Copper Alloys,
W74-07850 8G

NEFF, S. E.
Seasonal Changes in Water Quality and Primary Productivity in Doe Valley Lake,
W74-07605 5C

NEHRKORN, A.
Investigations on the Problem of Solubility and Stability of Steroid Ovulation Inhibitors in Water, Waste Water and Activated Sludge, (In German),
W74-08133 5A

NEIL, R. C.
Lime Grout Penetration and Associated Moisture Movements in Soil,
W74-07871 8D

NEILL, J. C.
Quality of Surface Water in Illinois, 1966-1971,
W74-07678 5A

NELSON, L. M.
Sediment Transport by Streams in the Upper Columbia River Basin, Washington, May 1969-June 1971,
W74-07911 2J

NELSON, R. W.
Soil Moisture Transport in Arid Site Vadose Zones,
W74-07780 2G

NELSON, V. A.
Biological Half-Lives for Zinc and Mercury in the Pacific Oyster, Crassostrea gigas,
W74-07807 5C

NESTLE, A. C.
Coupon Corrosion Rates Versus Hydrogen Probe Activity,
W74-07857 8G

NEWBOLD, J. D.
Oxygen Depletion Model for Cayuga Lake,
W74-08007 5C

NIELSEN, D. R.
Nitrogen Transformation in Soil During Leaching: II. Steady State Nitrification and Nitrate Reduction,
W74-07620 5B

Nitrogen Transformations During Continuous Leaching,
W74-07623 5B

Nitrogen Transformations in Soil During Leaching: I. Theoretical Considerations,
W74-07619 5B

Nitrogen Transformations in Soil During Leaching: III. Nitrate Reduction in Soil Columns,
W74-07621 5B

NIEUWENHULS, G. J.
Process for Treating Water Contaminated with Hexavalent Chromium,
W74-08024 5D

NIMAH, M. N.
Model for Estimating Soil Water, Plant, and Atmospheric Interrelations: I. Description and Sensitivity,
W74-08084 2G

Model for Estimating Soil Water, Plant, and Atmospheric Interrelations: II. Field Test of Model,
W74-08085 2G

NORDBERG, G. F.
Inorganic Mercury-Relation Between Exposure and Effects,
W74-07686 5C

Metabolism,
W74-07683 5B

NORMARK, W. R.
Ranger Submarine Slide, Northern Sebastian Vizcaino Bay, Baja California, Mexico,
W74-07938 2J

NORPOTH, K.
Investigations on the Problem of Solubility and Stability of Steroid Ovulation Inhibitors in Water, Waste Water and Activated Sludge, (In German),
W74-08133 5A

NOSHKIN, V. E.
Plutonium in North Atlantic Ocean Organisms; Ecological Relationships,
W74-07800 5C

NUNN, G.
Regional Water Authorities: Organizational Patterns-Purpose or Professional,
W74-07754 5G

NYHOLM, E.
Smelter Gases Yield Mercury,
W74-07956 5D

O'BRIEN, W. J.
Municipal and Industrial Water Supply,
W74-07968 6D

O'CONNOR, P. B.
Survival of Enteric Pathogens and Indicator Organisms in Natural Waters,
W74-07840 5A

O'DELL, B. L.
Evaluation of Zinc Availability in Foodstuffs of Plant and Animal Origin,
W74-07706 5C

O'HARA, J.
The Influence of Temperature and Salinity on the Toxicity of Cadmium to the Fiddler Crab, Uca pugilator,
W74-07699 5C

O'NEILL, R. V.
Error Analysis of Ecological Models,
W74-07811 5B

OBRECHT, M. F.
Performance and Selection of Materials for Potable Hot Water Service,
W74-07855 8G

OERTEL, G. F.
Patterns of Water Flow and Sediment Dispersion Adjacent to an Eroding Barrier Island,
W74-07920 2J

OERTLI, J. J.
Contribution to Water Pollution from Agricultural and Urban Sources in the Coachella Valley,
W74-07757 5B

OESAU, A.
Phytosociological Observations in Inundation Zone Farmlands in the Northern Upper Rhine Valley, (In German),
W74-08121 2I

OGLESBY, R. T.
An Evaluation of the Needs in Freshwater Research and Related Public Information Facilities,
W74-07838 6G

OLDHAM, R. R.
Pivotable Fluid Diverter for Recirulation System,
W74-08021 5D

OLEINIK, G. N.
Species Composition of Epiphytic Bacteria of Green Filamentous Algae in the Northern Donets-Donbas Canal, (in Russian),
W74-08112 5C

OLSON, K. R.
A Scanning Electron Microscopic Study of Secondary Lamellae and Chloride Cells of Rainbow Trout (Salmo gairdneri),
W74-08096 5C

OLSON, P. R.
Accumulation of Calcium-45 in Developing Coho Salmon Eggs and Fry reared in varying concentrations of Stable Calcium,
W74-07808 5C

OMANG, R. J.
Annual Peak Discharges from Small Drainage Areas in Montana, Through September 1972,
W74-07667 2E

OMEL'YANETS, N. I.
Organic Water Impurities and Evaluation of Methods for their Removal in Water Mains (In Russian),
W74-07862 5D

ONISHI, H.
Economic Evaluation of the Effect of Selected Crop Practices on Nonagricultural Uses of Water,
W74-07828 5B

ONSTENK, R. W.
Data Management,
W74-07659 5B

OPALINSKI, K. W.
Freshwater Fauna and Flora in Haswell Island (Queen Mary Land, Eastern Antarctica),
W74-08107 2I

ORLOB, G. T.
Ground-Water Quality Models: What They Can and Cannot Do,
W74-07933 5B

ORSBORN, J. F.
A Summary of Quantity, Quality and Economic Methodology for Establishing Minimum Flows,
W74-07847 6B

OSTER, J. D.
An Oscillator Circuit for Automated Salinity Sensor Measurements,
W74-08074 2G

OSTERBERG, C. L.
Effects of Gamma Irradiation on the Maintenance of Population Size in the Brine Shrimp, Artemia,
W74-07823 5C

Effects of Gamma Irradiation on the Reproductive Performance of Artermia as Determined by Individual Pair Matings,
W74-07822 5C

OSWALT, N. R.
Outlet Works, Stilling Basin for Tallahala Dam, Tallahala Creek, Mississippi,
W74-07925 8B

OTT, R.
The Treatment of Waste Water from Industries and Commerce in Public Purification Plants (in German),
W74-07748 5D

OTTO, S. V.
Molluscan Mortality Studies,
W74-07995 8I

OWENS, T. C.
Preliminary Study to Investigate Feasibility of Desalting Ground Water in North Dakota,
W74-08066 3A

PAILY, P. P.
Hydrologic Response of Ice-Covered Streams,
W74-07832 2E

PALMER, H. D.
Geological Investigations,
W74-07657 5B

Trace Metals Investigations,
W74-07655 5B

PALMER, J. D.
Galvanic Effects Increase Corrosion, Part 2,
W74-07904 8G

Learn the Basics of Corrosion Control,
W74-07892 8G

PANASENKO, G. I.
Organic Water Impurities and Evaluation of Methods for their Removal in Water Mains (In Russian),
W74-07862 5D

PAOLETTI DI CHIARA, ANDREINA
Study on the Periphytic Colonizations of a Lateral Environment of the River Po(Italy), (In Italian),
W74-07702 2I

PAPERIELLO, C. J.
Iodine-129 Levels in Milk and Water Near a Nuclear Fuel Reprocessing Plant,
W74-07798 5B

PARKER, M. M.
Determination of Copper and Zinc in Biological Material,
W74-07712 5A

PARKER, P. N.
Using Improved Technology to Obtain Better Cement Jobs on Deep, Hot Liners,
W74-07878 8F

PARKES, J. D.
An Evaluation of the Needs in Freshwater Research and Related Public Information Facilities,
W74-07838 6G

PASHKIN, L. M.
Biological Characteristics of the Volga School of Beluga and Stellate Sturgeon, (In Russian),
W74-08126 2I

PATHAK, A. N.
Correlations Between P, Fe and Mn Availability in Water-Logged Soil at Different Fertility Levels,
W74-08134 2G

PENG, C-Y.
A Numerical Study of the Steady Circulation in an Open Bay,
W74-07924 2L

PENTREATH, R. J.
Radioecology of the Plaice (Pleuronectes platessa L) in the Northeast Irish Sea,
W74-07802 5C

PERKINS, H. F.
Fixation of Zinc by Clay Minerals,
W74-07629 2G

PETERSON, W. H.
South Dakota Standards for Irrigation Pumps and Power Units,
W74-07895 8C

PETRONIO, F.
Accumulation Phenomenon Which takes Place in a Mussel (Mytilus galloprovincialis LMK) Grown in an Artificially Polluted Environment, Verification of a Simplified Model of the Dynamic Equilibrium of Metal Ripartition Between Mussels and Sea-Water, Note II-Pollution from Copper, (Fenomeno di Accumulo Nel Mitilo (Mytilus galloprovincia-Lis LMK) Stabulato in Ambiente Artificialmente Inquinato. Verifica di un Modello Semplificato per L'equilibr io Dinamico di Ripartizione del Metalli fra Mitilo e Acqua Marina, Nota II: Inquinamento da rame),
W74-07746 5C

PETRUSENKO, A. A.
Ground Beetles (Coleoptera, Carabidae) from the Boggy Areas of the Crimea, (in Russian),
W74-08103 2I

PETRUSENKO, S. V.
Ground Beetles (Coleoptera, Carabidae) from the Boggy Areas of the Crimea, (in Russian),
W74-08103 2I

PFITZENMEYER, H. T.
The Effects of the Maryland Hydraulic Clam Dredge on Populations of the Soft-Shell Clam, 'Mya Arenaria,'
W74-07994 8I

PHEASANT, D. R.
Delimitation of Weathering Zones in the Fiord Area of Eastern Baffin Island, Canada,
W74-07937 2J

PHILIPPI, G.
The Moss Vegetation of the Forests in the Rhine Lowland Between Basel and Mannheim, (In German),
W74-08131 2I

PIECZYNSKA, E.
Ecology of the Eulittoral Zone of Lakes,
W74-08003 5C

PISONIC, M.
Reduction of Lead Absorption from the Intestine in Newborn Rats,
W74-07953 5C

PITTMAN, E. D.
Microporosity in Carbonate Rocks,
W74-07861 4B

PLANAS, D.
Plankton Production and Water Quality in Spanish Reservoirs. First Report on a Research Project,
W74-08005 5C

PLONKA, J. H.
New Bromide Packer Fluid Cuts Corrosion Problems,
W74-07858 8G

PLUMMER, A. H. JR.
Industrial Application of Whitford's Demand Forecasting Procedure,
W74-08015 6D

POLLARD, J. F.
Experiments to Re-establish Historical Oyster Seed Grounds and to Control the Southern Oyster Drill,
W74-07982 8I

POLTZ, J.
Investigations on the Occurrence and Decomposition of Fats and Fatty Acids in Lakes, (In German),
W74-08141 5C

POOL, J. V. T.
Water Treatment Mud Decanting Tank,
W74-08042 5F

POPOV, E. G.
Hydrological Forecasting and Water Management (In Russian),
W74-07768 4A

POWER, J. F.
Effect of Temperature and Plant Water Stress on Photosynthesis Diffusion Resistance, and Leaf Water Potential in Spring Wheat,
W74-08075 3F

Recovery, Residual Effects, and Fate of Nitrogen Fertilizer Sources in a Semiarid Region,
W74-08086 5B

PRATT, P. F.
Effects of Drainage and Organic Amendments on the Reclamation of a Sodic Soil Cropped With Rice,
W74-08087 3C

PREHN, W. L.
The Future Role of Desalting in Nevada,
W74-08065 3A

PREUS, P.
Control of Waterborne Oil Slicks,
W74-08036 5G

PRICE, K. R.
Wastewater Treatment Using Electrolysis with Activated Carbon Cathode,
W74-08028 5D

PRIDE, R. W.
Estimated Use of Water in Florida, 1970,
W74-07917 6D

PROKACHEVA, V. G.
Application of Satellite Data for Hydrologic Purposes (Ispol'zovaniye sputnikovoy informatsii dlya gidrologicheskikh tseley),
W74-08049 7B

PUTTASWAMYGOWDA, B. S.
Effects of Drainage and Organic Amendments on the Reclamation of a Sodic Soil Cropped With Rice,
W74-08087 3C

QUERE, J-P.
Destruction Trials of the Muskrat, Ondatra Zibethica L., in Ponds Using Poisoning Rafts, (In French),
W74-08128 5G

QURESHI, M.
Paper Chromatographic and Electrochromatographic Separation of Edta Complexes of Metal Ions,
W74-07693 5A

RADO, F. A.
Water Treatment System,
W74-07979 5F

RAINS, B. A.
Odors Emitted from Raw and Digested Sewage Sludge,
W74-07960 5D

RAJEVSKI, V.
The Application of 'Rotenone' for the Extermination of the Indigenous Fish Stock in Waters Where Intensive Fish Farming is to be Introduced,
W74-08001 8I

RAMEL, C.
Genetic Effects,
W74-07688 5C

RANDHAWA, K. S.
Studies on the Influence of Irrigation and Different Doses of N, P and K on the Flowering Behaviour and Absorption of Nutrient Elements in Muskmelon (Cucumis melo L.),
W74-08144 5F

RANDOLPH, R. C.
Corrosive Effects of Potable Water,
W74-07886 8G

RANZAU, C. E. JR.
Data on Fresh-Water Inflow, April 14-July 28, 1973, For Analog-Model Study of the Houston Ship Channel, Houston, Texas,
W74-07921 7C

RASTAS, J.
Smelter Gases Yield Mercury,
W74-07956 5D

RATKOVICH, D. YA.
Trends and Problems in Investigation of Long-Term Fluctuations of River Runoff (Napravleniya i zadachi issledovaniya mnogoletnikh kolebaniy rechnogo stoka),
W74-08051 2E

RAWAT, J. P.
Paper Chromatographic and Electrochromatographic Separation of Edta Complexes of Metal Ions,
W74-07693 5A

RAWLS, W.
Axisymmetric Infiltrations,
W74-07839 2G

RAWSON, J.
Quality of Surface Waters in the Colorado River Basin, Texas, 1966-72 Water Years,
W74-07670 5B

RAY, E. L.
Cellulosic Reverse Osmosis Membranes Having High Flux and High Salt Rejection,
W74-08022 3A

REDDY, M. R.
Fixation of Zinc by Clay Minerals,
W74-07629 2G

REEDY, D. R.
Corrosive Effects of Southern California Potable Waters,
W74-07866 8G

REICHMAN, G. A.
Recovery, Residual Effects, and Fate of Nitrogen Fertilizer Sources in a Semiarid Region,
W74-08086 5B

REIMANN, E. M.
Antagonistic Effect of Arginine on Zinc Metabolism in Chicks,
W74-07955 5C

RENGER, M.
Calculation of Capillary Rise from Groundwater Table into the Root Zone Under Steady-State Conditions, (In German),
W74-08139 2G

REPLOH, H.
Pollution Control and Erection of Sewage Plants: Technical Feasibilities, Future Demands, (In German),
W74-08138 5G

REVINSKAYA, L. S.
Effect of Humidity and Temperature on Microbial Activity in Moor Peat Soils, (In Russian),
W74-08089 2G

REYNOLDS, J. A.
Pump Installation and Maintenance,
W74-07873 8C

RHEINHEIMER, G.
Investigations on the Occurrence of Phenol-Decomposing Microorganisms in Waters and Sediments. (in German),
W74-08115 5C

RHODEHAMEL, E. C.
Geology and Water Resources of the Wharton Tract and the Mullica River Basin in Southern New Jersey,
W74-07668 4B

RHODES, E. G.
Pleistocene-Holocene Sediments Interpreted by Seismic Refraction and Wash-Bore Sampling, Plum Island-Castle Neck, Mass.,
W74-07875 2L

RICCIARDELLA, K. A.
Carbonate Bonding of Taconite Tailings,
W74-07959 5G

RICE, G. K.
Theory and Application of Continuous Monitoring for Chemical Research in Natural Water Systems,
W74-07985 5A

RICHARDS, B. G.
The Significance of Moisture Flow and Equilibria in Unsaturated Soils in Relation to the Design of Engineering Structures Built on Shallow Foundations in Australia,
W74-07899 8D

RICKSON, R. E.
Social and Economic Factors in the Adoption by Industry of Water Pollution Control Measures in Minnesota,
W74-07834 5G

RIMIDIS, A. P.
Study of Mesh Fish Barriers in the Polder Systems of the Nemunas River Delta, (In Russian),
W74-08125 8I

RIPPLE, C. D.
Packing-Induced Radial Particle-Size Segregation: Influence on Hydrodynamic Dispersion and Water Transfer Measurements,
W74-07630 2G

RITCHIE, J. E. JR.
Petroleum Systems Reliability Analysis, A Program for Prevention of Oil Spills Using an Engineering Approach to a Study of Offshore and Onshore Crude Oil Petroleum Systems, Volume II - Appendices,
W74-07957 5G

RIVOLA, M.
Zonation of Mosses on the Banks of the Novy Cepsky Pond. (in Czech.),
W74-08119 2H

ROBERTS, B. J.
Down-Hole Motors for Improved Drilling,
W74-07880 8C

ROBINSON, F. E.
Tolerance of Rice (Oryza Sativa L.) to Salt During Boot, Flowering, and Grain-Filling Stages,
W74-08080 3C

ROBISON, T. M.
Ground-Water Resources of Montgomery County, Indiana,
W74-07645 2F

RODRIGUEZ-ITURBE, I.
The Methodology of Bayesian Inference and Decision Making Applied to Extreme Hydrologic Events,
W74-07601 2A

ROETMAN, E. L.
Soil Moisture Transport in Arid Site Vadose Zones,
W74-07780 2G

ROGERS, E. B. JR.
Sand Control in Oil and Gas Wells, Part I,
W74-07891 8B

Sand Control, (Part 4), Combinations, Comparisons, and Costs,
W74-07851 8A

ROGERS, J. E.
Water Resources of the Little River Basin, Louisiana,
W74-07671 4A

ROHWER, P. S.
A Systems analysis Methodology for Predicting Dose to Man From a Radioactively Contaminated Terrestrial Environment,
W74-07809 5C

RONCEDO, L. R.
'Hill-Top Irrigation,' A New System for Early Sweetpotato Planting, (In Spanish),
W74-08136 3F

ROSE, A. D.
Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality-Phase I,
W74-07715 5C

ROSS, D. S.
Apparatus and Method for Treating Waste Liquid,
W74-08026 5D

ROSS, S. S.
Federal Laws and Regulations,
W74-07703 5G

ROSSI, E. R.
'Hill-Top Irrigation,' A New System for Early Sweetpotato Planting, (In Spanish),
W74-08136 3F

ROUSAR, D. C.
Distribution of Phosphorus, Silica, Chlorophyll a, and Conductivity in Lake Michigan and Green Bay,
W74-08000 5C

Seasonal and Spatial Changes in Primary Production and Nutrients in Lake Michigan,
W74-07773 5C

ROVERS, F. A.
Infiltration and Landfill Behavior,
W74-08083 5B

ROYLE, L. G.
Chemical Evidence for the Dispersal of River Mersey Run-off in Liverpool Bay,
W74-07674 5B

RUBIN, J.
Packing-Induced Radial Particle-Size Segregation: Influence on Hydrodynamic Dispersion and Water Transfer Measurements,
W74-07630 2G

RUMANCIK, J. A.
Water Treatment System,
W74-07979 5F

RUNKLES, J. R.
Regional Energy-Water Problems, Southern Plains,
W74-07976 6D

RUTTAN, D.
The Determination of Heavy Metals in Domestic Sewage Treatment Plant Wastes,
W74-07763 5A

RYAN, J. L.
The Technology of Tritium Fixation and Storage,
W74-07789 5D

RYZHOV, S. V.
Automatic Pumping Installations for Livestock Sections,
W74-07864 8C

SAINI, G. R.
Relationship Between Soil Oxygen Diffusion Rate and Yield of Oats in a Coastal Alluvial Soil at Critical Salinity Level,
W74-08094 3C

SALTZMAN, S.
The Surface Catalyzed Hydrolysis of Parathion on Kaolinite,
W74-07628 5B

SAMOILOVYCH, R. YE.
Use of Morshin Mineral Water in Disease of the Liver and Biliary Tracts in Children, (in Ukrainian),
W74-08101 2I

SAMPSON, R. L.
High Temperature Electrodialysis, Phase IV,
W74-08070 3A

SASSCER, D. S.
Mathematical Model of Tntiated and Stable Water Movement in an Old-Field Ecosystem,
W74-07812 5B

SAVAGE, J. E.
Evaluation of Zinc Availability in Foodstuffs of Plant and Animal Origin,
W74-07706 5C

SAVINELL, A.
Water Treatment System,
W74-07979 5F

SAYLES, J. A.
Floating Barrier,
W74-08025 5G

SAYLOR, P.
Analysis of Liquid-Waste Injection Wells in Illinois by Mathematical Models,
W74-07604 5B

SCAIEF, C. C. III.
Influence of Dietary and Injected Selenium on Whole-Body Retention, Route of Excretion, and Tissue Retention of 75SeO3 (--) in the Rat,
W74-07708 5C

SCHAAF, DAVID
Preliminary Study to Investigate Feasibility of Desalting Ground Water in North Dakota,
W74-08066 3A

SCHAAKE, J. C.
The Methodology of Bayesian Inference and Decision Making Applied to Extreme Hydrologic Events,
W74-07601 2A

SCHECHTER, R. S.
Dissolution of a Porous Matrix by a Slowly Reacting Acid,
W74-07860 8B

SCHERTEL, M. E.
Effect of Ascorbic Acid on Cadmium Toxicity in the Young Coturnix,
W74-07707 5C

SCHILSKY, S. W.
Domestic Hot Water Systems, Silicate Treatment Inhibits Corrosion of Galvanized Steel and Copper Alloys,
W74-07850 8G

SCHMULBACH, J. C.
An Ecological Study of the Missouri River Prior to Channelization,
W74-07744 2I

SCHNYDER, H.
Mechanical-Biological Waste Water Purification Plant,
W74-08032 5D

SCHROEDER, E. E.
Estimating the Magnitude of Peak Discharges for Selected Flood Frequencies on Small Streams in East Texas,
W74-07664 2E

SCHROEDER, T.
The LD(50) Value of Tetraethyl Lead,
W74-07700 5C

Tetraethyl Lead Dose Response Curve for Mortality in Laboratory Rats,
W74-07701 5C

SCHUG, H.
Method and Equipment for Desalination of Liquids,
W74-08038 3A

SCHULZ, R. K.
A Kinetic Study of Ammonium and Nitrite Oxidation in a Soil Field Plot,
W74-07625 5B

SCHWAB, G. O.
Quality of Drainage Water From a Heavy-Textured Soil,
W74-08088 5B

SCOTT, R. B.
Reverse Osmosis-Neutralization Process for Treating Mineral Contaminated Waters,
W74-08041 5D

SEELY, R. J.
Influence of Dietary and Injected Selenium on Whole-Body Retention, Route of Excretion, and Tissue Retention of 75SeO3 (--) in the Rat,
W74-07708 5C

SEKI, H.
Results of Red Tide Formation in Tokyo Bay,
W74-07770 5C

SERGEEV, E. A.
Methods of Mercurometric Investigations,
W74-07695 5A

SERPIK, B. I.
Hydrology and Structural Design (In Russian),
W74-07767 8B

SEYMOUR, A. H.
Biological Half-Lives for Zinc and Mercury in the Pacific Oyster, Crassostrea gigas,
W74-07807 5C

SHAABAN, A. S.
Seasonal Changes of Benthos Algae of the Higher Part of Vorskla River, (In Russian),
W74-08142 5C

SHALAEVA, N. M.
Invertebrate Fauna of the Bodies of Water of the Stationary 'Agapa' (Western Taimir). (in Russian),
W74-08110 2I

SHAMEY, L. J.
Three-Dimensional Zone Model Log Interpretation,
W74-07735 8G

SHAPIRO, I. M.
The Distribution of Lead in Human Deciduous Teeth,
W74-07691 5C

SHETRON, S. G.
Distribution of Free Iron and Organic Carbon as Related to Available Water in Some Forested Sandy Soils,
W74-07622 2G

SHIKLOMANOV, I. A.
Problem of Assessing Effects of Human Activity on Surface-Water Resources (K probleme otsenki vliyaniya deyatel'nosti cheloveka na resursy poverkhnostnykh vod),
W74-08053 4A

SHORTT, W. A.
Petroleum Systems Reliability Analysis, A Program for Prevention of Oil Spills Using an Engineering Approach to a Study of Offshore and Onshore Crude Oil Petroleum Systems, Volume II - Appendices,
W74-07957 5G

SIEGEL, B. Z.
Icelandic Geothermal Activity and the Mercury of the Greenland Icecap,
W74-07944 5B

SIEGEL, S. M.
Icelandic Geothermal Activity and the Mercury of the Greenland Icecap,
W74-07944 5B

SILBERBERG, I. H.
Dissolution of a Porous Matrix by a Slowly Reacting Acid,
W74-07860 8B

SIMMONS, J. W.
Application of Remote Sensing to Hydrology--Final Technical Report,
W74-07940 2A

SIMONOVIC, I.
Reduction of Lead Absorption from the Intestine in Newborn Rats,
W74-07953 5C

SIMPSON, R. L.
A Data Acquisition System for Ecological Field Studies,
W74-07989 7B

SINCLAIR, R. A.
Quality of Surface Water in Illinois, 1966-1971,
W74-07678 5A

SINEX, W. E. JR.
Dissolution of a Porous Matrix by a Slowly Reacting Acid,
W74-07860 8B

SINGH, K. P.
The 7-Day 10-Year Low Flows of Illinois Streams,
W74-07677 2E

SIPLE, G. E.
Buried Triassic Basin in the Central Savannah River Area, South Carolina and Georgia,
W74-07916 2F

SISEMORE, C.
Project Rio Blanco Spall Measurements Data Report,
W74-07797 4B

SISK, F. J.
Submerged Turbine Aerator,
W74-08027 5D

SKAKAL'SKIY, B. G.
Present Problems in the Study of Surface-Water Quality (Aktual'nyye problemy issledovaniya kachestva poverkhnostnykh vod),
W74-08050 5G

SKERFVING, S.
Metabolism,
W74-07683 5B

Methods of Analysis,
W74-07681 5A

'Normal' Concentrations of Mercury in Human Tissue and Urine,
W74-07685 5C

Organic Mercury Compounds-Relation Between Exposure and Effects,
W74-07687 5C

Symptoms and Signs of Intoxication,
W74-07684 5C

SKOSYREVA, K. N.
Ways of Increasing the Production of Takyr Soils of the Tedzhen Delta, (In Russian),
W74-08098 3F

SMEDILE, ELIO
Study on the Periphytic Colonizations of a Lateral Environment of the River Po(Italy), (In Italian),
W74-07702 2I

SMITH, D. E.
Effect of Radiation, Salinity and Temperature on the Ionic Regulation of the Blue Crab, Callinectes sapidus,
W74-07818 5C

SMITH, E. M.
Exploration for a Buried Valley by Resistivity and Thermal Probe Surveys,
W74-07935 2F

SMITH, J. E. JR.
Lime Stabilization of Primary Sludges,
W74-07760 5D

SMITH, R.
Design and Simulation of Equalization Basins,
W74-08046 5D

Mathematical Model for Post Aeration,
W74-08045 5D

SMITH, R. C.
The Photosensitizing Action of Carcinogens. I. The Action of 2-Naphthylamine on Escherichia Coli K-12 and Paramecium Caudatum,
W74-08095 5C

SMITH, R. P.
Water Resources of the Little River Basin, Louisiana,
W74-07671 4A

SMITH, T. R.
A Derivation of the Hydraulic Geometry of Steady-State Channels from Conservation Principles and Sediment Transport Laws,
W74-07633 2J

SNAPE, T. R.
Management Priorities: Now and the Future,
W74-07755 6B

SNEDAKER, S. C.
Models of Matter Flow in a Southern Mixed Hardwood Forest in Florida: Preliminary Results,
W74-07813 5B

SNOEYINK, V. L.
Determination of the Fate of Polynuclear Aromatic Hydrocarbons in Natural Water Systems,
W74-07827 5A

SNYDER, H. H.
Effects of Colorado River Water Quality and Supply on Irrigated Agriculture,
W74-08014 3C

SOKOLOV, A. A.
All-Union Hydrologic Congresses (Vsesoyuznyye gidrologicheskiye syezdy),
W74-08056 6E

Problem of Rational Use and Conservation of Water Resources and Goals of Hydrology (Problema ratsional'nogo ispol'zovaniya i okhrany vodnykh resursov i zadachi gidrologii),
W74-08055 6B

SOKOLOVA, L. S.
Electric and Thermal Properties of Rocks,
W74-07906 8E

SOMERTON, W. H.
Deformation Moduli of Water-Bearing Formations at Elevated Temperatures,
W74-07726 4B

SOPPER, W. E.
Using Sewage Effluent and Liquid Digested Sludge to Establish Grasses and Legumes on Bituminous Strip-Mine Spoils,
W74-07612 5D

STALL, J. B.
The 7-Day 10-Year Low Flows of Illinois Streams,
W74-07677 2E

STAMER, J. K.
Hydrobiochemical Effects of Spraying Waste-Treatment Effluent in St. Petersburg, Florida,
W74-07978 5C

STANLEY, H. I.
Inorganic Nitrogen Removal in a Combined Tertiary Treatment-Marine Aquaculture System - II. Algal Bioassays,
W74-07777 5C

STANLEY, L. E.
Application of Electrical Energy to Culvert Icing Problems--A Laboratory Study,
W74-07909 8C

STARR, J. L.
Nitrogen Transformations During Continuous Leaching,
W74-07623 5B

STEINDLER, M. J.
Chemical Engineering Division, Waste Management Programs, Quarterly Report, July-September 1973,
W74-07788 5D

STEKETEE, F. B.
Zinc/Phosphate Combinations Control Corrosion in Potable Water Distribution Systems,
W74-07894 8G

STEPHENS, J. C.
Hydrologic Reconnaissance of the Northern Great Salt Lake Desert and Summary Hydrologic Reconnaissance of Northwestern Utah,
W74-07665 2F

STEWART, J. K.
Oil Recovery Apparatus,
W74-08033 5G

STEWART, R. J.
Tricladium varium, An Aquatic Hyphomycete on Wood in Water-Cooling Towers,
W74-08011 2I

STINDT, W. H.
Pump Selection,
W74-07872 8C

STORY, A. H.
Use of Fluorescent Dye Tracers in Mobile Bay,
W74-07642 5B

STREBEL, O.
Calculation of Capillary Rise from Groundwater Table into the Root Zone Under Steady-State Conditions, (In German),
W74-08139 2G

STREETER, R. L.
The Potential of Desalting for Industrial Water Supplies in Northeastern Wyoming,
W74-08062 3A

STRIDE, A. H.
Influence of Older Relief on the Location of Sand Waves in a Part of the Southern North Sea,
W74-07676 2J

SUBRAHMANYAM, D. V.
Influence of Water Quality on the Corrosion and Electrochemical Behavior of Mild Steel in Synthetic Acid Mine Waters,
W74-07876 8G

SULLIVAN, G. L.
Foam Fractionation of Mercury(II) Nitro Complexes,
W74-07945 5A

SUMMERS, D. A.
Water Jet Cutting of Sedimentary Rock,
W74-07883 8I

SUN, P.
Effects of Colorado River Water Quality and Supply on Irrigated Agriculture,
W74-08014 3C

SUNDE, M. L.
Antagonistic Effect of Arginine on Zinc Metabolism in Chicks,
W74-07955 5C

SURATT, W. B.
Commercial Desalting Plant Data and Analysis, Volumes I-VI,
W74-08061 3A

SURIYADASA, R.
Redevelopment of Haven Sewage-Treatment Works, Colchester,
W74-07759 5D

SUSSMAN, S.
Domestic Water Systems, Nonchemical Factors in Corrosion Control,
W74-07849 8G

SWANSON, E. R.
Economic Evaluation of the Effect of Selected Crop Practices on Nonagricultural Uses of Water,
W74-07828 5B

SZABOLCS, I.
Effect of Dilute Salt Solutions on Chernozem Soil Estimated Through the Hydration Properties of the Colloids,
W74-08135 2G

SZEKIELDA, K-H.
Heterogeneities in Salinity in a River Plume,
W74-07672 2L

SZIDAROVSZKY, F.
Induced Safety Algorithm for Hydrologic Design under Uncertainty,
W74-08017 6A

TACHII, M.
Floating Breakwater for Attenuating Seas,
W74-08043 8B

TAKAYAMA, T.
Economic Evaluation of the Effect of Selected Crop Practices on Nonagricultural Uses of Water,
W74-07828 5B

TAKENAKA, H.
The Relationships Between Soil Water and Engineering Properties of the Clayey Soils, (In Japanese),
W74-07679 2G

TANJI, K. K.
Flood and Seepage Water Sampling Techniques in Rice Fields Under Different Water Management Practices,
W74-08090 5B

TANNER, S. J.
A Preliminary Check-List of the Marine Algae of the Moss Landing Jetty: An Annotated Floristic Compilation,
W74-07981 5C

TATE, T. K.
Variations in the Design of Depth Samplers for use in Groundwater Studies,
W74-07865 8G

TATSUMOTO, M.
Uranium, Thorium, and Lead Concentrations in Three Silicate Standards and a Method of Lead Isotopic Analysis,
W74-07947 2K

TAYLOR, P. A.
A Simple, Segmented Prism Model of Tidal Mixing in Well-Mixed Estuaries,
W74-07673 2L

TEBBS, R. R.
Axisymmetric Infiltrations,
W74-07839 2G

TEIPEL, H.
Investigations on the Problem of Solubility and Stability of Steroid Ovulation Inhibitors in Water, Waste Water and Activated Sludge, (In German),
W74-08133 5A

TELFORD, A. S.
Gypsum-Cement Blend Works Well in Permafrost Areas,
W74-07884 8F

TELITCHENKO, M. M.
Problems for Hydrobiological Investigation under Conditions of Complex Use of Water Resources (In Russian),
W74-07765 5F

TEMPLETON, H. C.
Valve Installation, Operation and Maintenance,
W74-07867 8C

TEMPLETON, W. L.
Thermoluminescent Dosimetry of AquatiR Organisms,
W74-07819 5C

TENNANT, A. D.
Bacteriological Water Quality Data, Beach Areas, Gatineau Park Lakes, National Capital Commission, 1973,
W74-07932 5B

ENORE, K. R.
Inorganic Nitrogen Removal in a Combined Tertiary TreatmentMarine Aquaculture System - II. Algal Bioassays,
W74-07777 5C

HORARINSSON, F.
Icelandic Geothermal Activity and the Mercury of the Greenland Icecap,
W74-07944 5B

HORN, D.
Improved Dynamic Programing Procedures and Their Practical Application to Water Resource Systems,
W74-08013 6A

HORNTON, R. J.
Leachate Treatment by Coagulation and Precipitation,
W74-08091 5D

IBALDI, ETTORE
Study on the Periphytic Colonizations of a Lateral Environment of the River Po(Italy), (In Italian),
W74-07702 2I

IBBS, J. F.
Testacea (Protozoa: Sarcodina) as Indicators of Water Quality in Western Montana,
W74-07718 5A

ICHY, M.
Polyacrylamide Gel Disc Electrophoresis of Rat Bile after Intravenous Administration of 52 MnC12, 64CuC12, 203HgC12 and 210 Pb(N03)2,
W74-07694 5C

IEDJE, J. M.
Biodegradation of Nitrilotriacetate (NTA) in Soils,
W74-07624 5B

Environmental Control of Nitrogen Fixation in Lakes, I. In situ Nitrogen Fixation by Free Living Blue-Green Algae, and II. Nitrogen Fixation by the Duckweed-Algal Association,
W74-07716 5C

IMKU, D. J.
Solving Drilling Problems Utilizing Well Logs - A Case History,
W74-07898 8G

INDALL, F. M.
Mercury Analysis by Atomic Absorption Spectrophotometry,
W74-07704 5A

ING, R. Y.
Distribution of ZN, FE, MN, and SR in Marine Fishes of Different Feeding Habits,
W74-07801 5C

IPTON, A. R.
Part I - A Conceptual Model for a Terrestrial Ecosystem Perturbed with Sewage Effluent, with Special Reference to the Michigan State University Water Quality Management Project; Part II - A Personalized Bibliographi c Retrieval Package for Resource Scientists,
W74-07606 5D

IWARI, K. N.
Correlations Between P, Fe and Mn Availability in Water-Logged Soil at Different Fertility Levels,
W74-08134 2G

TOJA, J.
Plankton Production and Water Quality in Spanish Reservoirs. First Report on a Research Project,
W74-08005 5C

TOLER, L.
Effect of Deicing Chemicals on Ground and Surface Water--(Modus Operandi),
W74-07617 5B

TOMAN, J.
Project Rio Blanco Spall Measurements Data Report,
W74-07797 4B

TONELLI, F. A. F. M.
Electrolytic Flotation Apparatus,
W74-08030 5D

TORABI, M.
Earthquake Damage Costs in the Design of Water Resource Systems,
W74-08018 4A

TOXOPEUS, R.
Bacteriological Water Quality Data, Beach Areas, Gatineau Park Lakes, National Capital Commission, 1973,
W74-07932 5B

TRAGESSER, A.
Using Improved Technology to Obtain Better Cement Jobs on Deep, Hot Liners,
W74-07878 8F

TREVORROW, L. E.
Chemical Engineering Division, Waste Management Programs, Quarterly Report, July-September 1973,
W74-07788 5D

TRZPUC, D. J.
The Biology and Ecology of River Carpsucker, Carpiodes Carpio (Rafinesque), in the Little Missouri Arm of Lake Sakakawea, North Dakota,
W74-07991 2H

TSUGE, H.
Reverse Osmosis Process and its Application, (In Japanese),
W74-07750 5D

TSUJI, T.
Results of Red Tide Formation in Tokyo Bay,
W74-07770 5C

TUNCAY, O. C.
The Distribution of Lead in Human Deciduous Teeth,
W74-07691 5C

TZOU, K. T. S.
Meteorological and Hydrological Investigations,
W74-07658 5B

ULRIKSON, G. U.
Radiation Effects on Serum Proteins, Hematocrits, Electrophoretic Patterns and Protein Components in the Bluegill (Lepomis macrochirus),
W74-07816 5C

USINOWICS, P. J.
Adsorption from Aqueous Solution,
W74-07739 5D

VAN BLADEL, R.
Adsorption of Fenuron and Monuron (Substituted Ureas) by Two Montmorillonite Clays,
W74-07627 5B

VAN DER LEEDEN, F.
Groundwater Pollution Features of Federal and State Satutes and Regulations,
W74-07614 5G

VAN LOON, J. C.
The Determination of Heavy Metals in Domestic Sewage Treatment Plant Wastes,
W74-07763 5A

VAN ZON, C.
System for Reversed Osmosis,
W74-08037 5D

VANDEGRIFT, A. E.
Oxygenation of Aqueous Bodies Using Liquid Oxygen-Loxination,
W74-07741 5D

VARDUMYAN, G. G.
Present and Future of Lake Sevan (Sovremennoye sostoyaniye i budushcheye ozera Sevan),
W74-08048 2H

VARGA, L. P.
Theory and Application of Continuous Monitoring for Chemical Research in Natural Water Systems,
W74-07985 5A

VARRIN, R. D.
Regional Energy-Water Problems Northeast,
W74-07971 6D

VAUGHN, W. W.
An Instrumental Technique for the Determination of Sub-Microgram Concentrations of Mercury in Soils, Rocks, and Gas,
W74-07948 2K

VEGA, J.
Drought Hardening in Onions: I. Influence of Presowing Treatments on Vegetative Behavior and Yield, (In Spanish),
W74-08148 3F

Drought Hardening in Onions: II. Analysis of Growth, (In Spanish),
W74-08149 3F

VEKHOV, N. V.
Zooplankton of Fresh and Brackish Waters of the Bering Island (Commander Islands). (in Russian),
W74-08114 2I

VELYCHKOVS'KYI, P. O.
Use of Morshin Mineral Water in Disease of the Liver and Biliary Tracts in Children, (in Ukrainian),
W74-08101 2I

VIKLUND, H. I.
High Temperature Electrodialysis, Phase II,
W74-08068 3A

High Temperature Electrodialysis, Phase III,
W74-08069 3A

High Temperature Electrodialysis, Phase IV,
W74-08070 3A

VINCENT, J-P.
Destruction Trials of the Muskrat, Ondatra Zibethica L., in Ponds Using Poisoning Rafts, (In French),
W74-08128 5G

VINGOE, R. L.
Causes and Prevention of Drill Pipe Troubles,
W74-07889 8G

VLASOV, V. A.
Effect of Organic and Inorganic Fertilizers on the Growth and Development of Juvenile Carp in Spawning Ponds, (In Russian),
W74-08124 5C

VOITENKO, A. M.
Quality of Drinking Water on Ships in Relation to Sailing Conditions, (In Russian),
W74-08082 5B

VONDRACEK, M.
Zonation of Mosses on the Banks of the Novy Cepsky Pond. (in Czech.),
W74-08119 2H

VOSTAL, J.
General Discussion and Conclusions-Need for Further Research,
W74-07689 5C

Symptoms and Signs of Intoxication,
W74-07684 5C

Transport and Transformation of Mercury in Nature and Possible Routes of Exposure,
W74-07682 5B

VUTUKURI, V. S.
Improved Drilling Rates at Lower Costs,
W74-07901 8C

WAIT, R. L.
Hydrology and Chloride Contamination of the Principal Artesian Aquifer in Glynn County, Georgia,
W74-07919 2F

WALDRON, A. C.
Quality of Drainage Water From a Heavy-Textured Soil,
W74-08088 5B

WALLACE, J. B.
Studies on Southeastern Aquatic Insects,
W74-07740 5C

WALLACE, R. M.
Solid Forms for Savannah River Plant High-Level Waste,
W74-07787 5D

WALLER, R. M.
World's Greatest Source of Fresh Water,
W74-07643 2H

WALLIHAN, E. F.
Effects of Drainage and Organic Amendments on the Reclamation of a Sodic Soil Cropped With Rice,
W74-08087 3C

WALTERS, K. L.
Water in the Okanogan River Basin, Washington,
W74-07907 3B

WARD, F. N.
Determination of Mercury in Vegetation with Dithizone - A Single Extraction Procedure,
W74-07949 5A

WARD, F. P.
Progress in Ecological Research at Edgewood Arsenal, Maryland: Fiscal Years 1971 and 1972,
W74-07986 5C

WARNICK, C. C.
Regional Energy-Water Problems, Pacific Northwest,
W74-07975 6D

WARREN, A. W.
A Simple Method for Retention Basin Design,
W74-07753 5D

WARREN, M. R.
Capacity of Water-Based Recreation Systems Part I: The State of the Art - A Literature Review,
W74-07719 6B

WATSON, D. G.
Thermoluminescent Dosimetry of AquatiR Organisms,
W74-07819 5C

WATTS, D. G.
Agricultural Water Supply,
W74-07969 6D

WAUTIER, J.
Toxicity of an Algal Complex on Freshwater Fauna: I. Action on Some Benthic Animals and Fishes. (in French),
W74-08108 5C

WAYBRANT, R. C.
Factors Controlling the Dynamics of Non-Ionic Synthetic Organic Chemicals in Aquatic Environments,
W74-07831 5B

WEBER, W. J. JR.
Activated Silica in Wastewater Coagulation,
W74-07738 5D

Adsorption from Aqueous Solution,
W74-07739 5D

WEEKS, C. E.
Effect of Ascorbic Acid on Cadmium Toxicity in the Young Coturnix,
W74-07707 5C

WEHE, A. H.
The Dispersion of Continuously Injected Effluents in Open Channels,
W74-07833 5B

WELCH, J. T.
Gradient Analysis of Carbon Monoxide and Methane in Polluted and Other Nearshore Habitats,
W74-07984 5A

WELLS, E. S.
Endogenous Zinc Excretion and 65Zinc Metabolism in Holstein Calves Fed Intermediate to High But Nontoxic Zinc Levels in Practical Diets,
W74-07954 5C

WESTERMAN, A.
Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality-Phase I,
W74-07715 5C

WESWIG, P. H.
Tissue Sulfhydryl Groups in Selenium-Deficient Rats and Lambs,
W74-07952 5B

WHANGER, P. D.
Tissue Sulfhydryl Groups in Selenium-Deficient Rats and Lambs,
W74-07952 5B

WHIPPLE, W. JR.
Process and Apparatus for the Purification of a Natural Body of Water,
W74-08019 5D

WHITE, R. K.
Quality of Drainage Water From a Heavy-Textured Soil,
W74-08088 5B

WHITEHEAD, R. L.
A Ground-Water Monitoring Network for Kootenai Flats, Northern Idaho,
W74-07662 7A

WHITEMAN, C. D.
Some Climatological Characteristics of Seedable Upslope Cloud Systems in the High Plains,
W74-07929 3B

WICHARD, W.
Trichoptera in the Reservation Area Heiliges Meer in Westphalia,
W74-07997 2I

WIERSMA, J. L.
South Dakota Standards for Construction of Irrigation Wells in Shallow Unconsolidated Glacial Sediments,
W74-07896 8A

WILKENS, H.
Studies on the Occurrence of Planktonic Rotatoria in Urban Waters and Their Relationship to Saprobism. (in German),
W74-08111 2I

WILKINS, J. R.
The Chemical/Physical and Microbiological Characteristics of Typical Bath and Laundry Waste Waters,
W74-07663 5B

WILLIAMS, E. R.
The State of the System (SOS) Model: Measuring Growth Limitations Using Geological Concepts,
W74-07958 6G

WILLIAMS, P.
Survival of Enteric Pathogens and Indicator Organisms in Natural Waters,
W74-07840 5A

WILLIS, W. O.
Effect of Temperature and Plant Water Stress on Photosynthesis Diffusion Resistance, and Leaf Water Potential in Spring Wheat,
W74-08075 3F

WILMOTH, R. C.
Mine Drainage Pollution Control Via Reverse Osmosis,
W74-07881 5D

Reverse Osmosis-Neutralization Process for Treating Mineral Contaminated Waters,
W74-08041 5D

WINTER, D. F.
A Similarity Solution for Steady-State Gravitational Circulation in Fjords,
W74-07675 2L

WISEMAN, J. R.
Environmental Stress in the Pasture Scarab Sericesthis nigrolineata Boisd.: II. Effects of Soil

Moisture and Temperature on Survival of Firstinstar Larvae,
W74-08147 5C

Environmental Stress in the Pasture Scarab Sericesthis nigrolineata Boisd.: Mortality in Larvae Caused by High Temperature,
W74-08146 5C

WITHERSPOON, J. P.
Effects of Ionizing Radiation on Processes Influencing Tolerance of Tree Seedlings,
W74-07815 5C

WOLFE, D. A.
Iron-55 and Ruthenium-103 and -106 in the Brackish-Water Clam Rangia cuneata,
W74-07804 5A

Trace-Element Interactions Between River Water and Seawater,
W74-07805 5B

WOLFE, V. J.
Environmental Stress in the Pasture Scarab Sericesthis nigrolineata Boisd.: II. Effects of Soil Moisture and Temperature on Survival of Firstinstar Larvae,
W74-08147 5C

Environmental Stress in the Pasture Scarab Sericesthis nigrolineata Boisd.: Mortality in Larvae Caused by High Temperature,
W74-08146 5C

WOLLENBERG, H. A.
Radioactivity of Nevada Hot-Spring Systems,
W74-07786 5A

WOMACK, J. D.
Survival of Enteric Pathogens and Indicator Organisms in Natural Waters,
W74-07840 5A

WONG, K. M.
Plutonium in North Atlantic Ocean Organisms; Ecological Relationships,
W74-07800 5C

WOOD, C. R.
Water Resources of Lehigh County, Pennsylvania,
W74-07649 4A

WOOD, E. F.
The Methodology of Bayesian Inference and Decision Making Applied to Extreme Hydrologic Events,
W74-07601 2A

WOOD, N. E.
Industrial Waste Processing Apparatus,
W74-08035 5D

WOODDELL, J. H.
Pivotable Fluid Diverter for Recirulation System,
W74-08021 5D

WOODHEAD, D. S.
Radioecology of the Plaice (Pleuronectes platessa L) in the Northeast Irish Sea,
W74-07802 5C

WRIGHT, E. B.
Liver Zinc in Carcinoma,
W74-07690 5C

WU, L.
Aerial Pollution and the Rapid Evolution of Copper Tolerance,
W74-07713 5B

YAO, K. M.
Head Drop Across Bar Screens,
W74-08092 5D

YARON, B.
The Surface Catalyzed Hydrolysis of Parathion on Kaolinite,
W74-07628 5B

YRJANAINEN, G.
A Simple Method for Retention Basin Design,
W74-07753 5D

ZANIER, A. M.
Solving Drilling Problems Utilizing Well Logs - A Case History,
W74-07898 8G

ZANKER, A.
Ionic Activity Coefficients in Water Solutions Calculated by Means of Nomographs,
W74-08093 2K

ZIMENKO, T. G.
Effect of Humidity and Temperature on Microbial Activity in Moor Peat Soils, (In Russian),
W74-08089 2G

ZIMMERMAN, C. W.
Compensated Gamma Ray Densimeter Measures Slurry Densities in Flow,
W74-07877 8G

ZOVNE, J. J.
The Numerical Solution of Transient Supercritical Flow by the Method of Characteristics with a Technique for Simulating Bore Propagation,
W74-07732 8B

ZUCKERMAN, M. M.
Wastewater Treatment,
W74-08034 5D

ORGANIZATIONAL INDEX

GRICULTURAL RESEARCH RGANIZATION, BET-DAGAN (ISRAEL). EPT. OF SOIL PHYSICS.
Anion Exclusion and Coupling Effects in Non-steady Transport Through Unsaturated Soils: II. Laboratory and Numerical Experiments,
W74-07631 2G

GRICULTURAL RESEARCH RGANIZATION, BET-DAGAN(ISRAEL). INST. F SOILS AND WATER.
The Surface Catalyzed Hydrolysis of Parathion on Kaolinite,
W74-07628 5B

GRICULTURAL RESEARCH SERVICE, AWLEY, CALIF. IMPERIAL VALLEY ONSERVATION RESEARCH CENTER.
Tolerance of Rice (Oryza Sativa L.) to Salt During Boot, Flowering, and Grain-Filling Stages,
W74-08080 3C

GRICULTURAL RESEARCH SERVICE, ANDAN, N.DAK. NORTHERN GREAT AINS RESEARCH CENTER.
Effect of Temperature and Plant Water Stress on Photosynthesis Diffusion Resistance, and Leaf Water Potential in Spring Wheat,
W74-08075 3F

Recovery, Residual Effects, and Fate of Nitrogen Fertilizer Sources in a Semiarid Region,
W74-08086 5B

GRICULTURAL RESEARCH SERVICE, HOENIX, ARIZ. WATER CONSERVATION AB.
Nitrogen Removal by Soil Mechanisms,
W74-08081 5D

GRICULTURAL RESEARCH SERVICE, VERSIDE, CALIF. SALINITY LAB.
An Oscillator Circuit for Automated Salinity Sensor Measurements,
W74-08074 2G

GRICULTURAL RESEARCH SERVICE, VERSIDE. SALINITY LAB.
Leaching Requirement Studies: Sensitivity of Alfalfa to Salinity of Irrigation and Drainage Waters,
W74-07774 3C

GRICULTURAL RESEARCH SERVICE, ESLACO, TEX. SOIL AND WATER ONSERVATION RESEARCH DIV.
Effect of Narrow Trenching in Harlingen Clay Soil on Plant Growth, Rooting Depth, and Salinity,
W74-08078 3F

R FORCE INST. OF TECH., WRIGHT-TTERSON AFB, OHIO.
Performance and Selection of Materials for Potable Hot Water Service,
W74-07855 8G

KADEMIYA NAUK LITOVSKOI SSR, LNIUS. INSTITUT ZOOLOGII I RAZITOLOGII.
Study of Mesh Fish Barriers in the Polder Systems of the Nemunas River Delta, (In Russian),
W74-08125 8I

AKADEMIYA NAUK SSSR, MOSCOW. INSTITUT VODNYKH PROBLEM.
Trends and Problems in Investigation of Long-Term Fluctuations of River Runoff (Napravleniya i zadachi issledovaniya mnogoletnikh kolebaniy rechnogo stoka),
W74-08051 2E

AKADEMIYA NAUK SSSR, MOSCOW. LABORATORIYA LESOVEDENIYA.
Hydrological Investigations in Forest.
W74-08140 4C

AKADEMIYA NAUK SSSR, SVERDLOVSK. INST. OF PLANT AND ANIMAL ECOLOGY.
Effect of Water-Soluble Decomposition Products of Herbaceous Plants on Uptake of Radioisotopes in Soil. (in Russian),
W74-08117 2G

AKADEMIYA NAUK URSR, KIEV. INSTYTUT HIDROBIOLOGII.
Species Composition of Epiphytic Bacteria of Green Filamentous Algae in the Northern Donets-Donbas Canal, (in Russian),
W74-08112 5C

AKADEMIYA NAUK URSR, KIEV. INSTYTUT ZOOLOGII.
Ground Beetles (Coleoptera, Carabidae) from the Boggy Areas of the Crimea, (in Russian),
W74-08103 2I

ALASKA UNIV., COLLEGE. DEPT. OF BIOLOGICAL SCIENCES.
Effects of Crude Oil and Some of its Components on Young Coho and Sockeye Salmon,
W74-07613 5C

ALASKA UNIV., COLLEGE. DEPT. OF BIOLOGY.
Laboratory Rearing Experiments on Artifically Propagated Inconnu (Stenodus Leucichthys),
W74-07725 8I

ALLIED CHEMICAL CORP., IDAHO FALLS, IDAHO. IDAHO CHEMICAL PROGRAMS OPERATIONS OFFICE.
Tritium Distribution in the Nuclear Industry - The Requirements for Control Strategies,
W74-07784 5B

AMERICAN SOCIETY OF CIVIL ENGINEERS, NEW YORK.
Innovation: A Case Study,
W74-07720 6B

AMERICAN UNIV., BEIRUT (LEBANON). FACULTY OF ENGINEERING AND ARCHITECTURE.
Test Results on Buoyant Jets Injected Horizontally in a Cross Flowing Stream,
W74-07766 8B

AMF TUBOSCOPE, INC., GRAND RAPIDS, MICH.
Casing Potential Logging Related to Vertilog Corrosion Logging,
W74-07868 8G

AMOCO RESEARCH CENTER, TULSA, OKLA.
Microporosity in Carbonate Rocks,
W74-07861 4B

APPLIED TECHNOLOGY CORP., PITTSBURGH, PA.
Carbonate Bonding of Taconite Tailings,
W74-07959 5G

ARBETSMEDICINSKA INSTITUTET, STOCKHOLM (SWEDEN). DEPT. OF CHEMISTRY.
Methods of Analysis,
W74-07681 5A

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W74-07788 5D

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Improving Municipal Water Supplies in Arizona by Desalting,
W74-08063 3A

ARMCO STEEL CORP., HOUSTON, TEX.
Causes and Prevention of Drill Pipe Troubles,
W74-07889 8G

ARMY COASTAL ENGINEERING RESEARCH CENTER, FORT BELVOIR, VA.
Pleistocene-Holocene Sediments Interpreted by Seismic Refraction and Wash-Bore Sampling, Plum Island-Castle Neck, Mass.,
W74-07875 2L

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS.
Outlet Works, Stilling Basin for Tallahala Dam, Tallahala Creek, Mississippi,
W74-07925 8B

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS. HYDRAULICS LAB.
Spillway Water-Surface Profiles,
W74-07913 8B

Selective Withdrawal From Beech Fork Lake, Beech Fork River, West Virginia,
W74-07914 8B

Outlet Works Stilling Basins, Clinton and Fort Scott Dams, Wakarusa and Marmaton Rivers, Kansas,
W74-07930 8A

ARMY ENGINEERS, WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS.
Subsurface Exploration and Sampling of Soils for Civil Engineering Purposes,
W74-07905 8D

ARMY MEDICAL RESEARCH AND NUTRITION LAB., DENVER, COLO.
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W74-07708 5C

ASIAN INST. OF TECH., BANGKOK (THAILAND). DEPT. OF ENVIRONMENTAL ENGINEERING.
A Systems Approach to Assessment of Rural Water Supply Program Effectiveness,
W74-08012 6B

ATLANTIC RICHFIELD HANFORD CO., RICHLAND, WASH.
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W74-07780 2G

ATOMIC ENERGY OF CANADA LTD., PINAWA (MANITOBA). WHITESHELL NUCLEAR RESEARCH ESTABLISHMENT.
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W74-07821 5C

ATOMIZDAT, MOSCOW (USSR).
Uranium-234,
W74-07790 5B

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The Photosensitizing Action of Carcinogens. I. The Action of 2-Naphthylamine on Escherichia Coli K-12 and Paramecium Caudatum,
W74-08095 5C

AUCKLAND UNIV., (NEW ZEALAND). DEPT. OF CIVIL ENGINEERING.
Hydraulics of Culvert Outlets,
W74-07749 8B

BANNER (J.T.) AND ASSOCIATES, INC., BROOKINGS, S. DAK.
Potential Contribution of Desalting Systefs to Municipal Water Quality and Supply in South Dakota.
W74-08064 3A

BATTELLE-PACIFIC NORTHWEST LAB., RICHLAND, WASH., ECOSYSTEMS DEPT.
Thermoluminescent Dosimetry of AquatiR Organisms,
W74-07819 5C

BATTELLE-PACIFIC NORTHWEST LABS., RICHLAND, WASH.
The Technology of Tritium Fixation and Storage,
W74-07789 5D

BATTELLE-PACIFIC NORTHWEST LABS., RICHLAND, WASH. ECOSYSTEMS DEPT.
Modeling Radionuclides and Pesticides in Food Chains,
W74-07810 5B

BELOTSERKOVSKII SELSKOKHOZYAISTVENNYI INSTITUT, BELYA TSERKOV (USSR).
Sowing of Ponds and Carp with Clostridium perfringens, (In Ukrainian),
W74-08076 5B

BIOCHEMISCHES INSTITUT UMWELTCARCIOGENE, AHRENSBURG (WEST GERMANY).
Investigations on the Occurrence and Decomposition of Fats and Fatty Acids in Lakes, (In German),
W74-08141 5C

BIRMINGHAM UNIV. (ENGLAND). DEPT. OF GEOLOGY.
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W74-07936 4A

BLACK SEA-AZOV WATERSHED BASIN SANITARY EPIDEMIOLOGY STATION, ODESSA (USSR).
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W74-08082 5B

BRITISH PETROLEUM CO. LTD., SUNBURY-ON-THAMES (ENGLAND). RESEARCH CENTRE.
Influence of Older Relief on the Location of Sand Waves in a Part of the Southern North Sea,
W74-07676 2J

BROOM'S BARN EXPERIMENTAL STATION, BURY ST. EDMUNDS (ENGLAND).
Organo-Mercury Fungicide Treatment of Sugar-Beet Seed,
W74-07951 5B

BROWN AND ROOT, INC., HOUSTON, TEX.
Pump Selection,
W74-07872 8C

BUREAU OF RECLAMATION, DENVER, COLO.
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W74-07922 4A

BUREAU OF RECLAMATION, DENVER, COLO. OFFICE OF ATMOSPHERIC WATER RESOURCES.
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W74-07928 3B

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W74-07726 4B

CALIFORNIA UNIV., BERKELEY. DEPT. OF CIVIL AND ENVIRONMENTAL ENGINEERING.
Oxygen Depletion Model for Cayuga Lake,
W74-08007 5C

CALIFORNIA UNIV., BERKELEY. DEPT. OF SOILS AND PLANT NUTRITION.
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W74-07625 5B

CALIFORNIA UNIV., BERKELEY. LAWRENCE BERKELEY LAB.
Radioactivity of Nevada Hot-Spring Systems,
W74-07786 5A

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W74-07623 5B

CALIFORNIA UNIV., DAVIS. DEPT. OF WATER SCIENCE AND ENGINEERING.
Nitrogen Transformations in Soil During Leaching: I. Theoretical Considerations,
W74-07619 5B

Nitrogen Transformation in Soil During Leaching: II. Steady State Nitrification and Nitrate Reduction,
W74-07620 5B

Nitrogen Transformations in Soil During Leaching: III. Nitrate Reduction in Soil Columns,
W74-07621 5B

Flood and Seepage Water Sampling Techniques in Rice Fields Under Different Water Management Practices,
W74-08090 5B

CALIFORNIA UNIV., LIVERMORE. LAWRENCE LIVERMORE LAB.
Project Rio Blanco Spall Measurements Data Report,
W74-07797 4B

CALIFORNIA UNIV., LOS ANGELES. DEPT. OF ENGINEERING SYSTEMS.
Earthquake Damage Costs in the Design of Water Resource Systems,
W74-08018 4A

CALIFORNIA UNIV., LOS ANGELES. PUBLIC ADMINISTRATION PROGRAM.
The Political-Social Aspects of Energy-Water Relationships,
W74-07963 6D

CALIFORNIA UNIV., LOS ANGELES. SCHOOL OF ENGINEERING AND APPLIED SCIENCE.
Lead Detection in Living Plant Tissue Using a New Histochemical Method,
W74-07711 5A

CALIFORNIA UNIV., RIVERSIDE. DEPT. OF SOIL SCIENCE AND AGRICULTURAL ENGINEERING.
Anion Adsorption by Allophanic Tropical Soils: I. Chloride Adsorption,
W74-07634 2G

Anion Adsorption by Allophanic Tropical Soils: II. Sulfate Adsorption,
W74-07635 2G

Anion Adsorption by Allophanic Tropical Soils: III. Phosphate Adsorption,
W74-07636 2G

Contribution to Water Pollution from Agricultural and Urban Sources in the Coachella Valley,
W74-07757 5B

Effects of Drainage and Organic Amendments on the Reclamation of a Sodic Soil Cropped With Rice,
W74-08087 3C

CAMP, DRESSER, AND MCKEE, BOSTON, MASS.
Leachate Treatment by Coagulation and Precipitation,
W74-08091 5D

CANADA CENTRE FOR INLAND WATERS, BURLINGTON (ONTARIO).
Coliforms are an Inadequate Index of Water Quality,
W74-07885 5A

CARNEGIE-MELLON UNIV., PITTSBURGH, PA. DEPT. OF MECHANICAL ENGINEERING.
Water Treatment System,
W74-07979 5F

CARPENTER TECHNOLOGY CORP., SAN DIEGO, CALIF.
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W74-07863 8G

CENTRO DE ESTUDIOS HIDROGRAFICOS, MADRID (SPAIN).
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W74-08005 5C

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On Some Aspects of the Parasites of Ceylonese Fresh Water Crabs,
W74-08002 2I

CHASE, ROSEN AND WALLACE, INC. ALEXANDRIA, VIRGINIA
The State of the System (SOS) Model: Measuring Growth Limitations Using Geological Concepts,
W74-07958 6G

CHEVRON OIL CO., DENVER, COLO.
Tracers in Mud Improve DST, Wireline Test Accuracy,
W74-07856 8G

CHEVRON RESEARCH CO., SAN FRANCISCO, CALIF. (ASSIGNEE).
Floating Barrier,
W74-08025 5G

CINCINNATI UNIV., OHIO. COLL. OF MEDICINE.
Effluent Standards Strategy: Rejuvenation of an Old Game Plan,
W74-07769 5G

CITY OF HOPE NATIONAL MEDICAL CENTER, DUARTE, CALIF.
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W74-07987 5C

COLD REGIONS RESEARCH AND ENGINEERING LAB., HANOVER, N.H.
Adhesion of Ice Frozen from Dilute Electrolyte Solutions,
W74-07618 2C

Application of Electrical Energy to Culvert Icing Problems--A Laboratory Study,
W74-07909 8C

Isua, Greenland: Glaciological Investigations During 1973,
W74-07910 2C

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF CIVIL ENGINEERING.
Optimal Conjunctive Use Model for Indus Basin,
W74-08059 4B

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF ZOOLOGY.
The LD(50) Value of Tetraethyl Lead,
W74-07700 5C

Tetraethyl Lead Dose Response Curve for Mortality in Laboratory Rats,
W74-07701 5C

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Regional Energy-Water Problems--Colorado River-Great Basin,
W74-07977 6D

COLORADO UNIVERSITY, BOULDER. INST. OF ARCTIC AND ALPINE RESEARCH.
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W74-07937 2J

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, ARMIDALE (AUSTRALIA). PASTORAL RESEARCH LAB.
Environmental Stress in the Pasture Scarab Sericesthis nigrolineata Boisd.: Mortality in Larvae Caused by High Temperature,
W74-08146 5C

Environmental Stress in the Pasture Scarab Sericesthis nigrolineata Boisd.: II. Effects of Soil Moisture and Temperature on Survival of Firstinstar Larvae,
W74-08147 5C

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W74-07871 8D

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The Significance of Moisture Flow and Equilibria in Unsaturated Soils in Relation to the Design of Engineering Structures Built on Shallow Foundations in Australia,
W74-07899 8D

CONNECTICUT UNIV., STORRS.
The Environmental Context,
W74-07696 5C

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Pricing of Industrial Wastewater Treatment Service,
W74-07727 5D

CONNECTICUT UNIV., STORRS. INST. OF WATER RESOURCES.
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W74-07728 5B

CONTINENTAL OIL CO., HOUSTON, TEX.
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W74-07898 8G

CONTINENTAL OIL CO., PONCA CITY, OKLA.
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W74-07869 8G

CORNELL UNIV., ITHACA, N.Y. DEPT. OF THERMAL ENGINEERING.
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W74-07998 5C

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W74-07610 6B

An Evaluation of the Needs in Freshwater Research and Related Public Information Facilities,
W74-07838 6G

DAYTON UNIV., OHIO.
Analysis of Trace Metal Particulates in Atmospheric Samples Using X-Ray Fluorescence,
W74-07709 5A

DEBERO KOGYO CO. LTD., MITO (JAPAN). (ASSIGNEE)
Floating Breakwater for Attenuating Seas,
W74-08043 8B

DELAWARE UNIV., NEWARK.
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W74-07729 4C

DELAWARE UNIV., NEWARK. COLL. OF MARINE STUDIES.
Coastal Vegetation of Delaware,
W74-07616 2L

Heterogeneities in Salinity in a River Plume,
W74-07672 2L

DELAWARE UNIV., NEWARK. WATER RESOURCES CENTER.
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W74-07971 6D

DENVER WATER DEPT., COLO.
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W74-07886 8G

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Relationship Between Soil Oxygen Diffusion Rate and Yield of Oats in a Coastal Alluvial Soil at Critical Salinity Level,
W74-08094 3C

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W74-07814 5B

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Influence of Water Quality on the Corrosion and Electrochemical Behavior of Mild Steel in Synthetic Acid Mine Waters,
W74-07876 8G

DESALINATION SYSTEMS, INC., ESCONDIDO, CALIF. (ASSIGNEE)
Storage and Dispensing Apparatus for a Reverse Osmosis Water Purification System,
W74-08039 5D

Valve for Reverse Osmosis Purification and Storage System,
W74-08040 5D

DIRECTORATE OF LICENSING (AEC), WASHINGTON, D.C.
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W74-07793 5A

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W74-07792 5B

DIVISION OF BIOLOGY AND MEDICINE (AEC), WASHINGTON, D.C.
Effects of Gamma Irradiation on the Reproductive Performance of Artermia as Determined by Individual Pair Matings,
W74-07822 5C

Effects of Gamma Irradiation on the Maintenance of Population Size in the Brine Shrimp, Artemia,
W74-07823 5C

DOW CHEMICAL CO., MIDLAND, MICH. HALOGENS RESEARCH LAB.
New Bromide Packer Fluid Cuts Corrosion Problems,
W74-07858 8G

DSS ENGINEERS, INC., FT. LAUDERDALE, FLA.
Commercial Desalting Plant Data and Analysis, Volumes I-VI,
W74-08061 3A

DU PONT DE NEMOURS (E.I.) AND CO., AIKEN, S.C. SAVANNAH RIVER PLANT.
Solid Forms for Savannah River Plant High-Level Waste,
W74-07787 5D

DUPONT DE NEMOURS(E.I) AND CO., AIKEN, S.C. SAVANNAH RIVER LAB.
Geohydrology of the Buried Triassic Basin at the Savannah River Plant,
W74-07934 5B

DUVAL CORP., TUCSON, ARIZ.
Mercury Analysis by Atomic Absorption Spectrophotometry,
W74-07704 5A

DYNA-DRILL CO., HOUSTON, TEX.
Down-Hole Motors for Improved Drilling,
W74-07880 8C

DYNAMIC TECHNOLOGY, INC.
Positive Displacement Pumps,
W74-07874 8C

EASTMAN KODAK CO., ROCHESTER, N.Y. (ASSIGNEE)
Cellulosic Reverse Osmosis Membranes Having High Flux and High Salt Rejection,
W74-08022 3A

ECOLE NATIONALE VETERINAIRE DE LYON (FRANCE). LABORATOIRE DE RECHERCHES DE LA CHAIRE OF PARASITOLOGIE.
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W74-08014 3C

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W74-07912 5A

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W74-07986 5C

ENGELHARD INDUSTRIES, INC., NEWARK, N.J.
Corrosion Resistance of Piping and Construction Materials,
W74-07888 8G

ENVIRONMENTAL PROTECTION AGENCY, CINCINNATI, OHIO. ADVANCED WASTE TREATMENT RESEARCH LAB.
Mathematical Model for Post Aeration,
W74-08045 5D

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W74-08046 5D

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W74-07857 8G

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W74-07924 2L

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W74-08073 3C

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W74-07813 5B

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W74-07603 5D

FLUOR CORP. LTD., HOUSTON, TEX.
Dissolution of a Porous Matrix by a Slowly Reacting Acid,
W74-07860 8B

FOOD AND DRUG ADMINISTRATION, DAUPHIN ISLAND, ALA. GULF COAST TECHNICAL SERVICES UNIT.
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W74-07642 5B

FOOD AND DRUG ADMINISTRATION, WASHINGTON, D.C. DIV. OF NUTRITION.
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W74-07707 5C

Iron and Associated Trace Mineral Problems in Man and Animals,
W74-07950 2K

GENERAL ELECTRIC CO., SANTA BARBARA, CALIF. CENTER FOR ADVANCED STUDIES.
Polluted Groundwater Some Causes, Effects, Controls, and Monitoring
W74-07615 5B

GEOLOGICAL SURVEY, AIKEN, S.C.
Buried Triassic Basin in the Central Savannah River Area, South Carolina and Georgia,
W74-07916 2F

GEOLOGICAL SURVEY, ALBANY, N.Y. WATER RESOURCES DIV.
World's Greatest Source of Fresh Water,
W74-07643 2H

GEOLOGICAL SURVEY, ATLANTA, GA.
Hydrology and Chloride Contamination of the Principal Artesian Aquifer in Glynn County, Georgia,
W74-07919 2F

GEOLOGICAL SURVEY, AUSTIN, TEX.
Estimating the Magnitude of Peak Discharges for Selected Flood Frequencies on Small Streams in East Texas,
W74-07664 2E

Quality of Surface Waters in the Colorado River Basin, Texas, 1966-72 Water Years,
W74-07670 5B

GEOLOGICAL SURVEY, BOISE, IDAHO.
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W74-07662 7A

GEOLOGICAL SURVEY, BOSTON, MASS.
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W74-07617 5B

GEOLOGICAL SURVEY, DENVER, COLO.
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W74-07859 8B

Transit Losses and Travel Times for Reservoir Releases, Upper Arkansas River Basin, Colorado,
W74-07931 4A

Uranium, Thorium, and Lead Concentrations in Three Silicate Standards and a Method of Lead Isotopic Analysis,
W74-07947 2K

An Instrumental Technique for the Determination of Sub-Microgram Concentrations of Mercury in Soils, Rocks, and Gas,
W74-07948 2K

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W74-07949 5A

GEOLOGICAL SURVEY, HARRISBURG, PA.
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W74-07649 4A

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W74-07667 2E

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W74-07921 7C

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W74-07650 7C

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Drainage Area and River Mileage of Nebraska Streams: Part 1--Salt and Weeping Water Creeks, Big and Little Nemaha Rivers, and Minor Streams in Southeastern Nebraska,
W74-07669 2E

GEOLOGICAL SURVEY, MENLO PARK, CALIF.
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W74-07630 2G

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W74-07908 2F

GEOLOGICAL SURVEY, SALT LAKE CITY, UTAH.
Hydrologic Reconnaissance of the Northern Great Salt Lake Desert and Summary Hydrologic Reconnaissance of Northwestern Utah,
W74-07665 2F

GEOLOGICAL SURVEY, TACOMA, WASH.
Water in the Okanogan River Basin, Washington,
W74-07907 3B

Sediment Transport by Streams in the Upper Columbia River Basin, Washington, May 1969-June 1971,
W74-07911 2J

GEOLOGICAL SURVEY, TALLAHASSEE, FLA.
Reconnaissance of the Water Resources in the Vicinity of Proposed Deep-Well Injection Sites in Southeast Dade County, Florida,
W74-07915 5B

Estimated Use of Water in Florida, 1970,
W74-07917 6D

Hydrologic Data for 1972, Broward County, Florida,
W74-07918 7C

Hydrobiochemical Effects of Spraying Waste-Treatment Effluent in St. Petersburg, Florida,
W74-07978 5C

Quantity and Quality of Surface Water in Marion County, Florida,
W74-08044 7C

GEOLOGICAL SURVEY, TRENTON, N. J. WATER RESOURCES DIV.
Geology and Water Resources of the Wharton Tract and the Mullica River Basin in Southern New Jersey,
W74-07668 4B

GEOLOGICAL SURVEY, URBANA, ILL.
Sediment Distribution in a Beach Ridge Complex and its Application to Artificial Beach Replenishment,
W74-07666 2J

GEOLOGICAL SURVEY, WASHINGTON, D.C.
Ground-Water Resources of Montgomery County, Indiana,
W74-07645 2F

Historic Flood Information for Northern California Streams from Geological and Botanical Evidence,
W74-07646 2E

Geohydrology and Water Resources of the Tucson Basin, Arizona,
W74-07648 2F

Water Resources of the Little River Basin, Louisiana,
W74-07671 4A

GEORGIA AGRICULTURAL EXPERIMENT STATION, ATHENS.
Fixation of Zinc by Clay Minerals,
W74-07629 2G

GEORGIA INST. OF TECH., ATLANTA. ENVIRONMENTAL RESOURCES CENTER.
The Transport of Radioisotopes by Fine Particulate Matter in Aquifers,
W74-07730 5B

The Role of Sediment Gradation on Channel Armoring,
W74-07731 2J

The Numerical Solution of Transient Supercritical Flow by the Method of Characteristics with a Technique for Simulating Bore Propagation,
W74-07732 8B

State Organization for Water Resources Management,
W74-07733 6E

Regional Energy-Water Problems South Atlantic Gulf,
W74-07972 6D

GEORGIA UNIV., ATHENS. DEPT. OF DAIRY SCIENCE.
Endogenous Zinc Excretion and 65Zinc Metabolism in Holstein Calves Fed Intermediate to High But Nontoxic Zinc Levels in Practical Diets,
W74-07954 5C

GEORGIA UNIV., ATHENS. DEPT. OF ENTOMOLOGY.
Studies on Southeastern Aquatic Insects,
W74-07740 5C

GEORGIA UNIV., ATHENS. DEPT. OF ZOOLOGY.
Structure and Function of Hardwood Litter and Soil Subsystems After Chronic Gamma Irradiation, I. Mesofauna, Nitrogen, and Total Soil Respiration,
W74-07824 5C

GERAGHTY AND MILLER, PORT WASHINGTON, N.Y.
Groundwater Pollution Features of Federal and State Satutes and Regulations,
W74-07614 5G

GOODYEAR ATOMIC CORP., PORTSMOUTH, OHIO.
Environmental Effects of the Construction and Operation of a Gaseous Diffusion Plant.
W74-07781 5C

GOSUDARSTVENNYI GIDROLOGICHESKI INSTITUT, LENINGRAD (USSR).
International Cooperation of Hydrologists (Mezhdunarodnoye sotrudnichestvo gidrologov),
W74-08047 7A

Application of Satellite Data for Hydrologic Purposes (Ispol'zovaniye sputnikovoy informatsii dlya gidrologicheskikh tseley),
W74-08049 7B

GOSUDARSTVENNYI GIDROLOGICHESKII INSTITUT, LENINGRAD (USSR).
Present Problems in the Study of Surface-Water Quality (Aktual'nyye problemy issledovaniya kachestva poverkhnostnykh vod),
W74-08050 5G

Problem of Assessing Effects of Human Activity on Surface-Water Resources (K probleme otsenki vliyaniya deyatel'nosti cheloveka na resursy poverkhnostnykh vod),
W74-08053 4A

All-Union Hydrologic Congresses (Vsesoyuznyye gidrologicheskiye syezdy),
W74-08056 6E

GRUMMAN AEROSPACE CORP., BETHPAGE, N.Y.
Interdisciplinary Monitoring of the New York Bight,
W74-07764 5A

HALLIBURTON SERVICES, DUNCAN, OKLA.
Compensated Gamma Ray Densimeter Measures Slurry Densities in Flow,
W74-07877 8G

HAMBURG UNIV. (WEST GERMANY). MUSEUM OF ZOOLOGY.
Studies on the Occurrence of Planktonic Rotatoria in Urban Waters and Their Relationship to Saprobism. (in German),
W74-08111 2I

HARSHBARGER AND ASSOCIATES, TUCSON, ARIZ.
Exploration for a Buried Valley by Resistivity and Thermal Probe Surveys,
W74-07935 2F

HARVARD MEDICAL SCHOOL, BOSTON, MASS.
The Distribution of Lead in Human Deciduous Teeth,
W74-07691 5C

HAWAII UNIV., HONOLULU. DEPT. OF MICROBIOLOGY.
Icelandic Geothermal Activity and the Mercury of the Greenland Icecap,
W74-07944 5B

HAWAII UNIV., HONOLULU. WATER RESOURCES RESEARCH CENTER.
Annual Report '72 - '73.
W74-07602 9A

Optimum Drilling Sites for Ground-Water Development on the East Coast of Lanai Island,
W74-07734 4B

Three-Dimensional Zone Model Log Interpretation,
W74-07735 8G

HITTMAN ASSOCIATES, INC., COLUMBIA, MD.
Processes, Procedures, and Methods to Control Pollution Resulting from All Construction Activity.
W74-07942 5B

HYDRO-CLEAR CORP., AVON LAKE, OHIO.
Apparatus and Method for Treating Waste Liquid,
W74-08026 5D

HYDROMETEOROLOGICAL SERVICE OF THE USSR, MOSCOW.
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W74-08054 7A

Problem of Rational Use and Conservation of Water Resources and Goals of Hydrology (Problema ratsional'nogo ispol'zovaniya i okhrany vodnykh resursov i zadachi gidrologii),
W74-08055 6B

HYGIENE-INSTITUT, MUENSTER (WEST GERMANY).
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W74-08138 5G

IBM ELECTRONICS SYSTEMS CENTER, HUNTSVILLE, ALA.
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W74-07940 2A

IDAHO UNIV., MOSCOW. COLL. OF FORESTRY, WILDLIFE AND RANGE SCIENCES.
The Effects of River Fluctuations Resulting from Hydroelectric Peaking on Selected Aquatic Invertebrates,
W74-07830 2I

IDAHO UNIV., MOSCOW. DEPT. OF AGRICULTURAL ECONOMICS.
Summary Report for a Methodology Study to Develop Evaluation Criteria for Wild and Scenic Rivers,
W74-07608 6B

ILLINOIS STATE WATER SURVEY, URBANA.
Water Quality and Treatment of Domestic Groundwater Supplies,
W74-07637 5F

Wells and Pumping Systems for Domestic Water Supplies,
W74-07638 8B

Planning a Domestic Groundwater Supply System,
W74-07639 4B

The 7-Day 10-Year Low Flows of Illinois Streams,
W74-07677 2E

Quality of Surface Water in Illinois, 1966-1971,
W74-07678 5A

Domestic Hot Water Systems, Silicate Treatment Inhibits Corrosion of Galvanized Steel and Copper Alloys,
W74-07850 8G

ILLINOIS UNIV., URBANA. DEPT. OF AGRICULTURAL ECONOMICS.
Economic Evaluation of the Effect of Selected Crop Practices on Nonagricultural Uses of Water,
W74-07828 5B

ILLINOIS UNIV., URBANA. DEPT. OF CIVIL ENGINEERING.
Determination of the Fate of Polynuclear Aromatic Hydrocarbons in Natural Water Systems,
W74-07827 5A

ILLINOIS UNIV., URBANA. WATER RESOURCES CENTER.
Analysis of Liquid-Waste Injection Wells in Illinois by Mathematical Models,
W74-07604 5B

IMPERIAL COLL. OF SCIENCE AND TECHNOLOGY, LONDON (ENGLAND). DEPT. OF CIVIL ENGINEERING.
Flow-Induced Vibration of Vertical-Lift Gate,
W74-08058 8C

IMPERIAL OIL LTD., CALGARY (ALBERTA).
Gypsum-Cement Blend Works Well in Permafrost Areas,
W74-07884 8F

INDIAN INST. OF TECH., BOMBAY. DEPT. OF CHEMISTRY.
Solvent Extraction of Selenium (IV) with 2-Thenoyltri-Fluoroacetone,
W74-07692 5A

INDIAN INST. OF TECH., KHARAGPUR. DEPT. OF AGRICULTURAL ENGINEERING.
Effect of Dilute Salt Solutions on Chernozem Soil Estimated Through the Hydration Properties of the Colloids,
W74-08135 2G

INDUSTRIELE ONDERNEMING WAVIN, N.V., ZWOLLE (NETHERLANDS). (ASSIGNEE)
System for Reversed Osmosis,
W74-08037 5D

INSTITUT FRANCAIS DU PETROLE, RUEIL-MALMAISON (FRANCE).
37 Ways to Improve Your Well Completions,
W74-07870 8G

INSTITUT GIGIENY TRUDA I PROFZABOLEVANII, UFA (USSR).
Experimental Study of the Hazard Due to Chlorinated Quinones and their Safety Levels in Water Bodies (In Russian),
W74-07778 5C

INSTITUTE OF GEOLOGICAL SCIENCES, LONDON (ENGLAND). DEPT. OF HYDROGEOLOGY.
Variations in the Design of Depth Samplers for use in Groundwater Studies,
W74-07865 8G

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Polyacrylamide Gel Disc Electrophoresis of Rat Bile after Intravenous Administration of 52 MnC12, 64CuC12, 203HgC12 and 210 Pb(N03)2,
W74-07694 5C

INSTITUTE OF OCEANOGRAPHIC SCIENCES, TAUNTON (ENGLAND).
A Simple, Segmented Prism Model of Tidal Mixing in Well-Mixed Estuaries,
W74-07673 2L

INSTRUMENTATION LAB., INC., LEXINGTON, MASS.
Trace Metals in Atmospheric Particulates and Atomic Absorption Spectroscopy,
W74-07705 5A

IONICS, INC., WATERTOWN, MASS.
High Temperature Electrodialysis, Phase I,
W74-08067 3A

High Temperature Electrodialysis, Phase II,
W74-08068 3A

High Temperature Electrodialysis, Phase III,
W74-08069 3A

High Temperature Electrodialysis, Phase IV,
W74-08070 3A

IOWA UNIV., IOWA CITY. INST. OF HYDRAULIC RESEARCH.
Hydrologic Response of Ice-Covered Streams,
W74-07832 2E

JADAVPUR UNIV., CALCUTTA (INDIA).
Hydrological Aspect of Surface Run-Off,
W74-07756 2A

JIHOCESKE MUZEUM CESKE BUDEJOVICE (CZECHOSLOVAKIA).
Zonation of Mosses on the Banks of the Novy Cepsky Pond. (in Czech.),
W74-08119 2H

JOHNS HOPKINS UNIV., BALTIMORE, MD. DEPT. OF GEOGRAPHY AND ENVIRONMENTAL ENGINEERING.
Economic Aspects of Resource Use with Special Reference to Energy and Water,
W74-07964 6D

KANSAS UNIV., LAWRENCE. DEPT. OF CIVIL ENGINEERING.
Municipal and Industrial Water Supply,
W74-07968 6D

KANTONALES AMT FUER GEWASSERSCHUTZ, SANKT GALLEN (SWITZERLAND).
The Treatment of Waste Water from Industries and Commerce in Public Purification Plants (in German),
W74-07748 5D

KAROLINSKA INSTITUTE, STOCKHOLM (SWEDEN). DEPT. OF ENVIRONMENTAL HYGIENE.
General Discussion and Conclusions-Need for Further Research,
W74-07689 5C

KAROLINSKA INSTITUTET, STOCKHOLM (SWEDEN). DEPT. OF ENVIRONMENTAL HYGIENE.
Metabolism,
W74-07683 5B

Inorganic Mercury-Relation Between Exposure and Effects,
W74-07686 5C

KECK CONSULTING SERVICES, INC., EAST LANSING, MICH.
The Electrical Resistivity Method (Part I),
W74-07852 7B

KENTUCKY UNIV., LEXINGTON. WATER RESOURCES RESEARCH INST.
Seasonal Changes in Water Quality and Primary Productivity in Doe Valley Lake,
W74-07605 5C

Sensitivity of Vertebrate Embryos to Heavy Metals as a Criterion of Water Quality-Phase I,
W74-07715 5C

IEL UNIV. (WEST GERMANY). INSTITUT JER MEERESKUNDE.
Investigations on the Occurrence of Phenol-Decomposing Microorganisms in Waters and Sediments. (in German),
W74-08115 5C

IEV RESEARCH INST. OF GENERAL OMMUNAL HYGIENE (USSR).
Organic Water Impurities and Evaluation of Methods for their Removal in Water Mains (In Russian),
W74-07862 5D

ABORATOIRE DES PETITS VERTEBRES, OUY-EN-JOSAS (FRANCE).
Destruction Trials of the Muskrat, Ondatra Zibethica L., in Ponds Using Poisoning Rafts, (In French),
W74-08128 5G

AJOS KOSSUTH UNIV., DEBRECEN (UNGARY). DEPT. OF BOTANY.
Relics of the Boggy Vegetation in Sodic Territories, (In Hungarian),
W74-08122 2H

ANDESSAMMLUNGE FUER NATURKUNDE, ARLSRUHE (WEST GERMANY).
The Moss Vegetation of the Forests in the Rhine Lowland Between Basel and Mannheim, (In German),
W74-08131 2I

EEDS, UNIV. (ENGLAND). DEPT. OF ORGANIC AND STRUCTURAL CHEMISTRY.
Some Novel Complexes of Chromium(I),
W74-07946 5A

ENINGRAD STATE UNIV. (USSR).
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W74-08142 5C

VERPOOL UNIV. (ENGLAND). DEPT. OF OTANY.
Aerial Pollution and the Rapid Evolution of Copper Tolerance,
W74-07713 5B

VERPOOL UNIV. (ENGLAND). DEPT. OF CEANOGRAPHY.
Chemical Evidence for the Dispersal of River Mersey Run-off in Liverpool Bay,
W74-07674 5B

OUISIANA STATE UNIV., BATON ROUGE. ATER RESOURCES RESEARCH INST.
The Dispersion of Continuously Injected Effluents in Open Channels,
W74-07833 5B

OUISIANA WILD LIFE AND FISHERIES OMMISSION, NEW ORLEANS.
Ecological Factors Affecting Anadromous Fishes of Lake Ponchartrain and Its Tributaries,
W74-07993 2H

OUISIANA WILD LIFE AND FISHERIES OMMISSION, NEW ORLEANS. DIV. OF YSTERS, WATER BOTTOMS AND EAFOODS.
Experiments to Re-establish Historical Oyster Seed Grounds and to Control the Southern Oyster Drill,
W74-07982 8I

LOUVAIN UNIV. (BELGIUM). DEPT. OF SOIL SCIENCE.
Adsorption of Fenuron and Monuron (Substituted Ureas) by Two Montmorillonite Clays,
W74-07627 5B

LOYOLA UNIV., LOS ANGELES, CALIF.
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W74-08010 5D

LYON-1 UNIV., VILLEURBANNE (FRANCE). LABORATOIRE DE BIOLOGIE ANIMAUX ET D'ECOLOGIE.
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W74-08108 5C

MAINE DEPT. OF SEA SHORE FISHERIES, AUGUSTA.
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W74-08145 2I

MALCOLM PIRNIE, INC., WHITE PLAINS, N.Y.
Major Wastewater Treatment Plant to be Upgraded,
W74-07761 5D

MANNESMANN A.G., DUESSELDORF (WEST GERMANY). (ASSIGNEE)
Method and Equipment for Desalination of Liquids,
W74-08038 3A

MARYLAND DEPT. OF NATURAL RESOURCES, ANNAPOLIS.
Molluscan Mortality Studies,
W74-07995 8I

MARYLAND DEPT. OF RESEARCH AND EDUCATION, SOLOMONS. CHESAPEAKE BIOLOGICAL LAB.
The Effects of the Maryland Hydraulic Clam Dredge on Populations of the Soft-Shell Clam, 'Mya Arenaria,'
W74-07994 8I

MASSACHUSETTS INST. OF TECH., CAMBRIDGE. DEPT. OF CIVIL ENGINEERING.
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W74-07601 2A

MEDITSINSKII INSTITUT, KIEV (USSR).
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W74-08101 2I

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Treatment of Children with Chronic Hepatoangiocholecystitis at the Lake Uchum Health Resort,
W74-08102 2I

MEDITSINSKII INSTITUT, TSELINOGRAD (USSR).
Sanitary-Hygienic Evaluation of the Water Quality of the Nura Water Conduit of the Tselinograd District (In Russian),
W74-08052 5A

METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO, ILL.
A Streamflow Model for Metropolitan Planning and Design,
W74-07721 2A

METROPOLITAN WASHINGTON COUNCIL OF GOVERNMENTS, D.C.
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W74-07723 6B

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W74-07724 6B

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Estimation of Imperviousness and Specific Curb Length for Forecasting Stormwater Quality and Quantity,
W74-07640 5B

MICHIGAN STATE UNIV., EAST LANSING. DEPT. OF CROP AND SOIL SCIENCES.
Biodegradation of Nitrilotriacetate (NTA) in Soils,
W74-07624 5B

Environmental Control of Nitrogen Fixation in Lakes, I. In situ Nitrogen Fixation by Free Living Blue-Green Algae, and II. Nitrogen Fixation by the Duckweed-Algal Association,
W74-07716 5C

MICHIGAN STATE UNIV., EAST LANSING. DEPT. OF FISHERIES AND WILDLIFE.
Part I - A Conceptual Model for a Terrestrial Ecosystem Perturbed with Sewage Effluent, with Special Reference to the Michigan State University Water Quality Management Project; Part II - A Personalized Bibliographi c Retrieval Package for Resource Scientists,
W74-07606 5D

MICHIGAN STATE UNIV., EAST LANSING. DEPT. OF PHYSIOLOGY.
A Scanning Electron Microscopic Study of Secondary Lamellae and Chloride Cells of Rainbow Trout (Salmo gairdneri),
W74-08096 5C

MICHIGAN TECHNOLOGICAL UNIV., L'ANSE. FORD FORESTRY CENTER.
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W74-07622 2G

MICHIGAN UNIV., ANN ARBOR. ENVIRONMENTAL AND WATER RESOURCES ENGINEERING.
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W74-07738 5D

Adsorption from Aqueous Solution,
W74-07739 5D

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W74-07741 5D

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W74-07702 2I

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W74-07641 5A

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Ranger Submarine Slide, Northern Sebastian Vizcaino Bay, Baja California, Mexico,
W74-07938 2J

MINNESOTA UNIV., ST. PAUL. INST. OF AGRICULTURE.
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W74-07834 5G

MISSOURI UNIV., COLUMBIA. DEPT. OF AGRICULTURAL CHEMISTRY.
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W74-07706 5C

MISSOURI UNIV., ROLLA.
Water Jet Cutting of Sedimentary Rock,
W74-07883 8B

MITSUI MINING AND SMELTING CO. LTD., TOKYO (JAPAN). (ASSIGNEE)
Method of Treating Waste Water Containing Ligninsulfonate,
W74-08029 5D

MONTANA UNIV., MISSOULA. DEPT. OF ZOOLOGY.
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W74-07717 5C

Testacea (Protozoa: Sarcodina) as Indicators of Water Quality in Western Montana,
W74-07718 5A

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W74-07835 5C

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W74-07765 5F

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W74-08114 2I

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W74-08016 2I

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W74-08110 2I

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W74-07760 5D

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W74-07881 5D

NATIONAL LEAD CO., HIGHTSTOWN, N.J.
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W74-07945 5A

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W74-07803 5C

Iron-55 and Ruthenium-103 and -106 in the Brackish-Water Clam Rangia cuneata,
W74-07804 5A

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Some Climatological Characteristics of Seedable Upslope Cloud Systems in the High Plains,
W74-07929 3B

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, SILVER SPRING, MD. OFFICE OF HYDROLOGY.
National Weather Service River Forecastin System,
W74-08057 4A

NATIONAL SWEDISH FOOD ADMINISTRATION, STOCKHOLM. DEPT. OF NUTRITION AND FOOD HYGIENE.
Symptoms and Signs of Intoxication,
W74-07684 5C

'Normal' Concentrations of Mercury in Huma Tissue and Urine,
W74-07685 5C

Organic Mercury Compounds-Relatio Between Exposure and Effects,
W74-07687 5C

NATIONAL TRANSPORTATION SAFETY BOARD, WASHINGTON, D.C.
Prevention of Damage to Pipelines.
W74-07923 8A

NAUCHNO-ISSLEDOVATELSKII INSTITUT GIGIENY, MOSCOW (USSR).
Experimental Study of the Protective Ability o Water-Treatment Plants with Respect to som Substances of Caprolactam Production (In Rus sian),
W74-07771 5D

NAVAL POSTGRADUATE SCHOOL, MONTEREY, CALIF.
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W74-07984 5A

NAVAL UNDERSEA CENTER, SAN DIEGO, CALIF. DEPT. OF FLEET ENGINEERING.
Harbor Pollution from Large Ships,
W74-08006 5B

NEBRASKA UNIV., LINCOLN. DEPT. OF AGRICULTURAL ECONOMICS.
Environmental Aspects of Energy-Water Relationships,
W74-07965 6D

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The Role of Water in the Energy Crisis.
W74-07961 6D

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Agricultural Water Supply,
W74-07969 6D

NEW HAMPSHIRE UNIV., DURHAM. WATER RESOURCES RESEARCH CENTER.
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W74-07836 5A

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An Analytical Interdisciplinary Evaluation of the Utilization of the Water Resources of the Rio Grande in New Mexico: Lower Rio Grande Region,
W74-07609 6B

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Pollution Control,
W74-07970 6D

EW SOUTH WALES UNIV., BROKEN HILL (USTRALIA).
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W74-07901 8C

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W74-07798 5B

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Environmental Radioactivity,
W74-07791 5B

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W74-07903 7B

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Calculation of Capillary Rise from Groundwater Table into the Root Zone Under Steady-State Conditions, (In German),
W74-08139 2G

INDUSTRIES, INC., HOUSTON, TEX. ROID DIV.
Prevention of Calcium Carbonate Scale Deposition in Mill Water Systems,
W74-07848 8G

RTH CAROLINA STATE UNIV., RALEIGH. PT. OF RECREATION RESOURCES MINISTRATION.
Capacity of Water-Based Recreation Systems Part I: The State of the Art - A Literature Review,
W74-07719 6B

RTH DAKOTA STATE UNIV., FARGO. ATER RESOURCES RESEARCH INST.
Regional Energy-Water Problems, Missouri River,
W74-07974 6D

Regional Energy-Water Problems, Pacific Northwest,
W74-07975 6D

RTH DAKOTA STATE WATER MMISSION, BISMARCK.
Preliminary Study to Investigate Feasibility of Desalting Ground Water in North Dakota,
W74-08066 3A

RTH DAKOTA UNIV., GRAND FORKS.
The Biology and Ecology of River Carpsucker, Carpiodes Carpio (Rafinesque), in the Little Missouri Arm of Lake Sakakawea, North Dakota,
W74-07991 2H

RWICH SEWAGE TREATMENT WORKS NGLAND).
Automation of the Control and Operation of Water Pollution Control Works,
W74-07758 5D

K RIDGE GASEOUS DIFFUSION PLANT, NN.
A Study of Pollutant Discharges from Reactor Operations Utilizing Ultracentrifugation Techniques,
W74-07782 5A

Fractionation of Suspended and Colloidal Particles in Natural Water,
W74-07783 5A

OAK RIDGE NATIONAL LAB., TENN.
Documentation of Prosper - A Model of Atmosphere-Soil-Plant Water Flow,
W74-07785 2A

A Systems analysis Methodology for Predicting Dose to Man From a Radioactively Contaminated Terrestrial Environment,
W74-07809 5C

Error Analysis of Ecological Models,
W74-07811 5B

Effects of Ionizing Radiation on Processes Influencing Tolerance of Tree Seedlings,
W74-07815 5C

Radiation Effects on Serum Proteins, Hematocrits, Electrophoretic Patterns and Protein Components in the Bluegill (Lepomis macrochirus),
W74-07816 5C

Sensitivity of Carp (Cyprinus carpio) Embryos to Acute Gamma Radiation,
W74-07817 5C

Chromosome Aberrations in Chironomus Riparius developing in Different Concentrations of Tritiated Water,
W74-07820 5C

A Data Acquisition System for Ecological Field Studies,
W74-07989 7B

OAK RIDGE NATIONAL LAB., TENN. NUCLEAR SAFETY INFORMATION CENTER.
Design Data and Safety Features of Commercial Nuclear Power Plants, Vol I,
W74-07794 5G

Design Data and Safety Features of Commercial Nuclear Power Plants, Vol. II.
W74-07795 5G

Design Data and Safety Features of Commercial Nuclear Power Plants, Vol. III,
W74-07796 5G

OAK RIDGE NATIONAL LAB., TENNESSEE.
Radionuclides in Ecosystems, Volume II.
W74-07799 5C

OAKLAND COUNTY DRAIN COMMISSIONER'S OFFICE, PONTIAC, MICH.
A Simple Method for Retention Basin Design,
W74-07753 5D

OEKOLOGISKA STATIONEN, MEASSAURE (SWEDEN).
Experiments on the Movement Behavior of Unicellular Algae in Flowing Water,
W74-08120 2I

OFFICE OF WATER RESOURCES RESEARCH, WASHINGTON, D.C.
Phreatophytes, A Bibliography, Revised.
W74-07829 3B

The Role of Water Resources Research in the Energy Crisis,
W74-07966 6D

OHIO STATE UNIV., COLUMBUS. DEPT. OF AGRICULTURAL ENGINEERING.
Quality of Drainage Water From a Heavy-Textured Soil,
W74-08088 5B

OKLAHOMA STATE UNIV., STILLWATER.
Phytoplankton Community Structure and Nutrient Relationships in Lake Carl Blackwell, Oklahoma,
W74-07992 2H

OLD DOMINION UNIV., NORFOLK VA. INST. OF OCEANOGRAPHY.
Tidal Currents and Zig-Zag Sand Shoals in a Wide Estuary Entrance,
W74-07939 2L

OLDHAM (ROBERT R.), INC., SIDNEY, OHIO. (ASSIGNEE)
Pivotable Fluid Diverter for Recirulation System,
W74-08021 5D

OLIN CORP. STAMFORD, CONN.
Domestic Water Systems, Nonchemical Factors in Corrosion Control,
W74-07849 8G

OMAHA PUBLIC POWER DISTRICT, NEBR.
Energy Production,
W74-07967 6D

OREGON STATE UNIV., CORVALLIS. DEPT. OF AGRICULTURAL CHEMISTRY.
Tissue Sulfhydryl Groups in Selenium-Deficient Rats and Lambs,
W74-07952 5B

OREGON STATE UNIV., CORVALLIS. DEPT. OF AGRICULTURAL ENGINEERING.
Axisymmetric Infiltrations,
W74-07839 2G

OREGON STATE UNIV., CORVALLIS. SCHOOL OF OCEANOGRAPHY.
Observations and Analysis of Bottom Turbid Layers on the Oregon Continental Shelf,
W74-07632 2J

OREGON UNIV., EUGENE. SCHOOL OF LAW.
Survey of Oregon's Water Laws,
W74-07611 6E

ORGANISATION FOR TROPICAL STUDIES, SAN JOSE (COSTA RICA).
Vegetation and Soil Relationships in Southern Beaufort County, North Carolina,
W74-08150 2K

OTTAWA OCCUPATIONAL HEALTH DIV. (ONTARIO).
The Determination of Mercury in Air Samples and Biological Materials,
W74-07710 5A

OUTOKUMPU OY, HELSINKI (FINLAND).
Smelter Gases Yield Mercury,
W74-07956 5D

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. INST. FOR RESEARCH ON LAND AND WATER RESOURCES.
Regional Energy-Water Problems, Ohio-Great Lakes.
W74-07973 6D

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. SCHOOL OF FOREST RESOURCES.
Using Sewage Effluent and Liquid Digested Sludge to Establish Grasses and Legumes on Bituminous Strip-Mine Spoils,
W74-07612 5D

POLISH ACADEMY OF SCIENCES, WARSAW. INST. OF EXPERIMENTAL BIOLOGY.
Freshwater Fauna and Flora in Haswell Island (Queen Mary Land, Eastern Antarctica),
W74-08107 2I

PORTSMOUTH POLYTECHNIC (ENGLAND). DEPT. OF BIOLOGICAL SCIENCES.
Tricladium varium, An Aquatic Hyphomycete on Wood in Water-Cooling Towers,
W74-08011 2I

PRODORITE LTD., SURREY (ENGLAND).
Corrosion Resistant Cements,
W74-07887 8F

PUERTO RICO NUCLEAR CENTER, MAYAGUEZ.
Distribution of ZN, FE, MN, and SR in Marine Fishes of Different Feeding Habits,
W74-07801 5C

Trace-Element Interactions Between River Water and Seawater,
W74-07805 5B

PUERTO RICO UNIV., MAYAGUEZ. DEPT. OF NUCLEAR ENGINEERING.
Mathematical Model of Tritiated and Stable Water Movement in an Old-Field Ecosystem,
W74-07812 5B

PUNJAB AGRICULTURAL UNIV., LUDHIANA (INDIA). DEPT. OF HORTICULTURE.
Studies on the Influence of Irrigation and Different Doses of N, P and K on the Flowering Behaviour and Absorption of Nutrient Elements in Muskmelon (Cucumis melo L.),
W74-08144 3F

PURDUE UNIV., LAFAYETTE, INDIANA, DEPT. OF FORESTRY AND CONSERVATION.
Factors Controlling the Dynamics of Non-Ionic Synthetic Organic Chemicals in Aquatic Environments,
W74-07831 5B

RALSTON-PURINA CO., ST. LOUIS, MO.
Antagonistic Effect of Arginine on Zinc Metabolism in Chicks,
W74-07955 5C

RHODE ISLAND UNIV., KINGSTON. MARINE ADVISORY SERVICE.
A Water Quality Problem in Lobster Holding Tanks,
W74-07983 8I

RIJKSFACULTEIT DER LANDBOUWWETENSCHAPPEN, GHENT (BELGIUM).
Limnological Observations on the 'National Watersportbaan Georges Nachez' at Ghent in 1968, 1969, 1970 and 1971,
W74-08113 5C

ROCHESTER UNIV., N.Y. DEPT. OF PHARMACOLOGY AND TOXICOLOGY.
Transport and Transformation of Mercury in Nature and Possible Routes of Exposure,
W74-07682 5B

RUTGERS-THE STATE UNIV., NEW BRUNSWICK, N.J.
Precipitation Characteristics of the Northern New Jersey, New York City Metropolitan Area,
W74-07607 2B

RUTGERS THE STATE UNIV., NEW BRUNSWICK, N.J. DEPT. OF CHEMICAL AND BIOCHEMICAL ENGINEERS.
Process Control Model for Oxygen Regeneration of Polluted Rivers, Phases IV and V, and Spacially and Temporally Distributed Discharge of Effluents in Estuaries,
W74-07837 5B

SAINT LOUIS METROPOLITAN SEWER DISTRICT, MO.
Odors Emitted from Raw and Digested Sewage Sludge,
W74-07960 5D

SAN JOSE DEPT. PUBLIC WORKS, CALIF.
BOD, Solids and Nutrient Removal by Foam Flotation,
W74-07742 5D

SASKATCHEWAN UNIV., SASKATOON. INST. OF PEDOLOGY.
Effect of Monosilicic Acid on Hydrolytic Reactions of Aluminum,
W74-07626 2G

SCHLUMBERGER, WELL SURVEYING CORP., PARIS (FRANCE).
Recent Advances in Log Evaluation,
W74-07853 8G

SIMON-HARTLEY LTD., STRAFFORDSHIRE (ENGLAND). (ASSIGNEE)
Electrolytic Flotation Apparatus,
W74-08030 5D

SKELLY AND LOY, HARRISBURG, PA.
Processes, Procedures, and Methods to Control Pollution from Mining Activities.
W74-07927 5G

SKIDAWAY INST. OF OCEANOGRAPHY, SAVANNAH, GA.
Patterns of Water Flow and Sediment Dispersion Adjacent to an Eroding Barrier Island,
W74-07920 2J

Research to Determine the Environmental Response to the Deposition of Spoil on Salt Marshes Using Diked and Undiked Techniques.
W74-07990 6G

SOUTH CAROLINA UNIV., COLUMBIA BELLE W. BARUCH COASTAL RESEARCH INST.
The Influence of Temperature and Salinity on the Toxicity of Cadmium to the Fiddler Crab, Uca pugilator,
W74-07699 5C

SOUTH CAROLINA UNIV., COLUMBIA. DEPT. OF BIOLOGY.
Structure and Function of Hardwood Litter and Soil Subsystems After Chronic Gamma Irradiation. II. Microfungi,
W74-07825 5C

SOUTH DAKOTA STATE UNIV., BROOKINGS. DEPT. OF PLANT SCIENCE.
The Significance of Rainfall on Salt and Sodium Accumulations Under Irrigation,
W74-07743 3C

Effect of Establishment Method, Variety, and Seeding Rate on the Production and Quality of Alfalfa Under Dryland and Irrigation,
W74-08077 3F

SOUTH DAKOTA STATE UNIV., BROOKINGS. INST. OF IRRIGATION TECHNOLOGY.
South Dakota Standards for Irrigation Pumps and Power Units,
W74-07895 8C

South Dakota Standards for Construction of Irrigation Wells in Shallow Unconsolidated Glacial Sediments,
W74-07896 8A

Irrigation Well Construction.
W74-07897 8A

SOUTH STAFFORDSHIRE WATERWORKS CO. (ENGLAND). DISTRIBUTION DEPT.
The Design, Planning and Construction of a 45 inch Diameter Water Main Across a Congested Area of West Bromwich,
W74-07751 8A

SOUTHERN CALIFORNIA METROPOLITAN WATER DISTRICT, LOS ANGELES.
Corrosive Effects of Southern California Potable Waters,
W74-07866 8G

SOUTHERN METHODIST UNIV., DALLAS, TEX. INST. OF TECH.
Industrial Application of Whitford's Demand Forecasting Procedure,
W74-08015 6D

SOUTHWEST RESEARCH INST., SAN ANTONIO, TEX.
The Future Role of Desalting in Nevada,
W74-08065 3A

SOUTHWESTERN GREAT PLAINS RESEARCH CENTER, BUSHLAND, TEX.
Sugarbeet Response to Irrigation as Measured with Growth Sensors,
W74-08079 3F

STANDARD OIL CO. OF CALIFORNIA, HUNTINGTON BEACH. PRODUCTION OFFICE.
Sand Control, (Part 4), Combinations, Comparisons, and Costs,
W74-07851 8A

STANDARD OIL CO. OF CALIFORNIA, HUNTINGTON BEACH. WESTERN OPERATIONS DIV.
Sand Control in Oil and Gas Wells, Part I,
W74-07891 8B

STANFORD UNIV., PACIFIC GROVE, CALIF. HOPKINS MARINE STATION.
Trace Elements in Marine Shrimp,
W74-07806 5C

STATE UNIV. OF NEW YORK, BUFFALO. DEPT. OF CIVIL ENGINEERING.
Hydrologic Models of the Great Lakes,
W74-07826 2H

STOCKHOLM UNIV. (SWEDEN). ENVIRONMENTAL TOXICOLOGY GROUP.
Genetic Effects,
W74-07688 5C

SUN OIL CO., TOLEDO, OHIO.
Sun Oil Develops Water Reuse Program,
W74-07882 5D

SUPERIOR OIL CO., HOUSTON, TEX.
The Sulfate-Reducing Bacteria and Oilfield Bacterial Corrosion - A Review of the Current State-of-the-Art,
W74-07902 8G

TENNESSEE UNIV., KNOXVILLE. DEPT. OF CIVIL ENGINEERING.
Survival of Enteric Pathogens and Indicator Organisms in Natural Waters,
W74-07840 5A

TEXAS A AND M UNIV., COLLEGE STATION. WATER RESOURCES INST.
Regional Energy-Water Problems, Southern Plains,
W74-07976 6D

EXAS UNIV., AUSTIN.
Effect of Bentonitic Fluid Properties on Drilling Rate,
W74-07879 8B

EXAS WATER DEVELOPMENT BOARD, USTIN.
Economic Optimization and Simulation Techniques for Management of Regional Water Resource Systems,
W74-07714 6A

EXAS WATER DEVELOPMENT BOARD, USTIN. SYSTEMS ENGINEERING DIV.
Analytical Techniques for Planning Complex Water Resource Systems.
W74-07722 6A

PPETTS-ABBETT-MCCARTHY-STRATTON, EW YORK.
Dam Collapse Wave in a River,
W74-08060 2E

OKYO UNIV. (JAPAN). DEPT. OF GRICULTURAL ENGINEERING.
The Relationships Between Soil Water and Engineering Properties of the Clayey Soils, (In Japanese),
W74-07679 2G

OKYO UNIV. (JAPAN). FACULTY OF IENCE.
Results of Red Tide Formation in Tokyo Bay,
W74-07770 5C

ORONTO UNIV. (ONTARIO). DEPT. OF EOLOGY.
The Determination of Heavy Metals in Domestic Sewage Treatment Plant Wastes,
W74-07763 5A

UNIS UNIV. (TUNISIA). LABORATOIRE OCEANOGRAPHIE.
Determination of Counting Efficiency by 14C by Liquid Scintillation in Primary Production Measurements in a Lagoon Environment, (In French),
W74-08143 5A

NION CARBIDE CORP., NEW YORK.
Corrosion by Waters,
W74-07890 8G

NION CARBIDE CORP., SOUTH HARLESTON, W. VA. CHEMICALS AND ASTICS.
Pump Installation and Maintenance,
W74-07873 8C

NION OIL CO. OF CALIFORNIA, LOS NGELES.
Porosity-Resistivity Cross-Plotting,
W74-07900 8G

NIV., SOUTH DAKOTA VERMILLION. DEPT. F BIOLOGY.
An Ecological Study of the Missouri River Prior to Channelization,
W74-07744 2I

NIVERSIDAD NACIONAL DE CUYO, EDOZA (ARGENTINA). INSTITUTO DE OLOGIA VEGETAL.
Drought Hardening in Onions: I. Influence of Presowing Treatments on Vegetative Behavior and Yield, (In Spanish),
W74-08148 3F

UNIVERSIDAD NACIONAL DE TUCUMAN (ARGENTINA). FACULTAD DE AGRONOMIA Y ZOOTECNICA.
'Hill-Top Irrigation,' A New System for Early Sweetpotato Planting, (In Spanish),
W74-08136 3F

UNIVERSIDAD NATIONAL DE CUYO, MENDOZA (ARGENTIA). INSTITUTO DE BIOLOGIA VEGETAL.
Drought Hardening in Onions: II. Analysis of Growth, (In Spanish),
W74-08149 3F

UNIVERSITY OF SOUTH FLORIDA, TAMPA. DEPT. OF CHEMISTRY.
A Note Concerning the Environmental Acceptability of Nitrilotriacetic Acid (NTA): The Effect of NTA on the Growth of Gymnodinium breve,
W74-07775 5C

UNIVERSITY OF WESTERN ONTARIO, LONDON. DEPT. OF GEOGRAPHY.
A Derivation of the Hydraulic Geometry of Steady-State Channels from Conservation Principles and Sediment Transport Laws,
W74-07633 2J

URAL SCIENCE CENTER, SVERDLOVSK (USSR). INST. OF PLANT AND ANIMAL ECOLOGY.
Effect of Climatic and Phytocenotic Factors on Annual Increment of Trees in Stands, (In Russian),
W74-08127 2I

UTAH WATER RESEARCH LAB., LOGAN.
Model for Estimating Soil Water, Plant, and Atmospheric Interrelations: I. Description and Sensitivity,
W74-08084 2G

Model for Estimating Soil Water, Plant, and Atmospheric Interrelations: II. Field Test of Model,
W74-08085 2G

UTTAR PRADESH INST. OF AGRICULTURAL SCIENCES, KANPUR (INDIA). DIV. OF SOILS AND AGRICULTURAL CHEMISTRY.
Correlations Between P, Fe and Mn Availability in Water-Logged Soil at Different Fertility Levels,
W74-08134 2G

VERMONT UNIV., BURLINGTON. REMOTE SENSING LAB.
Pollution Monitoring in Lake Champlain Using ERTS-1 Imagery,
W74-08009 5A

VETERANS ADMINISTRATION HOSPITAL, OMAHA, NEBR.
Determination of Copper and Zinc in Biological Material,
W74-07712 5A

VIRGINIA CHEMICALS, INC., PORTSMOUTH, VA.
Zinc/Phosphate Combinations Control Corrosion in Potable Water Distribution Systems,
W74-07894 8G

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG.
Coagulant Recovery and Reuse in Water Reclamation Systems,
W74-07844 5D

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DEPT. OF BIOLOGY; AND VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. CENTER FOR ENVIRONMENTAL STUDIES.
Aquatic Invertebrate Recovery in the Clinch River Following Hazardous Spills and Floods,
W74-07841 5C

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DEPT. OF CHEMICAL ENGINEERING.
The Removal of Soluble Mercury from Waste Water by Complexing Techniques,
W74-07845 5D

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. WATER RESOURCES RESEARCH CENTER.
A Stochastic Model for the James,
W74-07843 5B

WAHNBACHTALSPERRENVERBAND, SIEGBURG (WEST GERMANY).
The Use of Algal Assays for Determining the Effect of Iron and Phosphorus Compounds on the Growth of Various Algal Species,
W74-07776 5C

WARSAW UNIV. (POLAND). DEPT. OF HYDROBIOLOGY.
Primary Production and Respiration of the Phytoplankton of the Rivers Thames and Kennet at Reading,
W74-08132 5C

WARSAW UNIV. (POLAND). LAB. OF HYDROBIOLOGY.
Ecology of the Eulittoral Zone of Lakes,
W74-08003 5C

WASHINGTON STATE UNIV., PULLMAN. DEPT. OF AGRONOMY AND SOILS.
Characterization of Suspended Sediments in Water from Selected Watersheds as Related to Control Processes, Nutrient Contents, and Lake Eutrophication,
W74-07736 5B

WASHINGTON STATE UNIV., PULLMAN. DEPT. OF CIVIL AND ENVIRONMENTAL ENGINEERING.
Survival of Intestinal Bacteria in Oligotrophic Waters,
W74-07737 5C

WASHINGTON STATE UNIV., PULLMAN. DEPT. OF GEOLOGY.
Geology and Groundwater Resources of the Hangman Creek Drainage Basin, Idaho-Washington,
W74-07644 4A

WASHINGTON STATE UNIV., PULLMAN. DEPT. OF POLITICAL SCIENCE.
The Columbia Interstate Compact: Politics of Water Resources in the Pacific Northwest,
W74-07846 6E

WASHINGTON UNIV., SEATTLE.
A Summary of Quantity, Quality and Economic Methodology for Establishing Minimum Flows,
W74-07847 6B

WASHINGTON UNIV., SEATTLE. COLL. OF FISHERIES.
Biological Half-Lives for Zinc and Mercury in the Pacific Oyster, Crassostrea gigas,
W74-07807 5C

WASHINGTON UNIV., SEATTLE. COLL. OF FISHERIES.

Accumulation of Calcium-45 in Developing Coho Salmon Eggs and Fry reared in varying concentrations of Stable Calcium,
W74-07808 5C

WASHINGTON UNIV., SEATTLE. DEPT. OF OCEANOGRAPHY.

A Similarity Solution for Steady-State Gravitational Circulation in Fjords,
W74-07675 2L

WASHINGTON UNIV., ST LOUIS, MO. DEPT. OF EARTH SCIENCES.

Evolution of Meander Loops,
W74-07661 2J

WATER RESEARCH ASSOCIATION, MARLOW (ENGLAND).

Improved Dynamic Programing Procedures and Their Practical Application to Water Resource Systems,
W74-08013 6A

WATER RESOURCES CENTER, BUDAPEST (HUNGARY).

Induced Safety Algorithm for Hydrologic Design under Uncertainty,
W74-08017 6A

WATER RESOURCES COUNCIL, WASHINGTON, D.C.

The Role of Water in the Energy Crisis,
W74-07962 6D

WATER RESOURCES ENGINEERS, INC., WALNUT CREEK, CALIF.

Ground-Water Quality Models: What They Can and Cannot Do,
W74-07933 5B

WATER RESOURCES RESEARCH CENTER. VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG.

Water Resources Research in Virginia - Annual Report for Fiscal Year 1972.
W74-07842 9D

WATERLOO UNIV. (ONTARIO).

Big Eddies and Mixing Processes in the Great Lakes.
W74-07926 5B

Infiltration and Landfill Behavior,
W74-08083 5B

WEST PAKISTAN UNIV. OF ENGINEERING AND TECHNOLOGY, LAHORE.

Head Drop Across Bar Screens,
W74-08092 5D

WESTERN CO., DALLAS, TEX.

Using Improved Technology to Obtain Better Cement Jobs on Deep, Hot Liners,
W74-07878 8F

WESTINGHOUSE ELECTRIC CORP., PITTSBURGH, PA.

Trace Metals Investigations,
W74-07655 5B

Geological Investigations,
W74-07657 5B

WESTINGHOUSE ELECTRIC CROP., PITTSBURGH, PA.

Submerged Turbine Aerator,
W74-08027 5D

WHITTINGTON HOSPITAL, LONDON (ENGLAND). DEPT. OF CHEMICAL PATHOLOGY.

Liver Zinc in Carcinoma,
W74-07690 5C

WISCONSIN UNIV., MADISON. GEO-ENVIRONMENTAL AND MINERAL RESOURCES PROGRAM.

Investigation of the Sediments and Potential Manganese Nodule Resources of Green Bay, Wisconsin,
W74-07652 2J

WISCONSIN UNIV., MILWAUKEE. CENTER FOR GREAT LAKES STUDIES.

Seasonal and Spatial Changes in Primary Production and Nutrients in Lake Michigan,
W74-07773 5C

Distribution of Phosphorus, Silica, Chlorophyll a, and Conductivity in Lake Michigan and Green Bay,
W74-08000 5C

WOODS HOLE OCEANOGRAPHIC INSTITUTION, MASS.

Inorganic Nitrogen Removal in a Combined Tertiary Treatment-Marine Aquaculture System - II. Algal Bioassays,
W74-07777 5C

Plutonium in North Atlantic Ocean Organisms; Ecological Relationships,
W74-07800 5C

YUGOSLAV ACADEMY OF SCIENCES AND ARTS, ZAGREB. INST. FOR MEDICAL RESEARCH.

Reduction of Lead Absorption from the Intestine in Newborn Rats,
W74-07953 5C

Z. H. COLL. OF ENGINEERING AND TECHNOLOGY, ALIGARH (INDIA).

Paper Chromatographic and Electrochromatographic Separation of Edta Complexes of Metal Ions,
W74-07693 5A

ZAGREB UNIV. (YUGOSLAVIA). ZAVOD OPCU PROIZVODE BILJA.

Variations in Potassium Content of Alfalfa Grown on Pseudogley Soil Depending on Mineral Fertilizing, (In Serbo-Creation),
W74-08097 3F

ACCESSION NUMBER INDEX

W74-07601 2A
W74-07602 9A
W74-07603 5D
W74-07604 5B
W74-07605 5C
W74-07606 5D
W74-07607 2B
W74-07608 6B
W74-07609 6B
W74-07610 6B
W74-07611 6E
W74-07612 5D
W74-07613 5C
W74-07614 5G
W74-07615 5B
W74-07616 2L
W74-07617 5B
W74-07618 2C
W74-07619 5B
W74-07620 5B
W74-07621 5B
W74-07622 2G
W74-07623 5B
W74-07624 5B
W74-07625 5B
W74-07626 2G
W74-07627 5B
W74-07628 5B
W74-07629 2G
W74-07630 2G
W74-07631 2G
W74-07632 2J
W74-07633 2J
W74-07634 2G
W74-07635 2G
W74-07636 2G
W74-07637 5F
W74-07638 8B
W74-07639 4B
W74-07640 5B
W74-07641 5A
W74-07642 5B
W74-07643 2H
W74-07644 4A
W74-07645 2F
W74-07646 2E
W74-07647 7C
W74-07648 2F
W74-07649 4A
W74-07650 7C
W74-07651 5G
W74-07652 2J
W74-07653 5B
W74-07654 5B
W74-07655 5B
W74-07656 5B
W74-07657 5B
W74-07658 5B
W74-07659 5B
W74-07660 5B
W74-07661 2J
W74-07662 7A
W74-07663 5B
W74-07664 2E
W74-07665 2F
W74-07666 2J
W74-07667 2E
W74-07668 4B
W74-07669 2E
W74-07670 5B
W74-07671 4A
W74-07672 2L
W74-07673 2L
W74-07674 5B
W74-07675 2L
W74-07676 2J
W74-07677 2E
W74-07678 5A
W74-07679 2G
W74-07680 5C
W74-07681 5A
W74-07682 5B
W74-07683 5B
W74-07684 5C
W74-07685 5C
W74-07686 5C
W74-07687 5C
W74-07688 5C
W74-07689 5C
W74-07690 5C
W74-07691 5C
W74-07692 5A
W74-07693 5A
W74-07694 5C
W74-07695 5A
W74-07696 5C
W74-07697 5B
W74-07698 5A
W74-07699 5C
W74-07700 5C
W74-07701 5C
W74-07702 2I
W74-07703 5G
W74-07704 5A
W74-07705 5A
W74-07706 5C
W74-07707 5C
W74-07708 5C
W74-07709 5A
W74-07710 5A
W74-07711 5A
W74-07712 5A
W74-07713 5B
W74-07714 6A
W74-07715 5C
W74-07716 5C
W74-07717 5C
W74-07718 5A
W74-07719 6B
W74-07720 6B
W74-07721 2A
W74-07722 6A
W74-07723 6B
W74-07724 6B
W74-07725 8I
W74-07726 4B
W74-07727 5D
W74-07728 5B
W74-07729 4C
W74-07730 5B
W74-07731 2J
W74-07732 8B
W74-07733 6E
W74-07734 4B
W74-07735 8G
W74-07736 5B
W74-07737 5C
W74-07738 5D
W74-07739 5D
W74-07740 5C
W74-07741 5D
W74-07742 5D
W74-07743 3C
W74-07744 2I
W74-07745 5D
W74-07746 5C
W74-07747 4A
W74-07748 5D
W74-07749 8B
W74-07750 5D
W74-07751 8A
W74-07752 5D
W74-07753 5D
W74-07754 5G
W74-07755 6B
W74-07756 2A
W74-07757 5B
W74-07758 5D
W74-07759 5D
W74-07760 5D
W74-07761 5D
W74-07762 5D
W74-07763 5A
W74-07764 5A
W74-07765 5F
W74-07766 8B
W74-07767 8B
W74-07768 4A
W74-07769 5G
W74-07770 5C
W74-07771 5D
W74-07772 5F
W74-07773 5C
W74-07774 3C
W74-07775 5C
W74-07776 5C
W74-07777 5C
W74-07778 5C
W74-07779 5D
W74-07780 2G
W74-07781 5C
W74-07782 5A
W74-07783 5A
W74-07784 5B
W74-07785 2A
W74-07786 5A
W74-07787 5D
W74-07788 5D
W74-07789 5D
W74-07790 5B
W74-07791 5B
W74-07792 5B
W74-07793 5A
W74-07794 5G
W74-07795 5G
W74-07796 5G
W74-07797 4B
W74-07798 5B
W74-07799 5C
W74-07800 5C
W74-07801 5C
W74-07802 5C
W74-07803 5C
W74-07804 5A
W74-07805 5B
W74-07806 5C
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W74-07809 5C
W74-07810 5B
W74-07811 5B
W74-07812 5B
W74-07813 5B
W74-07814 5B
W74-07815 5C
W74-07816 5C
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W74-07820 5C
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W74-07822 5C
W74-07823 5C
W74-07824 5C
W74-07825 5C
W74-07826 2H
W74-07827 5A
W74-07828 5B
W74-07829 3B
W74-07830 2I
W74-07831 5B
W74-07832 2E
W74-07833 5B
W74-07834 5G
W74-07835 5C
W74-07836 5A
W74-07837 5B
W74-07838 6G
W74-07839 2G
W74-07840 5A
W74-07841 5C
W74-07842 9D
W74-07843 5B
W74-07844 5D
W74-07845 5D
W74-07846 6E
W74-07847 6B
W74-07848 8G
W74-07849 8G
W74-07850 8G
W74-07851 8A
W74-07852 7B
W74-07853 8G
W74-07854 5G
W74-07855 8G
W74-07856 8G
W74-07857 8G
W74-07858 8G
W74-07859 8B
W74-07860 8B
W74-07861 4B
W74-07862 5D
W74-07863 8G
W74-07864 8C
W74-07865 8G
W74-07866 8G
W74-07867 8C
W74-07868 8G
W74-07869 8G
W74-07870 8G
W74-07871 8D
W74-07872 8C
W74-07873 8C
W74-07874 8C
W74-07875 2L
W74-07876 8G
W74-07877 8G
W74-07878 8F
W74-07879 8B
W74-07880 8C
W74-07881 5D
W74-07882 5D
W74-07883 8B
W74-07884 8F
W74-07885 5A
W74-07886 8G
W74-07887 8F
W74-07888 8G
W74-07889 8G
W74-07890 8G
W74-07891 8B
W74-07892 8G
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W74-07894 8G
W74-07895 8C
W74-07896 8A
W74-07897 8A
W74-07898 8G
W74-07899 8D
W74-07900 8G
W74-07901 8C
W74-07902 8G
W74-07903 7B
W74-07904 8G
W74-07905 8D
W74-07906 8E
W74-07907 3B
W74-07908 2F
W74-07909 8C
W74-07910 2C
W74-07911 2J
W74-07912 5A

W74-07913 8B
W74-07914 8B
W74-07915 5B
W74-07916 2F
W74-07917 6D
W74-07918 7C
W74-07919 2F
W74-07920 2J
W74-07921 7C
W74-07922 4A
W74-07923 8A
W74-07924 2L
W74-07925 8B
W74-07926 5B
W74-07927 5G
W74-07928 3B
W74-07929 3B
W74-07930 8A
W74-07931 4A
W74-07932 5B
W74-07933 5B
W74-07934 5B
W74-07935 2F
W74-07936 4A
W74-07937 2J
W74-07938 2J
W74-07939 2L
W74-07940 2A
W74-07941 5B
W74-07942 5B
W74-07943 6E
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W74-07945 5A
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W74-07947 2K
W74-07948 2K
W74-07949 5A
W74-07950 2K
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W74-07980 8G
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W74-07989 7B
W74-07990 6G
W74-07991 2H
W74-07992 2H
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W74-07994 8I
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W74-07996 2H
W74-07997 2I
W74-07998 5C
W74-07999 5C
W74-08000 5C
W74-08001 8I
W74-08002 2I
W74-08003 5C
W74-08004 5A
W74-08005 5C
W74-08006 5B
W74-08007 5C
W74-08008 5C
W74-08009 5A
W74-08010 5D
W74-08011 2I
W74-08012 6B
W74-08013 6A
W74-08014 3C
W74-08015 6D
W74-08016 2I
W74-08017 6A
W74-08018 4A
W74-08019 5D
W74-08020 5G
W74-08021 5D
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W74-08046 5D
W74-08047 7A
W74-08048 2H
W74-08049 7B
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W74-08051 2E
W74-08052 5A
W74-08053 4A
W74-08054 7A
W74-08055 6B
W74-08056 6E
W74-08057 4A
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W74-08059 4B
W74-08060 2E
W74-08061 3A
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W74-08063 3A
W74-08064 3A
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W74-08072 5B
W74-08073 3C
W74-08074 2G
W74-08075 3F
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W74-08077 3F
W74-08078 3F
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W74-08086 5B
W74-08087 3C
W74-08088 5B
W74-08089 2G
W74-08090 5B
W74-08091 5D
W74-08092 5D
W74-08093 2K
W74-08094 3C
W74-08095 5C
W74-08096 5C
W74-08097 3F
W74-08098 3F
W74-08099 3F
W74-08100 4A
W74-08101 2I
W74-08102 2I
W74-08103 2I
W74-08104 2I
W74-08105 2I
W74-08106 2I
W74-08107 2I
W74-08108 5C
W74-08109 5C
W74-08110 2I
W74-08111 2I
W74-08112 5C
W74-08113 5C
W74-08114 2I
W74-08115 5C
W74-08116 4A
W74-08117 2G
W74-08118 2I
W74-08119 2H
W74-08120 2I
W74-08121 2I
W74-08122 2H
W74-08123 2H
W74-08124 5C
W74-08125 8I
W74-08126 2I
W74-08127 2I
W74-08128 5G
W74-08129 8I
W74-08130 8I
W74-08131 2I
W74-08132 5C
W74-08133 5A
W74-08134 2G
W74-08135 2G
W74-08136 3F
W74-08137 4D
W74-08138 5G
W74-08139 2G
W74-08140 4C
W74-08141 5C
W74-08142 5C
W74-08143 5A
W74-08144 3F
W74-08145 2I
W74-08146 5C
W74-08147 5C
W74-08148 3F
W74-08149 3F
W74-08150 2K

ABSTRACT SOURCES

Source	Accession Number	Total
A. Centers of Competence		
AEC Oak Ridge National Laboratory, Nuclear Radiation and Safety	W74-07780 -- 07825	46
Colorado State University, Irrigation Return Flow Quality	W74-08071 -- 08075 08077 -- 08081 08083 -- 08088 08090 -- 08094	21
Cornell University, Policy Models for Water Resources Systems	W74-08010 08012 -- 08015 08017 -- 08018	7
Franklin Institute, Municipal Wastewater Treatment Technology	W74-07745 -- 07762 07764 -- 07770 07772 -- 07777 07779	32
National Water Well Association, Water Well Construction Technology	W74-07848 -- 07861 07863 -- 07906 07980	59
University of Florida, Eastern U.S. Water Law	W74-07943	1
University of North Carolina, Metropolitan Water Resources Planning and Management	W74-07961	1
University of Wisconsin, Eutrophication	W74-07981 -- 07995 07998 08000 -- 08001 08003 08005 -- 08009	24
U.S. Geological Survey, Hydrology	W74-07602 07616 -- 07678 07907 -- 07942 07962 -- 07979 08044 -- 08051 08053 -- 08060	134
Vanderbilt University, Metals Pollution	W74-07680 -- 07701 07703 -- 07713 07944 -- 07956	46
B. State Water Resources Research Institutes		
Alabama Water Resources Research Institute	W74-08095	1
Alaska Institute for Water Research	W74-07725	1
California Water Resources Center	W74-07726	1
Connecticut Institute of Water Resources	W74-07727 -- 07728	2
Delaware Water Resources Center	W74-07729	1
Florida Water Resources Research Center	W74-07603	1
Georgia Environmental Resources Center	W74-07730 -- 07733	4
Hawaii Water Resources Research Center	W74-07734 -- 07735	2
Idaho Water Resources Research Institute	W74-07608, 07830	2

Source	Accession Number	Total
B. State Water Resources Research Institutes (Con't)		
Illinois Water Resources Center	W74-07604 07826 – 07828	4
Indiana Water Resources Research Center	W74-07831	1
Iowa State Water Resources Research Institute	W74-07832	1
Kansas Water Resources Research Institute	W74-07841	1
Kentucky Water Resources Research Institute	W74-07605, 07715	2
Louisiana Water Resources Research Institute	W74-07833	1
Michigan Institute of Water Research	W74-07606, 07716 08096	3
Minnesota Water Resources Research Center	W74-07834	
Montana Water Resources Research Center	W74-07717 – 07718 07835	3
New Hampshire Water Resources Research Center	W74-07836	1
New Jersey Water Resources Research Institute	W74-07607, 07837	2
New Mexico Water Resources Research Institute	W74-07609	1
New York Water Resources and Marine Sciences Center	W74-07610, 07838	2
North Carolina Water Resources Research Institute	W74-07719	1
Oregon Water Resources Research Institute	W74-07611, 07839	2
Pennsylvania Institute for Research on Land and Water Resources	W74-07612	1
South Dakota Water Resources Institute	W74-07743 – 07744	2
Tennessee Water Resources Research Center	W74-07840	1
Virginia Water Resources Research Center	W74-07842 – 07845	4
Washington Water Research Center	W74-07736 – 07737 07846 – 07847	4
C. Other		
BioSciences Information Service	W74-07679, 07702 07763, 07771 07778, 07862 07996 – 07997 07999, 08002 08004, 08011 08016, 08052 08076, 08082 08089 08097 – 08150	71
Environmental Protection Agency	W74-07613 – 07615 07738 – 07742 07957 – 07960	12

ABSTRACT SOURCES

Source	Accession Number	Total
C. Other (Con't)		
Ocean Engineering Information Service (Patents)	W74-08019 – 08043	25
Office of Saline Water	W74-08061 – 08070	10
Office of Water Resources Research	W74-07601, 07714 07720 – 07724 07829	8

* U. S. GOVERNMENT PRINTING OFFICE: 1974 O - 582-934 (2)

CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

6 WATER RESOURCES PLANNING

7 RESOURCES DATA

8 ENGINEERING WORKS

9 MANPOWER, GRANTS, AND FACILITIES

10 SCIENTIFIC AND TECHNICAL INFORMATION

INDEXES

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

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VOLUME 7, NUMBER 16
AUGUST 15, 1974

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SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

VOLUME 7, NUMBER 16
AUGUST 15, 1974

W74-08151 -- W74-08700

The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

CONTENTS

FOREWORD_____iii

SUBJECT FIELDS AND GROUPS

(Use Edge Index on back cover to Locate Subject Fields and Indexes in the journal.)

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Non-Water Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

NATURE OF WATER

. Properties

LF-DIFFUSION COEFFICIENTS AND ROTA-NAL CORRELATION TIMES IN POLAR UIDS. VI. WATER,
onne National Lab., Ill.
E. O'Reilly.
rnal of Chemical Physics, Vol 60, No 4, p 1607-8, Feb. 15, 1974. 10 fig, 2 tab, 35 ref.

criptors: *Water structure, *Molecular struc-, *Mathematical models, *Polarity, Approxi-ion method, Density, Ice, Diffusion, Move-nt, Viscosity, Particle shape, *Water proper-.

ew model for liquid water is presented. As a approximation (A), the liquid is considered as asi-hard-sphere fluid, and the scaled particle ory is used to calculate the work (w) required to te a vacancy of molecular dimension using the erved density of water. In the second approxi-ion (B), a quasilattice model is invoked, based the Ice VII structure, and the density and hermal compressibility of water are computed n w values. A final approximation (C), based he Ice Ic structure, evaluates the temperature pressure dependence of self-diffusion, osity, and nuclear relaxation times. Agreement he model with experiment is good. Only a few ameters having physically reasonable mag-des enter into the calculation. Results of ecular dynamics calculations on water ob-ed by Rahman are presented and interpreted to w that molecular rotation in water occurs in er large excursions of relatively short dura-. For times between the large angular reorien-ons, librational motions occur which do not lt in a large net molecular reorientation. The e-amplitude reorientations are proposed to lt from hard molecular collisions. These lts confirm the conclusions of earlier studies other liquids. The anisotropy of the rotational relation time of rank 2 (tau sub 2) in an asym-ric top molecule is derived, based on the finite rotation hypothesis. Available experimental ues of 'tau sub 2' for liquid water are sum-rized and compared with the results of the del. (Brown-IPC)
4-08439

ATER: A COMPREHENSIVE TREATISE. LUME 1. PHYSICS AND PHYSICAL EMISTRY OF WATER.
num Press, New York and London, 1972. F. nks, editor. 596 p, 1204 ref. $37.50. Unilever search Laboratory, Sharnbrook, Bedford, En-nd.

scriptors: *Water properties, *Water chemis-, *Ice, *Steam, *Water vapor, Water supply, ter resources, Molecular structure, Ther-dynamic behavior, Hydrogen bonding, Spec-scopy, Analytical techniques, Hydrodynamics, draulics, *Bibliographies, *Reviews.
ntifiers: Textbooks.

e 14 chapters of this volume, authored by dif-ent experts, deal with the following topics: The nificance of water on earth, including its occur-ce, distribution, relation to other liquids, im-tance to life, and the history of its scientific dy. The structure of water molecules. The ory of hydrogen bonding in water, including oretical models, dimer and polymer forms, etc. e properties of ice, such as crystallinity, phase ations, molecular and ionic transport, elec-conductivity, and self-diffusion. Raman and in-red spectra. Nuclear magnetic resonance. electric properties. X-ray scattering. Neutron ttering. Thermodynamic and transport proper-s, including thermodynamic and hydrodynamic characteristics. Statistical mechanics. Acoustic properties, notably sound and ultrasound absorption and relaxation. Water at high temperatures and pressures. Structural models. A subject index and an extensive bibliography of pertinent references are included. (See also W74-08666 and W74-08667) (Brown-IPC)
W74-08665

1B. Aqueous Solutions and Suspensions

WATEQ, A COMPUTER PROGRAM FOR CALCULATING CHEMICAL EQUILIBRIA OF NATURAL WATERS,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2K.
W74-08606

WATER: A COMPREHENSIVE TREATISE. VOLUME 2. WATER IN CRYSTALLINE HYDRATES: AQUEOUS SOLUTIONS OF SIMPLE NONELECTROLYTES.
Plenum Press, New York and London, 1973. F. Franks, editor. 684 p, 1458 ref. $37.50.

Descriptors: *Water properties, *Aqueous solutions, Solvents, Water of hydration, Clathrates, Hydrogen bonding, Thermodynamic behavior, Spectroscopy, High pressure, Molecular structure, *Bibliographies, *Reviews.
Identifiers: Dielectrics, Mixtures, Textbooks.

Eleven chapters authored by different experts deal with following topics: The solvent properties of water. Water in stoichiometric hydrates. Clathrate hydrates. Infrared studies of hydrogen bonding in pure liquids and solutions. Thermodynamic properties of binary and ternary systems. Phase behavior of aqueous solutions at high pressures. Dielectric properties of polar liquids and aqueous mixtures. Spectral properties. Acoustic properties. Nuclear magnetic resonance spectroscopy. Molecular theories and models of water and dilute aqueous solutions. A bibliography of appropriate references is appended. Subject, compound, and formula indexes are included. (See also W74-08665 and W74-08667) (Brown-IPC)
W74-08666

WATER: A COMPREHENSIVE TREATISE. VOLUME 3. AQUEOUS SOLUTIONS OF SIMPLE ELECTROLYTES.
Plenum Press, New York and London, 1973. F. Franks, editor. 472 p, 887 ref. $37.50.

Descriptors: *Water properties, *Aqueous solutions, *Electrolytes, Hydration, Water of hydration, Thermodynamic behavior, Solvents, Equilibrium, Spectroscopy, *Bibliographies, *Reviews.
Identifiers: Dielectrics, Textbooks.

The eight chapters of this volume, authorized by different experts, discuss the following topics: The thermodynamics of ion hydration and of aqueous mixed electrolytes. Hydration effects and acid-base equilibria. Ionic transport in water and mixed aqueous solvents. Infrared and raman spectroscopy of aqueous electrolytes. Nuclear magnetic resonance. Dielectric properties. Subject, compound, and formula indexes are appended, along with a pertinent bibliography. (See also W74-08665 and W74-08666) (Brown-IPC)
W74-08667

2. WATER CYCLE

2A. General

MODELING SNOWMELT RUNOFF IN AN ARCTIC COASTAL PLAIN,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 2C.
W74-08233

HYDROLOGICAL EFFECTS OF URBANIZATION,
For primary bibliographic entry see Field 4C.
W74-08257

TRANSIENT RESPONSE OF A LAYERED, SLOPING SOIL TO NATURAL RAINFALL IN THE PRESENCE OF A SHALLOW WATER TABLE: EXPERIMENTAL RESULTS,
Agricultural Research Service, University Park, Pa. Northeast Watershed Research Center.
A. S. Rogowski, E. T. Engman, and E. L. Jacoby, Jr.
Report ARS-NE-30, February 1974. 61 p, 25 fig, 4 tab, 10 ref, 7 append.

Descriptors: *Soil water movement, *Infiltration, *Rainfall-runoff relationships, *Pennsylvania, Slopes, Structural geology, Hydrogeology, Recharge, Watersheds(Basins).
Identifiers: Mahantango Creek(Penn).

Soil water flux was studied in a layered, sloping soil under natural field conditions. The study area is located on the Mahantango Creek Experimental Watershed in the ridge and valley region of east-central Pennsylvania. The area is characterized by long mountain ridges with local relief of about 200 meters from valley floors to ridges consist of sandstone, while interbedded shales and siltstones make up the slope and valley material. At the experimental site the angle of dip in the rock strata is about 30 degrees on both sides of the stream. The principal zones of soil water concentration lie along the abundant fracture traces. Runoff originates considerably faster in response to rainfall than either the changes in groundwater level or the changes in the soil water and the soil water pressure in the study area. Shallow well behavior in 1970 provided a response to rainfall almost as fast as the response of the stream weir in 1969. The general trend of the well and weir data is closely related to soil water content, soil water pressure, and piezometric fluctuation. Because of their fast transitory nature, the extreme peaks may well typify local response of the soil material close to the streambed or close to the shallow well. There is little change in the soil water and soil water pressure below 55 cm on Albrights silt loam. Most changes occur in the surface layer. (Knapp-USGS)
W74-08375

HYDROLOGICAL ACTIVITIES IN SINGAPORE,
Singapore Dept. of Public Works. Drainage and Marine Branch.
For primary bibliographic entry see Field 7C.
W74-08457

TRENDS AND VARIABILITY OF YEARLY MEAN SEA LEVEL 1893-1972,
National Ocean Survey, Rockville, Md.
For primary bibliographic entry see Field 2B.
W74-08643

2B. Precipitation

RAINFALL FREQUENCY ATLAS FOR MISSOURI,
National Weather Service, Columbia, Mo.

For primary bibliographic entry see Field 7C.
W74-08174

FOG MODIFICATION--A TECHNOLOGY ASSESSMENT,
Air Force Cambridge Research Labs., Bedford, Mass.
For primary bibliographic entry see Field 3B.
W74-08177

SATELLITE VIEWS OF HURRICANE CAMILLE,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
W. E. Shenk, and E. B. Rodgers.
Available from NTIS, Springfield, Va. 22151, NASA TND-7547 - Price $4.00 printed copy, $1.45 microfiche. Technical Note D-7547, April 1974. 80 p, 61 fig, 13 ref, append.

Descriptors: *Remote sensing, *Hurricanes, *Synoptic analysis, *Aerial photography, Meteorology, Storms, Rainfall, Floods, Climatology, Data collections, Cyclones, Weather patterns.
Identifiers: *Hurricane Camille(1969).

Three periods within the life cycle of Hurricane Camille (1969) were studied with radiometric and camera measurements from Nimbus-3 satellites and camera information from ATS-3 satellites in conjunction with other information. These periods were the deepening phase, the interaction of Camille with midlatitude westerlies, and the excessive rain period when the cyclone was over the central Appalachian Mountains. Just prior to significant deepening, the Nimbus-3 Medium Resolution Infrared Radiometer (MRIR) showed that a pronounced feeder band southeast of the center was associated with the rapid transport of moisture into the storm circulation. During the rapid deepening phase the MRIR measurements indicated the development of large-scale subsidence throughout the troposphere northwest of the center. When Camille was over the lower Mississippi Valley it acted as an obstruction to the environmental wind. A region of widespread subsidence was created west and north of the cyclone center. Increased cloud-top elevations, back to the levels reached when Camille was an intense cyclone over the Gulf of Mexico, were estimated from the Nimbus-3 High Resolution Infrared Radiometer (HRIR) measurements on August 20, 1969, when Camille produced rains of major flood proportions near the east slopes of the Appalachians in central Virginia. (Knapp-USGS)
W74-08291

AVERAGE WEEKLY RAINFALL AND PROBABILITIES DURING THE PLANTING-GROWING-HARVESTING PERIOD IN SOUTH CAROLINA,
National Oceanic and Atmospheric Administration, Clemson, S.C. National Weather Service.
H. Landers.
Available from NTIS, Springfield, Va. 22151, COM-73-10811 - Price $3.00 printed copy; $1.45 microfiche. Climatic Research Series No 14, March 1973. 41 p, 34 fig, 1 ref.

Descriptors: *Precipitation(Atmospheric), *Probability, Meteorological data, Data collections, Statistics, *Rainfall, Thunderstorms, *Forecasting, *South Carolina, Meteorology, Climatology.

Weekly average values of precipitation during the growing season in South Carolina were computed for 31 weeks, from April 24 through November 26. Weekly precipitation probabilities were also computed. Weekly curves show many distinct maxima and minima, and with very few exceptions, the major ones occur at the same time all over the state. The fact that the curves relate well to each other in the last two months is related to the fact that the precipitation tends to be of a larger scale than the scattered showers and thunderstorms common in late spring and summer. (Knapp-USGS)
W74-08295

SOME FACTORS AFFECTING THE ANNUAL RAILFALL OF SINGAPORE,
Singapore Meteorological Service.
In: Water Resources, Environment and National Development--Volume II: Selected Papers. Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 72-83, 1972. 6 fig, 2 tab.

Descriptors: *Rainfall, *Meteorological data, *Data collections, Rain gages, Statistics, Statistical methods, Forecasting, Monsoons, Wet seasons.
Identifiers: *Singapore.

Rainfall records on Singapore Island are presented to show the relationship between the current year's annual rainfall and the following year's annual rainfall. The 10-year running mean annual rainfall are plotted to study trends in the annual rainfall for Singapore. The relationship between exceptionally heavy rain spells during the first half of the Northeast Monsoon and spells of dry weather conditions in the later half of the same monsoon season over Singapore are discussed. Although rainfall data for one or two stations on Singapore Island were available as far back as 1835, continuous rainfall records from one station from that data were not available. Two stations were selected with combined records totaling 96 years; they are sited about 13 miles apart. An exceptionally dry year, with rainfall equal to or more than 20% below average was never followed by another year which was also exceptionally dry. An exceptionally wet year, with rainfall equal to or more than 20% above average was often followed by a year with rainfall below average. There were 2 occasions in the 14 exceptionally wet years when rainfall in the following year was above average but did not reach the 20% above average mark. Severe Northeast Monsoon storms that brought spells of exceptionally heavy rain to the east coast of West Malaysia, Singapore or the coastal areas of Sarawak in East Malaysia were frequently followed by dry conditions at Singapore during succeeding months. (See also W74-08454) (Knapp-USGS)
W74-08459

TRENDS AND VARIABILITY OF YEARLY MEAN SEA LEVEL 1893-1972,
National Ocean Survey, Rockville, Md.
S. D. Hicks, and J. E. Crosby.
NOAA Technical Memorandum NOS 13, March 1974. 16 p, 9 fig, 1 tab.

Descriptors: *Sea level, *Meteorological data, *Data collections, Water levels, *United States.
Identifiers: *Mean sea level, *Oceanographic data.

Sea-level trends, their standard errors, and variability are presented in tabular form for 50 locations along the coasts of the United States. The values are given for the entire series length at each station, the oldest dating from 1893 at New York. For intrastation comparisons, values are also given for the longest length of series common to 46 of the stations, 1940-72. Graphs of yearly mean sea level, upon which the calculations were performed, are plotted for 44 stations. (Sinha-OEIS)
W74-08643

2C. Snow, Ice, and Frost

SURVEY OF THE SEASONAL SNOW COVER IN ALASKA,
Alaska Univ., College. Geophysical Inst.
B. Holmgren, C. Benson, and G. Weller.
Available from NTIS, Springfield, Va 2215
N73-29269 Price $3.50 printed copy
microfiche ERTS-1 Project Semi-annual Re
for National Aeronautics and Space Admini
tion, July 31, 1973. 15 p, 9 fig, 3 ref, 4 app
NASA Contract NAS5-21833

Descriptors: *Alaska, *Remote sensing, breakup, *Snowmelt, Satellites(Artificial), Sn
Ice, *Snow cover Ice cover
Identifiers: *ERTS

Freezeup and breakup patterns of the seas
snow and ice covers in Alaska were studied by
lection of ground-based data in a north-s
transect across Alaska, and by using ERTS
together with observations from air and groun
describe the snow cover characteristics on
Arctic Slope. The ERTS data provide informa
on breakup patterns including development of
noff over extensive watersheds. Areas of low
bedo and early snows retreat before the sta
the main ablation period, and large snow drifts
aufeis remains after the main ablation period
ERTS data can also be used to monitor manm
effects on the breakup in the Prudhoe Bay oil
ploration area. (Knapp-USGS)
W74-08179

MODELING SNOWMELT RUNOFF IN AN A TIC COASTAL PLAIN,
Alaska Univ., College. Inst. of Water Resource
R. F. Carlson, W. Norton, and J. McDougall.
Available from the National Technical Infor
tion Service as PB-232 431 $3.75 in paper co
$1.45 in microfiche. Report No IWR-43, Janu
1974. 72 p, 16 fig, 4 ref, 3 append. OWRR A-0
ALAS(5).

Descriptors: *Snowmelt, *Arctic, *Alas
*Runoff, *Coastal plains, *Mathematical mod
Simulation analysis, Hydrograph analysis, H
budget, Temperature, Melt water.

Snowmelt runoff models simulate the spring
noff, an important part of the hydrologic system
Alaska's arctic coastal plain. The snowmelt mo
produces a snowmelt hydrograph which is c
verted by the runoff model into a runoff hyd
graph. The snowmelt model subdivides the sno
pack into two layers. Daily climatological param
ters govern the heat transfer between snowpa
and atmosphere. Once the heat flux received
emitted by the snowpack has been computed,
melting processes within the snowpack are c
sidered. Computed parameters of the snowpa
are density, depth, water equivalent, water co
tent, temperature, and thermal quality. The run
model uses a three-parameter linear storage mo
to transform the snowmelt hydrograph into a
noff hydrograph. The parameters represent t
amount of storage, the rate of runoff, and the
between snowmelt and runoff. Using Prudhoe B
weather data as input, and comparing the output
runoff data from the Kuparuk, Putuligayuk, a
Sagavanirktok Rivers for the years 1970 and 197
results indicate that the models perform satisfa
torily. (Knapp-USGS)
W74-08233

GROUND WATER QUALITY EFFECTS O DOMESTIC WATER UTILIZATION,
Univ. of Alaska College. Inst. of Water Resource
For primary bibliographic entry see Field 5B.
W74-08287

ACTIVATED SLUDGE DISPOSAL IN A SU ARCTIC ENVIRONMENT,
Hill, Ingman, Chase and Co., Seattle, Wash.
For primary bibliographic entry see Field 5E.
W74-08443

APPLICATION OF ERTS-1 IMAGERY TO TH STUDY OF CARIBOU MOVEMENTS AN

TER DISPERSAL IN RELATION TO VAILING SNOWCOVER,
ka Univ., College.
. Lent.
ilable from NTIS, Springfield, Va. 22151, as -24376, Price $3.00 printed copy; $1.45 ofiche. Fifth Bi-Monthly Progress Report on S Project 110-7, June 1973. 7 p.

criptors: *Remote sensing, *Artic, Tundra, ow cover, Ice satellites(Artificial), Deer, ping, Snowmelt.
tifiers: *ERTS, *Caribou.

al reconnaissance photographs and observa- s on snowmelt were obtained on May 21 for ral selected sites within range of the caribou ulation. Stepwise discrimate analysis demon- es the feasibility of feature identification g linear discriminate functions of ERTS MSS l densities and their ratios. Features such as ll streams can be detected even when they are ark mountain shadow. The potential utility of and similar techniques appear considerable. app-USGS)
-08602

TERIAL DEGRADATION OF MINERAL S AT LOW TEMPERATURES,
pps Institution of Oceanography, La Jolla, f.
primary bibliographic entry see Field 5B.
-08625

. Evaporation and Transpiration

OP COOLING WITH SPRINKLERS,
artment of Agriculture, Lethbridge (Alberta). earch Station.
primary bibliographic entry see Field 3F.
-08271

APORATION FROM BARE SOIL IN A ASTAL ENVIRONMENT,
hnion--Israel Inst. of Tech., Haifa. Low- nilk Faculty of Agricultural Engineering.
. Rosenberg, I. Seginer, and I. Lomas.
Ecological Studies--Analysis and Synthesis, 4, Hadas, A., and others, editors, Springer- lag, New York, 1973. p 227-236. 4 fig, 4 tab, 21 OWRR A-017-NEB(6).

criptors: *Evaporation, *Microclimatology, asts, Microenvironment, Energy budget, Hu- ity, Solar radiation, Deserts, Arid lands.
ntifiers: *Israel.

rometeorological observations of energy nce components made during two days in the ing of 1968 over irrigated bare soil on the thern Coastal Plain of Israel indicate that air ditioned over the sea was a strong sink for sen- e heat. Evapotranspiration under these climatic umstances is well below the amount which the radiation balance would permit. These data are sistent with the few available observations le in analogous coastal climatic situations. The a are also consistent with rough estimates of fraction of net radiation consumed in potranspiration by well watered grass at a ilar, but more southerly, site on the coastal n of Israel. Water use in many coastal areas y be conditioned by advective influences which uce evapotranspiration considerably below the ivalent quantity of available net radiant energy. app-USGS)
4-08305

. Streamflow and Runoff

TLAND HYDROLOGY,
ological Survey, Hartford, Conn. Water ources Div.
For primary bibliographic entry see Field 2L.
W74-08163

LOW-FLOW CHARACTERISTICS OF KENTUCKY STREAMS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-08173

IMPROVING THE ACCURACY OF POINT-GAUGE MEASUREMENT IN HIGH-VELOCITY FLOWS (AMELIORATION DE LA PRECISION DE LA POINTE DE MESURE DANS LES ECOULEMENTS RAPIDS),
Indian Inst. of Tech., Madras. Hydraulic Engineering Lab.
For primary bibliographic entry see Field 7B.
W74-08195

THE CALIBRATION AND USE OF A CONICAL HOT FILM ANEMOMETER PROBE IN RECIRCULATING WATER FLOW,
International Business Machines Corp., Charlotte, N.C.
M. H. Stenhouse, and R. L. Stoy.
Review of Scientific Instruments, Vol 45, No 3, p 368-370, March 1974. 3 fig, 5 ref.

Descriptors: Flow, *Anemometers, *Flow measurement, *Calibrations, Reviews, *Instrumentation.

A calibration for directional sensitivity of a conical hot film anemometer probe is described. It is usually assumed that the conical probe is insensitive to the velocity vector direction but, in fact, this is not true because deviations of + or - 60% of the mean velocity can occur at low water speeds. In this study, the probe is aligned at right angles to the velocity vector, but the trend of the results applies to probes aligned along the velocity vector. An application of the conical probe to velocity measurements in a vortical water flow for speeds from 0.66 to 3 m/sec is discussed. (Merritt-FIRL)
W74-08222

FLOODFLOWS FROM SMALL DRAINAGE AREAS IN OKLAHOMA: PROGRESS REPORT AND DATA COMPILATION,
Geological Survey, Oklahoma City, Okla.
W. O. Thomas, Jr., and R. K. Corley.
Open-file report, 1974. 50 p, 19 fig, 8 tab, 13 ref.

Descriptors: *Floods, *Small watersheds, *Oklahoma, *Rainfall-runoff relationships, *Mathematical models, Calibrations, Hydrologic data, Data collections, Streamflow forecasting.

Annual peak discharges and basin and climatic characteristics are summarized for 103 small-stream sites in Oklahoma. The U.S. Geological Survey rainfall-runoff model was calibrated for six small watersheds. The rainfall-runoff model can be used to extend the length of flood records for small watersheds. Records from four small watersheds were extended by the model, and synthetic frequency curves were computed for these sites to show applicability of the model. (Knapp-USGS)
W74-08292

FLOODS IN PUNALUU-HAUULA AREA, OAHU, HAWAII,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-08310

MODLEING OF LAND RUNOFF EFFECTS ON DISSOLVED OXYGEN,
Kansas State Univ., Manhattan. Dept. of Engineering.
For primary bibliographic entry see Field 5B.
W74-08316

THE DEVELOPMENT OF MEANDERS IN NATURAL RIVER-CHANNELS,
Simon Fraser Univ., Burnaby (British Columbia). Dept. of Geography.
E. J. Hickin.
American Journal of Science, Vol 274, No 4, p 414-442, April 1974. 8 fig, 3 tab, 4 plates, 20 ref.

Descriptors: *Channels, *Flood plains, Channel morphology, Channel erosion, Open channel flow, Hydraulic engineering, *Canada, *Meanders, River training.
Identifiers: *Channel migration, *Beatton River(B.C.).

Investigations of the meander growth-patterns of the Beatton River in northeast British Columbia indicate that there is a critical value of the ratio radius of channel curvature to channel width (rm/w) which, once reached by a developing meander, exerts considerable control over subsequent direction and rate of lateral migration. Furthermore, the critical value of rm/w, which is readily identifiable from the pattern of flood-plain surface deposits, appears to be much less variable in nature than is a similar parameter described by Leopold and Wolman in 1960. On the Beatton River the critical value of rm/w averages 2.11, and standard deviation is only 0.13. The pattern of meander growth is discussed in terms of the dynamics of open-channel flow. Some implications of the study for river engineering and palaeohydrological investigations also are presented. (Sandoski-FIRL)
W74-08357

A PROGRAMMED SAMPLER FOR RUNOFF AND BEDLOADS,
Agricultural Research Service, Lincoln, Neb.
For primary bibliographic entry see Field 5A.
W74-08361

A SUMMARY OF PEAK STAGES AND DISCHARGES FOR THE FLOOD OF AUGUST 1973 IN NEW JERSEY,
Geological Survey, Trenton, N.J.
S. J. Stankowski, and A. J. Velnich.
Open-file report, 1974. 12 p, 2 fig, 3 tab.

Descriptors: *Floods, *New Jersey, *Peak discharge, *Historic floods, Stage-discharge relations, Water levels, Discharge(Water), Flood damage.

Intense rainfall associated with a cold front moving northeastward across New Jersey caused devastating flooding in four highly urbanized counties of north-central New Jersey on August 2, 1973. Peak-stage and peak-discharge data are given for streams in the flood-affected area. Total rainfall during a 5-hour period (0700 to 1200 hours EDT on August 2, 1973) averaged about 7 inches (178 mm) in a relatively narrow band across Somerset, Union, and northern Middlsex Counties. The highest total precipitation recorded was 8.78 inches (223 mm) at Bound Brook. The greatest rainfall intensity was observed in Plainfield where a total of 4 inches (102 mm) was recorded between 0715 and 0815 hours EDT on August 2, 1973. New records for stage or discharge were established at 6 continuous-record gaging stations and 6 crest-stage stations in north-central New Jersey. Flooding of unprecedented magnitude was concentrated in the highly urbanized Rahway River and Green Brook basins. (Knapp-USGS)
W74-08374

MEASUREMENT OF DYE CONCENTRATIONS BY PHOTOGRAPHY,
California Univ., Berkeley. Dept. of Civil Engineering.
P. R. B. Ward.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 99, No EE3, Paper 9768, p 165-175, June 1973. 9 fig, 8 ref, append.

Descriptors: *Dye releases, *Aerial photography, *Photogrammetry, Path of pollutants, Dye dispersion, Dispersion, Mixing, Instrumentation, Water measurement, Remote sensing.
Identifiers: *Densitometry.

A method of measuring concentrations of solutions of dye for dispersion studies in laboratory channels uses black and white photography, followed by analysis of the photographs with a microdensitometer to determine dye concentration. The calibration curve was measured by photographing a group of bowls with solutions of known concentration. The method is reproducible and enables measurements at many points to be made with a single photograph. (Knapp-USGS)
W74-08376

CLARKS FORK YELLOWSTONE RIVER REMOTE SENSING STUDY,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W74-08386

FLOW CHARACTERISTICS OF SLOPING CHANNEL JUMPS,
Alberta Univ., Edmonton. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W74-08387

MECHANISM FOR STREAMFLOW MEANDERING,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W74-08388

OBSERVATIONS ON HYDRAULIC JUMPS AT ROUNDED STEP,
Memorial Univ. of Newfoundland, St. Johns. Dept. of Engineering and Applied Science.
For primary bibliographic entry see Field 8B.
W74-08391

FLOODS IN THE VICINITY OF CRETE, NEBRASKA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-08444

FLOOD PLAIN INFORMATION; GRANTS CREEK - TOWN CREEK, CITY OF SALISBURY, NORTH CAROLINA.
Army Engineer District, Charleston. S.C.
For primary bibliographic entry see Field 4A.
W74-08490

FLOOD PLAIN INFORMATION; PETERS CREEK AND LICK RUN, ROANOKE, VIRGINIA.
For primary bibliographic entry see Field 4A.
W74-08491

GALVESTON BAY HURRICANE SURGE STUDY: REPORT 1. EFFECTS OF PROPOSED BARRIERS ON HURRICANE SURGE HEIGHTS--APPENDIX A, CALIBRATION TESTS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 8B.
W74-08586

FLOODS IN ALABAMA--MAGNITUDE AND FREQUENCY BASED ON DATA THROUGH SEPTEMBER 30, 1971,
Geological Survey, Tuscaloosa, Ala.
C. F. Hains.
Alabama Highway Department, Montgomery, 1973. 174 p, 11 fig, 6 tab, 20 ref, 3 append

Descriptors: *Floods, *Alabama, *Flood frequency, Statistics, Equations, *Data collections, *Hydrologic data, Stage-discharge relations, Rainfall-runoff relationships.

Methods for estimating the magnitude and frequency of floods on Alabama streams are given. Data analysis includes extensions of short-term records and the fitting of log-Pearson Type III distribution to the extended data with regional adjustments of skew, using modern computer techniques, all available streamflow records, and geographic and hydrologic information abstracted from maps. Except for streams draining urban areas, flood discharges up to 100-year recurrence can be computed for ungaged sites with drainage areas as small as 1 square mile. As geology or rock type is the most important variable, a geologic map is included. Records of annual maximum discharge for 209 sites in Alabama and 44 selected sites in adjacent states are included in an appendix. Tables of magnitude and frequency of floods based on station records at gaging stations and similar tables based on generalized flood equations are also included. (Knapp-USGS)
W74-08587

TIME OF CONCENTRATION--A KINEMATIC WAVE APPROACH,
Metropolitan Sanitary District of Greater Chicago, Ill, Sewer Design Section.
A. S. Paintal.
Water and Sewage Works, Reference No 1974, p R26-R30, April 30, 1974. 2 fig, 10 ref.

Descriptors: *Time of concentration, *Hydrographs, *Overland flow, Urban hydrology, Rational formula, *Storm runoff, Rainfall-runoff relationships, *Rainfall intensity, Slope, Infiltration, Storage.
Identifiers: *Kinematic wave theory.

A method is given for estimating the time of concentration as it is governed by rainfall intensity and watershed characteristics. The time of concentration (overland flow time) is affected by numerous factors such as rainfall intensity, surface slope, surface roughness, infiltration, depression, storage, and flow distance. The kinematic wave formulation provides a good approximation of the rising side of overland flow hydrograph. The solution of this equation is shown in graphical form. (Knapp-USGS)
W74-08593

ESTIMATING LOW-FLOW FREQUENCY FOR PERENNIAL MISSOURI OZARKS STREAMS,
Geological Survey, Rolla, Mo.
For primary bibliographic entry see Field 4A.
W74-08599

HYDROGEOLOGY OF ANTIETAM CREEK BASIN,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 2F.
W74-08607

TOWARDS AN OBJECTIVE ANALYSIS OF THE SEASONAL THERMOCLINE,
Quebec Ministere de l'Industrie et du Commerce. Service Recherche et Direction Peches Maritimes.
F. R. Boudreault, and J. P. Laprise.
J Fish Res Board Can. Vol 30, No 2, p 320-322, 1973. Illus. English summary.
Identifiers: *Seasonal, *Thermocline, Temperature, Environmental gradient, *Thermal stratification.

A definition of the seasonal thermocline, based on a generalization suggested by Riffenburgh (1970) is proposed. This allows objective analysis of the thermocline.--Copyright 1973, Biological Abstracts, Inc.
W74-08691

2F. Groundwater

INLAND WETLANDS AND GROUND WAT IN EASTERN CONNECTICUT,
Connecticut Univ., Storrs. Dept. of Geology.
T. L. Holzer.
In: Proceedings of First Wetlands Confere Storrs, Connecticut, June 20, 1973. Connect University Institute of Water Resources Re No 21, p 66-81, December 1973. 9 fig.

Descriptors: *Wetlands, *Connecti *Hydrogeology, Marshes, Swamps, Water ta Aquifers, Till, Glacial drift, Surface-groundw relationships.

Climate, geology and topography determine relationship between inland wetlands and grou water. In eastern Connecticut, geology and top raphy are the most important controlling factor the high precipitation and relative uniformity the climate over the region. In eastern Conn ticut, geology, particularly surficial geology, topography are intimately related because of r tively recent glaciation. Dense crystalline bedr is overlain by a blanket of till ranging in de from a few inches to more than 100 feet, averaging approximately 10 to 15 feet. Thic deposits of stratified glacial drift, consist predominantly of sand and silt, commonly ove the till and bedrock in major valleys. The til usually poorly sorted, consisting of particles ra ing from clay to boulders; and in some areas i quite dense. Hence the permeability of the su cial deposits tends to be lower in upland areas t in major valleys. Lowland wetlands are the re of depressions in topography which are su ciently deep to intersect the water table. T upland wetlands may be more significant in ter of groundwater flow than are most valley w lands. Upland wetlands in many cases probal are the result of the low permeability of crystall bedrock. The low permeability of the bedrc makes the bedrock unable to transmit the wa over long horizontal distances. The upland w land may be functioning in the groundwa system as an overflow. (See also W74-081 (Knapp-USGS)
W74-08162

GROUND WATER POLLUTION FROM SU SURFACE EXCAVATIONS.
Environmental Protection Agency, Washingto D.C. Office of Air and Water Program.
For primary bibliographic entry see Field 5.
W74-08185

INVESTIGATIONS OF THE RESPONSE OF A UNCONFINED AQUIFER TO LOCALIZE RECHARGE,
Maryland Univ., College Park. Dept. of Civil E gineering.
P. S. Tinsley, and R. M. Ragan.
Available from the National Technical Inform tion Service as PB-232 422 $4.00 in paper cop $1.45 in microfiche. Maryland Water Resourc Research Center, College Park, Technical Repo No 20, (1974). 80 p, 22 fig, 8 tab, 20 ref, 2 appen OWRR B-003-Md(1).

Descriptors: *Water level fluctuation *Numerical analysis, *Hydraulic model Recharge, Surface-groundwater relationships, I filtration, Capillary fringe.

Rapid groundwater responses were studied by e periments and numerical analysis. With numeric techniques, it is possible to accurately predict th behavior of an idealized unconfined aquifer unde varying conditions of water table slope and loca

ed infiltration. The study was conducted by comaring the results of the finite difference solution f the Boussinesq equation to data collected from Hele-Shaw viscous flow model. The agreement etween the experimental and numerically enerated water-surface profiles was quite good hen the water table was mildly sloped, but this greement became weaker as the slope was inreased. The effect of capillary rise was very oticeable on the water-surface profiles under teady and unsteady conditions. Seepage surfaces ere observed in the model but were ignored in ie numerical solution. The experimental and nuerically generated hydrographs agreed very well ver the entire range of conditions studied. When ubjected to localized infiltration, the water surace of the groundwater formed a mound of the ame type observed in field investigations. The esulting steepening of the slope at the streamquifer interface produced a rapid increase in the ow into the channel which could be a quite sigificant portion of the storm hydrograph. (Knapp-ISGS)
W74-08234

WO-PHASE FLOWS IN POROUS MEDIA,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
I. J. Morel-Seytoux.
n: Advances in Hydroscience, Vol 9, Academic ress, Inc., New York, p 119-202, 1973. 56 fig, 62 ef. OWRR B-070-COLO(5).

Descriptors: *Porous media, *Flow, Groundwater movement, *Unsaturated flow, aturated flow, Oil-water interfaces, Air-water inerfaces, Saline water intrusion, Infiltration, Soil vater movement, Percolation, Mathematical nodels, Hysteresis, Reviews.
dentifiers: *Multiphase flow.

Vater movement in the soil is a two-phase henomenon and may not be at times adequately escribed or understood by the prevailing current nsaturated (one phase) approach. Many of the tudies in the petroleum literature can be used effectively to solve two-phase flow problems. The nderstanding of simultaneous flow of immiscible luids in a porous medium is a prerequisite to ound operations in the production of oil and of atural gas. The petroleum industry has devoted nuch effort to gaining a better understanding of his subject. This knowledge can be beneficially ntroduced to help resolve subsurface hydrology roblems. The common denominator of the two isciplines (reservoir engineering and subsurface ydrology) is evident. In both areas two immiscible fluids are present: water and oil (or oil and gas) nd water and air. In hydrology the mechanisms or water and air movement in the soil are primariy natural, so that fluid flow movement is caused y forces of relatively small magnitude. In petroleum production, on the contrary, fluid flow movement is often induced by considerable external ressure gradients. (Knapp-USGS)
W74-08303

GROUNDWATER LEVELS IN NEBRASKA, 1973,
Geological Survey, Lincoln, Nebr.
For primary bibliographic entry see Field 4B.
W74-08367

STOCHASTIC ANALYSIS OF GROUNDWATER LEVEL TIME SERIES IN THE WESTERN UNITED STATES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
A. G. Law.
Hydrology Paper No 68, May 1974. 26 p, 19 fig, 12 tab, 15 ref. NSF Grants GR-11444 and GK-11564.

Descriptors: *Water level fluctuations, *Stochastic processes, *Groundwater, *Statistical methods, Markov processes, Infiltration, Evapotranspiration, Statistical models.

The stochastic structure of monthly groundwater levels in the western United States was studied. The regional variation of the time dependence was studied in the form of the stochastic components of autocorrelation coefficients for the groundwater level time series. For investigation of the stochastic structure, it was first necessary to remove the deterministic components. Upon removal of the periodic mean and periodic standard deviation, the resulting stochastic series was examined for dependence using Markov models of lag one, two and three, including the periodicity in the autocorrelation coefficients. When the dependence effects were removed, the resulting process was tested for independence. Thus the original nonstationary process is reduced to a second-order stationary and independent stochastic component process. The final independent stochastic residuals were analyzed to find their probability distribution functions. A total of 84 wells in the 22 states west of the Mississippi River were selected for analysis. For each well the parameters necessary for the stochastic model were evaluated. Most wells could be described by a first-, second-, or third-order Markov model, but for 29 wells higher-order dependence models were indicated. Analysis of the regional variation of the first autocorrelation coefficient in the stationary stochastic component shows a much greater dependence in monthly groundwater level series than in either monthly precipitation or streamflow time series. The second and third autocorrelation coefficients of groundwater series also displayed high values. The mean third autocorrelation coefficient for the groundwater series is greater than the mean first autocorrelation coefficient for the streamflow series. The regional correlation coefficients between the pairs of stochastic components of groundwater level time series depend on the distance between wells. However, the absolute values oscillate widely, probably due in large part to sampling errors. (Knapp-USGS)
W74-08368

GROUND-WATER RESOURCES OF DUVAL COUNTY, TEXAS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 4B.
W74-08372

GROUND-WATER RESOURCES, ALLEGHENY RIVER BASIN AND PART OF THE LAKE ERIE BASIN, NEW YORK,
Geological Survey, Albany, N.Y.
M. H. Frimpter.
New York Department of Environmental Conservation Basin Planning Report ARB-2, 1974. 98 p, 21 fig, 7 tab, 44 ref.

Descriptors: *Water resources, *Groundwater, *New York, Alluvium, Glacial drift, Water yield, Gravels, Sands, Induced infiltration, Aquifers, Water quality, Hydrologic data, *River basins.
Identifiers: *Allegheny River basin(NY).

Large supplies of groundwater are available from Pleistocene sand and gravel aquifers in the valleys of the Allegheny River basin in parts of Allegany, Cattaraugus, and Chautauqua Counties in southwestern New York. The potential yield of the largest of these aquifers is estimated to be more than 220 mgd. This water-table aquifer extends up the Allegheny River valley from the Allegheny Reservoir into Pennsylvania and has an average thickness of about 80 feet. Potential yields of smaller aquifers along Great Valley, Little Valley, Fivemile, Ischua, Olean, Dodge, and Little Genesee Creeks are estimated to range from 4 to 30 mgd. A sand and gravel outwash deposit in the valley of Cold Spring Creek near Steamburg could possibly yield more than 50 mgd by induced recharge from the nearby Allegheny Reservoir. Chautauqua Lake, Cassadaga Creek, and Conewango Creek valleys contain unconsolidated artesian aquifers of small volume and recharge. The valleys of Brokenstraw and French Creeks also contain some small water-table aquifers. Bedrock is a reliable aquifer for rural-home and farm-water supplies, except on the Lake Erie Plain where groundwater is usually salty at depths greater than 50 feet. Major aquifers usually contain water whose chemical quality is suitable for public water supplies. (Knapp-USGS)
W74-08380

WATER-LEVEL RECORDS FOR THE NORTHERN HIGH PLAINS OF COLORADO, 1970-74,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4B.
W74-08381

DIGITAL-MODEL STUDY OF GROUNDWATER HYDROLOGY, COLUMBIA BASIN IRRIGATION PROJECT AREA, WASHINGTON,
Geological Survey, Tacoma, Wash.
H. H. Tanaka, A. J. Hansen, Jr., and J. A. Skrivan.
Washington Department of Ecology Water-Supply Bulletin 40, 1974. 60 p, 45 fig, 4 tab, 19 ref.

Descriptors: *Mathematical models, *Washington, *Surface-groundwater relationships, *Irrigation water, Infiltration, Water balance, Water storage, Simulation analysis, Hydrogeology, Groundwater, Aquifer characteristics, Columbia River.
Identifiers: *Columbia River basin.

In the Columbia Basin Irrigation Project area in eastern Washington groundwater levels generally have risen because of rapid increases in groundwater inflow, outflow, and storage from irrigation. Quantitative analyses of groundwater inflow and outflow by means of digital computer models represent three major areas--Quincy Basin, Pasco Basin, and Royal Slope. The digital computer models were designed to simulate the hydraulic-head response to natural or manmade stresses in the two-aquifer system underlying the area. The two-aquifer system is an unconfined upper aquifer (clay, silt, sand, and gravel in varying amounts) overlying a confined lower aquifer (basalt), separated by a leaky confining layer. The steady-state model analyzes conditions before irrigation (1952) when inflow and outflow to the aquifer system were essentially in balance and the transient model analyzes conditions during the first 16 years of irrigation (1952-67), when rapid hydrologic changes were taking place in the aquifer system. For the Quincy model, annual inflow and outflow from both aquifers totaled 105,000 acre-feet, and average annual recharge from precipitation to both aquifers was 11,000 acre-feet; for the Pasco model, inflow and outflow from both aquifers totaled 28,700 acre-feet, and average annual recharge from precipitation to both aquifers was 5,200 acre-feet; for the Royal model, annual inflow and outflow from the lower aquifer totaled 14,800 acre-feet and average annual recharge from precipitation to the lower aquifer was 1,300 acre-feet. Cumulative storage of water between 1952-69 for the Quincy model was about 2.7 million acre-feet in the upper aquifer and about 29 thousand acre-feet in the lower aquifer; for the Pasco model it was about 3.8 million acre-feet in the upper aquifer and about 23 thousand acre-feet in the lower aquifer; and for the Royal model it was about 750 thousand acre-feet in the upper aquifer and about 14 thousand acre-feet in the lower aquifer. (Knapp-USGS)
W74-08382

DISCHARGE AND TRAVEL TIME FOR GROUND-WATER CONDUITS,
University of Southern California, Los Angeles. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W74-08383

WELL YIELDS IN THE BEDROCK AQUIFERS OF MARYLAND,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 4B.
W74-08446

USE OF HYDROCHEMISTRY FOR INTERPRETING GROUND-WATER FLOW SYSTEMS IN CENTRAL NEVADA,
Nevada Univ., Las Vegas. Desert Research Inst.
G. W. Fiero, Jr., J. R. Illian, G. A. Dinwiddie, and L. J. Schroder.
Geological Survey and University of Nevada Desert Research Institute Cooperative Report for U.S. Atomic Energy Commission, April 1974. 44 p, 23 fig, 53 ref. AEC Contract No AT(29-2)-474 and AT(29-2)-1253.

Descriptors: *Groundwater movement, *Hydrogeology, *Geochemistry, *Water chemistry, *Nevada, Aqueous solutions, Path of pollutants, Hydrology.

Groundwater movement in central Nevada was studied by hydrochemical methods. Groundwater in motion dissolves and deposits minerals in a systematic manner as it approaches chemical equilibrium with its surroundings. Flow-system interpretation based on hydraulic data was compared with the flow-system interpretation based on the concentration distribution of calcium, calcium plus magnesium, bicarbonate, sulfate, sodium, sodium-adsorption ratio, silica, chloride, and dissolved solids. Regional hydrochemical trends have a general relationship to regional head distribution in central Nevada. Hydrochemical conditions that are anomalous to general trends probably reflect flow-system characteristics that are difficult to interpret on the basis of hydraulic data alone. (Knapp-USGS)
W74-08453

GROUNDWATER INVESTIGATIONS IN SINGAPORE,
Singapore Public Utilities. Water Planning Unit.
For primary bibliographic entry see Field 4B.
W74-08455

GEOLOGY AND WATER RESOURCES OF THE GIRDWOOD-ALYESKA AREA, ALASKA,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 4B.
W74-08595

WATER FROM THE COASTAL PLAIN AQUIFERS IN THE WASHINGTON, D.C., METROPOLITAN AREA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 4B.
W74-08597

HYDROGEOLOGY OF ANTIETAM CREEK BASIN,
Geological Survey, Parkville, Md.
L. J. Nutter.
Journal of Research of the U.S. Geological Survey, Vol 2, No 2, p 249-252, March-April 1974. 4 fig, 8 ref.

Descriptors: *Hydrogeology, *Maryland, *Karst hydrology, Karst, Surface-groundwater relationships, Sinks, Springs, Caves, Joints(Geologic), Carbonate rocks, Pennsylvania.
Identifiers: *Antietam Creek(Md).

The Antietam Creek basin in the Great Valley of Maryland and Pennsylvania is underlain almost entirely by intensely folded and faulted lower Paleozoic carbonate rocks. The groundwater discharge of the basin is about 85% of the total discharge, in contrast with less than 70% of the total discharge in two small basins underlain by igneous and metamorphic rocks in the Maryland Piedmont. Large quantities of groundwater are stored in a thick residual mantle, which overlies the carbonate rocks in the valley and adjacent metamorphic rocks in mountain areas on the east edge of the basin. Streams that flow off the mountain areas are major sources of recharge to the carbonate-rock aquifers. Several streams lose a large part of their flow within a mile after reaching the carbonate rocks in the valley, and a few flow directly into swallow holes (sinkholes). The low density of perennial streams in the basin is a result of subsurface drainage through solution cavities along joints, faults, and bedding in the carbonate rocks. The major orientations of straight stream reaches along Antietam Creek and the strikes of major joint sets in quarries are nearly coincident, suggesting that the stream network throughout the basin is joint controlled. (Knapp-USGS)
W74-08607

RATES OF SALT SOLUTION IN THE PERMIAN BASIN,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 2K.
W74-08608

2G. Water In Soils

INLAND WETLAND SOILS,
Connecticut Agricultural Experiment Station, New Haven.
D. E. Hill.
In: Proceedings of First Wetlands Conference, Storrs, Connecticut, June 20, 1973: Connecticut University Institute of Water Resources Report No 21, p 30-39, December 1973. 1 fig, 2 tab.

Descriptors: *Wetlands, *Connecticut, *Legislation, *Surveys, *Soil classification, Environment, Regulation, Land management, Marshes, Swamps.

Inland wetlands, as defined by Public Act 155 of the 1972 Connecticut General Assembly, are 'land, including submerged land...which consists of any of the soil types designated by the National Cooperative Soils Survey as poorly drained, very poorly drained, alluvial and flood plain.' The act thus encompasses more than 410,000 acres of wetlands soils in Connecticut as measured in three complete county surveys and estimated in the other five counties. Add the watercourses of the state, such as rivers, streams, brooks, lakes, ponds and marshes and the total acreage probably exceeds 20% of Connecticut's more than 3,200,000 acres. Use of the soil survey as a regulatory tool to define wetland boundaries may be limited if high degrees of accuracy are required in the location of the boundaries on a map. Despite the fact that the soil survey, as a regulatory tool, has mapping and classification limitations, it does provide the most complete inventory of wetland areas presently available. In the hands of a local regulatory agency, it can be used as a starting point for the necessary regulatory functions. (See also W74-08157) (Knapp-USGS)
W74-08160

THE SOIL CONSERVATION AND ITS ROLE IN WETLAND MANAGEMENT FOR CONNECTICUT,
Soil Conservation Service, Storrs, Conn.
For primary bibliographic entry see Field 6E.
W74-08169

THERMODYNAMICS OF SOIL WATER: IV. CHEMICAL POTENTIAL OF SOIL WATER,
National Inst. of Agricultural Sciences, Nishigahara (Japan).
S. Iwata.
Soil Science, Vol 117, No 3, p 135-139, March, 1974. 7 fig, 3 ref.

Descriptors: Adsorption, Model studies, *Soil water, *Thermodynamics, *Montmorillonite, Theoretical analysis, *Chemical potential.
Identifiers: *Japan.

The relationship between the chemical potential of water adsorbed to K montmorillonite and film thickness of adsorbed water was theoretically calculated by establishing an adsorption model. This relationship was compared with experimentally obtained results which yielded a good comparison. In addition, the decrements of chemical potential due to the solute, the force field, and the electric field were each compared. (See also W72-08885 and W73-05108) (Merritt-FIRL)
W74-08191

COMPARISON OF NUMERICAL METHODS SOLVING FLOW THROUGH POROUS MEDIA (EIN VERGLEICH VON NUMERISCHEN VERFAHREN ZUR LOESUNG VON SICKERSTROEMUNGEN),
Karlsruhe Univ. (West Germany).
H. P. Luehr.
La Houille Blanche, No 5-6, p 433-434, 1973. 2 ref.

Descriptors: *Numerical analysis, *Flow measurement, *Porous media, Finite Element analysis, Cost-benefit analysis.
Identifiers: Germany, Finite differences analysis.

Numerical methods of solving flow through porous media are compared and a cost effectiveness analysis was made. Digital solution methods generally are considerably more effective than analytical and analogous methods. Either finite elements or finite differences can be used in the digital solution method, and both methods produce discrete solutions of given problems. The comparison of both methods is done by significant criteria: the required core storage, the required computing time, and the flexibility of the methods approximating the problems. As the core storage and the computing time directly depend on the organization technique and the algorithm solving linear equation systems, special organization techniques are discussed. The flexibility is seen in dependence on physical problems. Finite differences are better than finite elements in terms of organization and programming and should be used to solve flow problems through porous media. For problems involving an automatic search of free surfaces, the method of finite elements appears to be more suitable. (Merritt-FIRL)
W74-08194

RETENTION AND RELEASE OF APPLIED MOLYBDENUM TO SOILS UNDER PERMANENT WATER-LOGGED CONDITION,
Jawaharlal Nehru Agricultural Univ., Jabalpur (India).
K. C. Mishra, and S. G. Misra.
J Indian Soc Soil Sci. Vol 20, No 3, p 259-262. 1972.
Identifiers: *Cations, *Molybdate, *Molybdenum, *Soil types, Waterlogged soils, Alkali soils, Red soils, Black soils.

The retention and release of Mo were studied using 3 soils, black, red and alkali soils under permanent waterlogged conditions. The introduction of cations like Fe++, Cu++, Mn++, Zn++ and Al++ or anions laike CO3 = and PO4 along with molybdate resulted in a varied retention of Mo and its subsequent release by the soils.--Copyright 1973, Biological Abstracts, Inc.
W74-08209

INFILTRATION INTO A SWELLING MATERIAL,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia).
D. E. Smiles.
Soil Science, Vol 117, No 3, p 140-147, March 1974. 4 fig, 11 ref.

Descriptors: *Infiltration, Flow, Clays, Theoretical analysis, Soils, Soil water movement, Soil structure, Soil texture.
Identifiers: Swelling, Soils.

The process of infiltration into a swelling material is discussed and some of J. R. Philip's predictions on the properties of flow in swelling systems are reexamined. Because of a paucity of experimental data on these materials Philip was forced to use plausible arbitrary properties for his illustrative calculations. A saturated clay was used and results in considerable simplification of the mathematics while the essential characteristics of the swelling phenomenon, in the gravitational field, are retained. As Philip predicts, infiltration in swelling materials has more in common physically with capillary rise than with infiltration in a rigid soil. This arises because in a saturated swelling soil infiltration is accompanied by a net increase in the gravitational potential energy of the system. Infiltration in a rigid soil results in a decrease in the potential energy of the water while that of the solid is unchanged. The net increase in the potential energy of the system together with the flow properties of swelling clays results in the sorption component of the infiltration process being temporarily more persistent, by several orders of magnitude, than is the case for rigid soils. (Merritt-FIRL)
W74-08230

SURFACE WATER POLLUTION CONTRACT STUDIES: ADSORPTION OF COMPLEX ORGANIC MOLECULES BY SUSPENDED CLAY,
For primary bibliographic entry see Field 5B.
W74-08239

ADSORPTION STUDIES AT SOLID-SOLUTION INTERFACES,
New Hampshire Univ., Durham. Inst. of Natural and Environmental Resources.
For primary bibliographic entry see Field 5B.
W74-08240

EFFECT OF EXCHANGE CATIONS ON ADSORPTION OF LYSOZYME AND OVALBUMIN BY SMECTITE,
New Hampshire Univ., Durham. Inst. of Natural and Environmental Resources.
For primary bibliographic entry see Field 5B.
W74-08241

EFFECT OF SALT CONTENT OF EQUILIBRIUM-SOLUTION ON FORMATION AND STABILITY OF SMECTITE-PROTEIN COMPLEXES,
New Hampshire Univ., Durham. Inst. of Natural and Environmental Resources.
For primary bibliographic entry see Field 5B.
W74-08242

THE MEASUREMENT OF THE HEAT OF REACTION BETWEEN PROTEINS AND MONTMORILLONITE BY MICROCALORIMETRY,
New Hampshire Univ., Durham. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W74-08243

DIRECT MEASUREMENT OF WATER MOVEMENT IN THE ZONE OF AERATION,
California Univ., Davis. Coll. of Agricultural and Environmental Sciences.
D. R. Nielson, and J. C. Corey.
Transactions, American Geophysical Union, Vol 55, No 4, p 183-186, April, 1974. 1 fig, 23 ref.

Descriptors: *Measurement, *Reviews, *Soil moisture, Flow measurement, Water resources, Flow, Soil water, *Soil water movement, Monitoring, Tracers.

The state of the art of three methods of direct measurement of soil water movement in the zone of aeration are reviewed. The approaches include: monitoring the rate of change of the distribution of soil water content within the zone; calculating the water movement on the basis of measured values of the forces acting on the water and the soil transmissibility coefficients; and following the movement of a tracer to identify the direction and rate of water flow. Although accurate estimates of water flow have been obtained by using the three techniques, almost without exception, measurements have been confined to small plots of land only a few meters square. Measurement and predictions are needed that can be applied to large land areas such as those of a field cultivated for crop production, of range or forest land, or those of sufficient size to be significant in managing land and water resources. (Merritt-FIRL)
W74-08256

INORGANIC TRANSFORMATION OF ADDED PHOSPHORUS IN SOIL RELATION TO SOIL CHARACTERISTICS AND MOISTURE REGIME,
Kalyani Agricultural Univ. (India). Dept. of Agricultural Chemistry and Soil Science.
N. C. Debnath, and J. N. Hajra.
J Indian Soc Soil Sci, Vol 20, No 4, p 327-335. 1972. Illus.
Identifiers: Aluminum, Calcium, *Inorganic reactions, Iron, Phosphates, *Phosphorus, *Soil moisture.

Transformation of added water soluble P was studied in 5 contrasting soils, both under field moisture and waterlogged conditions. Within 24 hr, most of the added P was recovered in different inorganic fractions in the order, Al-phosphate > Fe-phosphate > Ca-phosphate. Reductant soluble Fe-phosphate increased in red, laterite and hilly soils with no significant change in alluvial and saline soils. On aging, the quantity of Fe-phosphate increased and that of Al-phosphate decreased irrespective of soil characteristics and moisture regimes. On the whole, Ca-phosphate did not change much except in alluvial and saline soils. It increased in saline soils and decreased in alluvial soil on aging. Aging caused an increase in reductant soluble Fe-phosphate in red and laterite soils and a decrease in hilly soil. Though the general trends of the transformation process were identical under both moisture regimes, the rate as well as the magnitude of shift in the amounts of various phosphate fractions were enhanced by higher moisture level.--Copyright 1973, Biological Abstracts, Inc.
W74-08258

INFILTRATION AND ROOT EXTRACTION FROM SUBSURFACE IRRIGATION LATERALS,
Minnesota Univ., St. Paul. Dept. of Agricultural Engineering. Saint Paul.
For primary bibliographic entry see Field 3F.
W74-08270

WATER RELATIONS AND GROWTH OF COTTON IN DRYING SOIL,
Auburn Univ., Ala. Dept. of Botany and Microbiology.
B. Klepper, H. M. Taylor, M. G. Huck, and E. L. Fiscus.
Agronomy Journal, Vol 65, No 2, p 307-310, March-April, 1973. 5 fig, 1 tab, 17 ref.

Descriptors: *Irrigation, *Soil moisture, *Crop response, Cotton, Transpiration, Root development, Root systems, Diurnal.

Two 70-day-old cotton plants were subjected to a 26-day drying cycle at the Auburn rhizotron in order to quantitatively study water relations and growth of both root and shoot as the soil dried. Measurements were made of rooting density changes; stem diameter and height increase; and soil water content, soil water potential, and plant water potential. Marked dirunal fluctuations in plant hydration and soil water potential were observed, especially during the middle of the drying cycle. Plant height increase and stem diameter growth slowed drastically after 17 days even though 35% of the root system was in soil wetter than -1 bar and the plant was rehydrating to a water potential of -3 to -5 bars. Plant water potential in the early morning did not equilibrate with the water potential of the wettest horizon of soil. (Skogerboe-Colorado State)
W74-08272

SOIL MOISTURE PROFILE UNDER STEADY INFILTRATION,
Auburn Univ. Ala. Dept. of Agricultural Engineering.
S. S. Lin, E. W. Rochester, and R. E. Hermanson.
Journal of Agricultural Engineering Research, Vol 18, No 3, p 179-187, September, 1973. 8 fig, 2 tab, 4 ref.

Descriptors: *Soil moisture, *Soil water, *Infiltration, Groundwater movement, Infiltration rates, Permeability, Porosity, Runoff.

Finite difference procedures were applied in the solution of time and space dependent differential equations describing moisture potential and content. The problem under consideration was a homogeneous soil profile with a constant water table at 120 cm. Initially the soil moisture was at static equilibrium. Constant infiltration was initiated and continued until dynamic equilibrium was approximated. The resulting moisture content and pressure profiles are presented graphically for a number of time intervals and relative infiltration values. Zones of constant moisture content and pressure are discussed. (Skogerboe-Colorado State)
W74-08273

EFFECTS OF STRAW, CALCIUM CHLORIDE, AND SUBMERGENCE ON A SODIC SOIL,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
B. S. Puttaswamygowda, and P. F. Pratt.
Soil Science Society of America Proceedings, Vol 37, No 2, p 208-212, March-April, 1973. 5 fig, 3 tab, 15 ref.

Descriptors: *Saline soils, *Alkali soils, *Salinity, Leaching, Reduction(Chemical), Soil chemistry, Soil physics, Organic matter, *Anaerobic conditions, *Aerobic conditions, *Calcium chloride.

The effects of straw and CaC12 during 130 days of submergence, and the effects of these amendments under submerged aerobic vs. anaerobic conditions for a period of 30 days were studied. Comparisons of pH, EC, Na, Ca + Mg, K, Fe, the optical density of the water extract, and ESP were used to evaluate the effects of these amendments. The straw and straw + CaC12 treatments had the largest effect in lowering the pH and the ESP, increasing the Na and Ca + Mg concentrations and the EC. Submerged anaerobic conditions had the largest effect on promoting these reactions. The concentration of Fe2 was highest in the straw treatments whereas CaC12 had a depressing effect on the soluble Fe2. The optical density was lowest in the straw plus CaC12 amendment treated soil and the effect of this treatment was larger under anaerobic conditions. Wheat straw under anaerobic conditions caused an increase in the sum of Na plus Ca plus Mg that was about three times greater than the sum of these cations in the straw itself. In combination with CaC12 wheat straw reduced the loss of Ca from solution observed when CaC12 alone was added to soil. (Skogerboe-Colorado State)
W74-08274

DETERMINATION OF WATER INTAKE RATE OF ADVANCE,
Pant Coll. of Technology Pantnagar (India).
For primary bibliographic entry see Field 3F.
W74-08275

CONTROLLING SOIL CRUSTING WITH PHOSPHORIC ACID TO ENHANCE SEEDLING EMERGENCE,
Agricultural Research Service, Kimberly Idaho. Snake River Conservation Research Center.
For primary bibliographic entry see Field 3F.
W74-08279

A COMPUTER MODEL FOR PREDICTING NITRATE AND OTHER SOLUTES OF AGRICULTURAL DRAIN WATER,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 5B.
W74-08280

A NEW APPROACH TO SOIL TESTING: II. IONIC EQUILIBRIA INVOLVING H, K, CA, MG, MN, FE, CU, ZN, NA, P, AND S,
Pennsylvania Agricultural Experiment Station, University Park.
D. E. Baker.
Soil Science Society of America Proceedings, Vol 37, No 4, p 537-541, July-August, 1973. 6 tab, 24 ref.

Descriptors: *Soil chemistry, *Ions, *Soil tests, Salinity, Soil analysis, Soil investigations, Soil properties, Soil science.

Several experiments were conducted in an effort to modify a new approach to soil testing in which the equilibrating or testing solution contains each element for which the soil is being tested. This report includes results for modification which caused 15 soils to differ more with respect to test levels of Mn, Fe, Zn, Cu, S, and P without substantially changing their rankings for K, Ca, and Mg. Modifications included the incorporation of a preservative, a flocculating agent, a pH buffer, DTPA, and several additional elements to maintain a relatively constant activity coefficient for each element in different soils. Results concluded that the adsorption equilibria soil test can be used successfully to test for several elements. The approach for calculating soil requirements is given for P. Although the test shows promise by indicating soil differences, additional calibration data will be required prior to routine use of the method. (Skogerboe-Colorado State)
W74-08281

EFFECT OF PHOSPHATE SALTS AS SATURATING SOLUTIONS IN CATION-EXCHANGE CAPACITY DETERMINATIONS,
Chile Univ., Santiago.
E. B. Schalscha, P. F. Pratt, T. Kinjo, and A. J. Amar.
Soil Science Society of America Proceedings, Vol 36, No 6, p 912-914, November-December, 1972. 3 tab, 19 ref.

Descriptors: *Cation exchange, *Soil chemistry, Salinity, *Phosphates, Soil physics, *Saline soils.

Cation-exchange capacities with KCl or NaNO3 in volcanic ash soils varied from 6 to 18 meq/100 g whereas CEC with KH2PO4 varied from 78 to 188. Cation-exchange capacities with NaH2PO4 and Na NO3 were 28 and 6, respectively, for an alfisol and 12 and 2, respectively, for an oxisol. The ratios of CEC with H2PO4(-) as compared to Cl(-) or NO3(-) varied from about 4 to 30. The effect of the H2PO4(-) is explained as a result of neutralization of positive charge in the soil with a simultaneous release of negative charge. (Skogerboe-Colorado State)
W74-08285

SALINE-SEEP DEVELOPMENT IN DRYLAND SOILS OF NORTHEASTERN MONTANA,
Agricultural Research Service, Sidney, Mont.
For primary bibliographic entry see Field 3C.
W74-08300

TWO-PHASE FLOWS IN POROUS MEDIA,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W74-08303

MAXIMUM CORN YIELDS WITH MINIMUM WATER.
For primary bibliographic entry see Field 3F.
W74-08312

AVAILABLE WATER IN SOME GREAT GROUPS OF MOZAMBIQUE SOILS,
Instituto de Investigacao Agronomica de Mocambique, Lourenco Marquez.
J. F. Serrano.
Agron Mocambicana. Vol 6, No 4, p 259-266. 1972. Illus. English summary.
Identifiers: Alluvial soils, Ferrallitic soils, Fersiallitic soils, Hydromorphic soils, *Mozambique, *Soils types, Regression analysis, Aridic soils, *Clays.

The relations between the available water and the clay and clay + silt percentage in ferrallitic, fersiallitic, aridic, hydromorphic and alluvial soils are reported. All the established regression equations are of the linear form with highly significant correlation coefficients. In all the soils studied there is a straight relation between the available water and the texture.--Copyright 1973, Biological Abstracts, Inc.
W74-08313

CONCENTRATIONS OF NITROGEN, PHOSPHORUS, POTASSIUM, AND TOTAL SOLUBLE SALTS IN SOIL SOLUTION SAMPLES FROM FERTILIZED AND UNFERTILIZED HISTOSOLS,
Florida Univ., Gainesville. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W74-08319

FATE OF NITRATE FROM MANURE AND INORGANIC NITROGEN IN A CLAY SOIL CROPPED TO CONTINUOUS CORN,
Vermont Univ., Burlington. Dept. of Plant and Soil Science.
For primary bibliographic entry see Field 5B.
W74-08321

INCREASED DENITRIFICATION IN SOILS BY ADDITIONS OF SULFUR AS AN ENERGY SOURCE,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W74-08322

A SIMPLE DIGESTION PROCEDURE FOR ESTIMATION OF TOTAL NITROGEN IN SOILS AND SEDIMENTS,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W74-08324

RECYCLING AND RECOVERY OF NITROGEN, PHOSPHORUS, AND POTASSIUM BY COASTAL BERMUDAGRASS: I. EFFECT OF SOURCES AND RATES OF NITROGEN UNDER A CLIPPING SYSTEM,
Texas A and M Univ., Overton. Agricultural Research and Extension Center.
For primary bibliographic entry see Field 5B.
W74-08327

RECYCLING AND RECOVERY OF NITROGEN, PHOSPHORUS, AND POTASSIUM BY COASTAL BERMUDAGRASS: II. UNDER GRAZING CONDITIONS WITH TWO STOCKING RATES,
Texas A and M Univ., Overton. Agricultural Research and Extension Center.
For primary bibliographic entry see Field 5B.
W74-08328

MOVEMENT OF NITRATE NITROGEN IN SOME GRASSLAND SOILS OF SOUTHERN ALBERTA,
Department of Agricultural, Lethbridge (Alberta). Research Station.
For primary bibliographic entry see Field 5B.
W74-08329

CHEMICAL DISTRIBUTION OF RESIDUAL FERTILIZER NITROGEN IN SOIL AS REVEALED BY NITROGEN-15 STUDIES,
Langston Univ., Okla. Dept. of Agriculture.
For primary bibliographic entry see Field 5B.
W74-08332

TRANSIENT RESPONSE OF A LAYERED, SLOPING SOIL TO NATURAL RAINFALL IN THE PRESENCE OF A SHALLOW WATER TABLE: EXPERIMENTAL RESULTS,
Agricultural Research Service, University Park, Pa. Northeast Watershed Research Center.
For primary bibliographic entry see Field 2A.
W74-08375

SOIL POTASSIUM FORMS IN RELATION TO AGROCLIMATIC CONDITIONS IN MAHARASHTRA,
College of Agriculture, Dapoli(India).
S. B. Kadrekar, and M. M. Kibe.
J Indian Soc Soil Sci. Vol 20, No 3, p231-240. 1972.
Identifiers: *Argo-climatic conditions, Climatic-conditions, *India(Maharashtra), *Potassium, Rainfall, *Soil potash.

The average contents of various forms of potash in Maharashtra(India) soils were 6.0, 123.3, 52.7, 668.8, 2346.7 and 6878.5 ppm of water soluble, exchangeable, available, fixed, HCl-soluble and total, respectively. When expressed as percentage of total K2O, they were found to constitute 0.08, 2.01, 0.82, 11.02 and 37.31, respectively. The lateritic and nonlateritic soils of heavy rainfall zones were, in general, found to be poor in different forms of potash whereas the soils of arid to semi-arid zones were higher in all fractions of potash. The soils of transition zone occupied an intermediate position. The available form of potash was highly correlated not only with water soluble and exchangeable forms but also with the fixed and HCl-soluble forms. The clay fraction of the soil was positively correlated with all the forms of potash but significantly so with HCl-soluble and fixed forms.--Copyright 1973, Biological Abstracts, Inc.
W74-08378

RADIAL PARTICLE-SIZE SEGREGATION DURING PACKING OF PARTICULATES INTO CYLINDRICAL CONTAINERS,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2J.
W74-08447

HYDROLYSIS AND AVAILABILITY OF PYROPHOSPHATE IN TROPICAL SOILS,
International Inst. of Tropical Agriculture, Ibadan (Nigeria).
A. S. R. Juo, and H. O. Maduakor.
Soil Sci Soc Am Proc. Vol 37, No 2, p 240-242, 1973, Illus.
Identifiers: *Hydrolysis, Nutrients, *Phosphates, *Tropical soils, *Nigeria, Pyrophosphates, Orthosphates.

Hydrolysis of pyrophosphate in selected Nigerian soils was found to proceed readily in the coarse-textured surface soils with half-lives ranging 4-14 days. Rate of hydrolysis was much slower in the subsoil samples studied. Subsoil samples retained large amounts of pyrophosphate which was resistant to hydolysis. A short-term P uptake experiment showed that pyrophosphate and orthophosphate were of equal efficiency when used as sources of P for plants.--Copyright 1973, Biological Abstracts, Inc.
W74-08498

VERTICAL DISTRIBUTION OF FALLOUT CESIUM-137 IN CULTIVATED SOILS,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 5B.
W74-08644

CONTRIBUTION TO THE STUDY OF THE MECHANISM OF SOIL COMPACTION: THE CONCEPT OF LUBRICATION POTENTIAL, (IN FRENCH),
Institut National de la Recherche Agronomique, Versailles (France). Station Centrale d'Agronomie.
A. Faure.
Ann Agron (Paris). Vol 22, No 5, p 487-513, 1971. Illus. English summary.
Identifiers: Lubrication potential, *Soil compaction, *Sand-clay mixture, Proctor technique.

With the help of materials comprising a mixture of sand and clay, compacted in a mold using the Proctor technique, it was determined that a certain volume of excess water (so called to distinguish if from the water required for swelling of the clay) is necessary to enable maximum sample compaction. This phenomenon can be explained by attributing to the excess water certain lubricating properties. On the basis of simple hypotheses incorporating the concept for a lubrication potential, and giving the sample the role of an excess water reservoir, it was possible to establish laws of variations, as a function of clay content, water content and bulk density when the sample is compacted to the maximum. Three phases were observed: when the clay content is low (below about 10%), the lubricating action is due entirely to the excess water; when the clay content is from 10-18%, the lubricating action of the excess water is complemented by that of the clay present in the sample; if proportion to the clay content, exceeds 18%, the lubricating action of the excess water is complemented by that of the clay present in the sample, but is independent of the clay content. The resulting equations reveal various possibilities of behavior, depending on the swelling properties of the clay used.--Copyright 1973, Biological Abstracts, Inc.
W74-08700

2H. Lakes

APPLICATIONS OF GROWTH AND SORPTION ALGAL ASSAYS,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 5C.
W74-08154

PANEL REVIEW AND COMMENTARY,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 6E.
W74-08172

LIMNOLOGICAL STUDIES AND REMOTE SENSING OF THE UPPER TRUCKEE RIVER SEDIMENT PLUME IN LAKE TAHOE, CALIFORNIA-NEVADA,
California Univ., Davis. Inst. of Ecology.
For primary bibliographic entry see Field 2J.
W74-08302

CONCENTRATIONS OF NITROGEN, PHOSPHORUS, POTASSIUM, AND TOTAL SOLUBLE SALTS IN SOIL SOLUTION SAMPLES FROM FERTILIZED AND UNFERTILIZED HISTOSOLS,
Florida Univ., Gainesville. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W74-08319

CHANGES IN THE HETEROTROPHIC BACTERIA OF VOLTA LAKE, 1968-1971,
Ghana Univ., Legon. Volta Basin Research Project.
For primary bibliographic entry see Field 5C.
W74-08434

INDICATIONS OF THE RELATIONSHIP BETWEEN PHYTO-PLANKTON DISTRIBUTION AND PHOSPHATE LEVELS,
Singapore Primary Production Dept.
For primary bibliographic entry see Field 5C.
W74-08476

DEVELOPMENT OF BLUE-GREEN ALGAL BLOOMS IN NON-ALKALINE WATERS,
Singapore Univ. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W74-08478

CHEMICAL COMPOSITION AND MOLECULAR WEIGHT DISTRIBUTION OF DISSOLVED ORGANIC MATTER PRODUCED BY BACTERIAL DEGRADATION OF GREEN ALGAE,
Dep. Chem., Tokyo Metrop. Univ., Setagaya, Tokyo Jap. Tokyo Metropolitan Univ. (Japan). Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W74-08494

CHANGES OF THE NUMBER OF BACTERIAL CELLS OF DIFFERENT MORPHOLOGICAL GROUPS IN THE WATER AND BOTTOM DEPOSITS OF THE KHAKON RESERVOIR AS A FUNCTION OF THE INTENSITY OF DEVELOPMENT OF BLUE-GREEN ALGAE, (IN UKRAINIAN),
For primary bibliographic entry see Field 5C.
W74-08505

OUR GREAT LAKES.
Wisconsin Univ., Madison. Sea Grant College Program.
September, 1973. 48 p, 23 photo, 2 tab.

Descriptors: *Lake Erie, *Lake Huron, *Lake Michigan, *Lake Ontario, *Lake Superior, *Great Lakes, lakes, bodies of water, Great Lakes region, Eutrophication, Commercial fishing, Freshwater fish, International commissions, Recreation demand, Water pollution effects, Wastewater, Industrial pollution, Erosion, Water pollution, Water pollution sources, Pollution abatement, Recreation.

Thirty million people live and work on the slopes of the Great Lakes Basin. The Great Lakes in some way touch the lives of all these people. However, man's activities in and around the lakes has greatly endangered them. Commercial shipping has declined due to the failure of industry to modernize, and fishing has declined due to pollution. Recreation on the lakes is endangered because of overcrowding at campsites and parks and also because of the increase of coastal construction which has eliminated many areas formerly used for recreation. Pollution, both industrial and agricultural, has aged the lakes far beyond their years. The natural problem of erosion, made more acute by man's activities, has also endangered the lakes, particularly Lake Superior. A vast number of agencies have been created in the United States and Canada to attempt to clean the lakes. Some progress has been made, but lack of coordination among these agencies still presents a major obstacle. The economic and environmental future of the Great Lakes Basin depends on the success of these cleanup efforts. (Flowers-Florida)
W74-08531

STRUCTURE OF ONCORHYNCHUS NERKA (WALB.) ISOLATED POPULATION OF THE AZABACHYE LAKE, (IN RUSSIAN),
Akademiya Nauk SSSR, Vladivostok. Institut Morskogo Biologii.
S. M. Konovalov.
Zh Obshch Biol. Vol 33, No 6, p 668-682, 1972. Illus. (English summary).
Identifiers: Lakes, *Oncorhynchus-Nerka, Spawning, *USSR(Azabachye Lake), *Fish populations.

Analysis of the structure of O. nerka isolated population in Azabachye lake (USSR) revealed 3 hierarchical levels. The population of O. nerka spawning in the lake includes spring and summer races which in turn consist of a great number of sub-isolated groups. Ecological niches being present, the fishes of each sub-isolated population diverge into ecological groups which form the lowest hierarchical level. The advantages of complex-structured populations as compared with panmictic ones are considered.--Copyright 1973, Biological Abstracts, Inc.
W74-08548

NOURISHMENT OF RUTILUS RUTILUS ARALENSIS MORPHA FRAGMITETI BERG. OF THE KAYRAKKUM WATER RESERVOIR, (IN RUSSIAN),
Akademiya Nauk Tadzhikskoi SSR, Dushanbe. Institut Zoologii i Parazitologii.
L. V. Kondur.
Izv Akad Nauk Tadzh SSR Otd Biol Nauk. 3. p 84-90, 1972, Illus.
Identifiers: Reservoirs, Rutilus-rutilus-aralensis-m-fragmite, Season, *USSR(Kayrakkum reservoir), *Fish diets, *Roach.

The nourishment of R. rutilus aralensis morpha fragmiteti found in the Krairakkum water reserve (Tadzhik SSR, USSR) was studied. Intestines (98) 10-24 cm in length were observed. Seasonal, local and measurement differences in the nourishment of this species were noted. The concurrent relationship with other species of fish in the water reserve was explained.--Copyright 1973, Biological Abstracts, Inc.
W74-08663

MICROBIOLOGICAL COMPARISON BETWEEN A FEW AQUATIC MEDIUMS, (IN FRENCH),
Poiters Univ. (France). Unite d'Enseignment et de Recherche de Medicine et Pharmacie.
For primary bibliographic entry see Field 5C.
W74-08669

HETEROTROPHIC POTENTIAL FOR AMINO ACID UPTAKE IN A NATURALLY EUTROPHIC LAKE,
Oregon State Univ., Corvallis. Dept. of Microbiology.; and Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 5C.
W74-08678

BIOLOGY OF ARCTODIAPTOMUS ACUTILOBATUS SARS (COPEPODA, CRUSTACEA) IN THE MINGECHAUR WATER RESERVOIR, (IN RUSSIAN),
A. G. Kasymov, and I. A. Akhmedov.
Izv Akad Nauk Az SSR Ser Biol Nauk. 3, p 95-100, 1971.

Identifiers: Arctodiaptomus-acutilobatus, *Copepoda, Crustacea, *Reproduction, Reservoirs, Sex, *USSR(Mingechaur reservoir).

This small copepod was studied in 1965-1966. As a year-round form it gave 2 maxima during a year--in the spring and fall. Under experimental conditions at a 10.4 deg C water temperature the brood pouch was formed in 55 days, at 7.5 deg C in 64 days, but at 20.7 deg C in only 30-31 days. Average number of eggs in 1 brood pouch was 8. In the summer, the copepod gave dormant eggs. Each female produced 6 generations during the propagation period. During the first part of the year females predominated over males in the Mingechaur water reservoir, then the sex ratio leveled off gradually, and beginning with June the cycle was reversed. This phenomenon was also observed in Dec.--Copyright 1973, Biological Abstracts, Inc.
W74-08683

2I. Water In Plants

CHARACTERISTIC USE OF GENETIC PRINCIPLES IN THE CLASSIFICATION OF NORTH KAZAKHSTAN FORESTS ON THE ANCIENT CRUSTS OF WHEATHERING AND ON QUATERNARY DEPOSITS, (IN RUSSIAN),
V. N. Biryukov.
Tr Kaz Nauchno-Issled Inst Lesn Koz. 7 p 44-51, 1970.
Identifiers: Aspen, Birch, Brachypodium-Sylvaticum, Calamagrostic, Carex, Classification, Crusts, Festuca-Ovina, Filipendula, *Forests, *Genetic principles, Glycyrrhiza, Grass, Lysimachia, Minerals, Pine, *Quaternary deposits, Rubus-Saxatilis, *USSR(Kazakhstan), *Weathering.

An enumeration of forest types, including the basic characteristics of the growing conditions is given. Among the primeval stand types are the Calamagrostis-Rubus saxatilis-pine forests (on the summits and the upper parts of the ridges), Calamagrostis-Glycyrrhiza-pine (on the runoff ravines in the plains), Brachy-podium sylvaticum pine (the medium and the lower parts of the ridges), Festuca ovina-pine (the interridge depressions), Filipendula-Lysimachia-pine (slightly drained ridge trains), forb-grass pine (sinkholes), as well as forb-berry and forb birch forests and Carex-Filependula aspen forests formed on saline soils. The possible successions of stand types are shown. The hydrological regime of individual habitats is the most important factor the formation of the forest vegetation; next in importance is the mineral salt content.--Copyright 1973, Biological Abstracts, Inc.
W74-08182

CONSIDERING IRRIGATED GRASS. TAKE A TIP FROM NEW MEXICO.
For primary bibliographic entry see Field 3F.
W74-08282

AQUATIC ORGANISMS FROM SELECTED SITES ALONG THE PROPOSED TRANS-ALASKA PIPELINE CORRIDOR, SEPTEMBER 1970 TO SEPTEMBER 1972,
Geological Survey, Anchorage, Alaska.
J. W. Nauman, and D. R. Kernodle.
Basic-Data Report, 1974. 23 p, 1 fig, 3 tab, 12 ref.

Descriptors: *Aquatic animals, *Aquatic life, *Alaska, Sampling, Monitoring, Water pollution effects, Pipelines, Data collections, Water quality.
Identifiers: *Trans-Alaska pipeline, Aquatic organisms.

Biological data were collected along the proposed trans-Alaska pipeline corridor from Prudhoe Bay to Valdez including the terminal site at Port Valdez. Benthic invertebrates and other miscellaneous aquatic organisms were collected in 314 samples including artificial substrate, Surber, Ekman dredge, dip net, and 10-rock samples from 62 sites (33 streams, 3 lakes, and 1 fjord-type estuary). The data provide a basis for evaluating naturally occurring and man-induced changes of water quality along the proposed trans-Alaska pipeline corridor. The alteration of normal faunal composition and abundance of benthic invertebrates can provide an indicator of adverse environmental change. (Knapp-USGS)
W74-08369

GENERALIZATION OF SPAWNING AND REARING DISCHARGES FOR SEVERAL PACIFIC SALMON SPECIES IN WESTERN WASHINGTON,
Geological Survey, Tacoma, Wash.
M. R. Collings.
Open-file report, 1974. 39 p, 7 fig, 7 tab, 16 ref.

Descriptors: *Salmon, *Washington, *Fisheries, *Discharge(Water), *Spawning, Fish reproduction, Fish establishment, Life cycles, Commercial fish.

Equations can be used to estimate stream discharges desirable for spawning and rearing by fall chinook, spring chinook, sockeye, coho, pink, and chum salmon in western Washington. Preferred spawning discharge in the discharge that will provide the maximum area for salmon spawning. Spawning-sustaining discharge is a smaller flow such that the percentage reduction in spawnable area equals the percentage reduction in discharge, but is not less than 75% of the preferred discharge. Rearing discharges are based on the shape of the stream channel. Regression equations were developed between (1) preferred and spawning-sustaining discharges for each salmon species, (2) preferred and spawning-sustaining discharges and the basin and stream-channel parameters for each salmon species, (3) rearing discharges and the basin and stream-channel parameters, and (4) mean spawning-sustaining and mean preferred spawning discharges and the basin and stream-channel parameters. The empirical equations determined for the generalization of the spawning and rearing discharges given in this report represent the data presently available. (Knapp-USGS)
W74-08370

WOODY PHREATOPHYTES ALONG THE COLORADO RIVER FROM SOUTHEAST RUNNELS COUNTY TO THE HEADWATERS IN BORDEN COUNTY, TEXAS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 3B.
W74-08371

FOOD NICHE OF GRAUS NIGRA PHILIPPI (OSTEICHTHYES, LABRIDAE),
Chile Univ., Santiago. Laboratorio de Hidrobiologia.
C. Moreno.
Mus Nac Hist Nat Not Mens (Santiago). Vol 16, No 186, p 5-6, 1972.
Identifiers: *Chile, *Food niche, *Graus-Nigra, Labridae, Osteichthyes, Taliepus-Marginatus, Tetrapygus-Niger.

This fish is a common sp. of the sublittoral of central and northern Chile, being found at its greatest density between 1-8 m deep. During the day it hides in irregularities of the rocks and it is hard to find it swimming. It may reach a length of 80 cm and weight of 10 kg, and is thus attractive to sports fishermen. With the collaboration of divers, 13 specimens were obtained at Cartagena and Horcon, and stomach contents were examined. The chief prey were Taliepus marginatus and Tetrapygus niger. Other species less frequently found in the stomach are listed. The data are tabulated.--Copyright 1973, Biological Abstracts, Inc.
W74-08526

AN INVESTIGATION OF THE FOOD OF ONE- TO FOUR-MONTH-OLD SALMON FRY (SALMO SALAR L.) IN THE SULDALSLAGEN, WEST NORWAY,
Zoologisk Museum, Oslo (Norway).
A. Lillehammer.
Norw J Zool, Vol 21, No 1, p 17-24, 1973. Illus.
Identifiers: Chironomidae, Crustacea, *Norway(Suldalslagen), Plankton, Plecoptera, Rivers, Salmo-salar, *Salmon fry, *Fish diets.

In the river Suldalslagen feeding activity of salmon fry starts at a temperature of about 5 deg C and before the yolk has been absorbed. The most important foods were Chironomidae larvae, Plecoptera nymphs and planktonic crustacea. Chironomidae and Plecoptera dominated the fauna associations of the river bottom in June and July. Planktonic Crustacea, which drifted from lake Suldalsvatn, were numerous in Aug., and were the most common food item for the fry in Aug. and Sept. The invertebrates taken for food were of low mean weight, mostly less than 10 mg. In number they formed between 60 and 90% of the total bottom fauna. In terms of biomass they never reached 25% of the total bottom fauna in any one month.--Copyright 1973, Biological Abstracts, Inc.
W74-08679

NOTES ON THE FEEDING RELATIONSHIPS OF TROUT (SALMO TRUTTA L.) AND SALMON (SALMO SALAR L.) IN THE RIVER SULDALSLAGEN, WEST NORWAY,
Zoologisk Museum, Oslo (Norway).
A. Lillehammer.
Norw J Zool, Vol 21, No 1, p 25-28, 1973.
Identifiers: *Norway(River Suldalslagen), Rivers, Salmo-salar, Salmo-trutta, *Salmon, *Trout, *Fish diets.

Investigations were made of the feeding relationships of young salmon and trout in the river Suldalslagen, west Norway. The results indicate the differences in feeding behavior between the 2 species in the river and in the tributary streams. In the river there are only small differences in feeding behavior of salmon and trout fry. In older fish there seem to be greater differences in feeding upon certain food groups, especially planktonic Crustacea.--Copyright 1973, Biological Abstracts, Inc.
W74-08680

THE FISH OF THE SOUTH WESTPHALIAN HIGHLAND INCLUDING THE MOEHNE DAM AND RUHR,
Landesanstalt Fischerei, Kirchhundem (West Germany).
E. Tack.
Decheniana, Vol 125, No 1/2, p 63-77, 1972. Illus.
Identifiers: Anguilla-anguilla, Barbus-barbus, Coregonus-albula, Esox-lucius, *Fish, Gobio-gobio, Highland, Leuciscus-cephalus, Noemacheilus-barbatulus, Phoxinus-phoxinus, *Ruhr River, Rutilus-rutilus, Salmo-gairdneri, Salmo-trutta-F-fario, Salmo-trutta-F-lacustris, Salvelinus-alpinus-salvelinus, Thymallus-thymallus, *West Germany(Westphalia).

A study of the fish species of the South Westphalian Highland (W. Germany) revealed a total of 31 spp. with 20 being autochthonous, and the rest having been imported in the 20th century. The low number of species is primarily due to the lack of standing waters. The upper and middle reaches of the numerous creeks in this area are populated mostly by trout of which Salmo trutta f. fario is a representative species. Other species found in creeks are Rutilus rutilus L., Thymallus thymallus L., Gobio gobio L., Barbus barbus L., Leuscicus cephalus L., Anguilla anguilla L., Phoxinus phoxinus L., Noemacheilus barbatulus L., Salmo gairdneri and Esox lucius L. The Moehne dam accommodates Salmo trutta f. lacustris, Salvelinus alpinus salvelinus L. and Coregonus albula L. which are artificially introduced deepwater species.--Copyright 1973, Biological Abstracts, Inc.

74-08681

TILIZATION PATTERNS OF THE DEEP ATER BY A WEEPING LOVEGRASS CROP RAGROSTIS CURVULA NEES), IN A GOSOL SOIL OF THE PAMPEAN MIARID REGION, (IN SPANISH),
tacion Experimental Regional Agropecuaria, guil (Argentina).
Fagioli.
v Invest Agropecu Ser 3 Clima Suelo. Vol 9, No p 61-70, 1972. Illus. (English summary).
entifiers: Arid lands, Eragrostis-curvula, rasses, Lovegrass, Pampean, *Water consumpn, *Argentina(Pampean region), oils(Regosol), Soil moisture.

ater consumption in the summer reached 4-5 n/day in soils well provided with moisture. eeping lovegrass drew out soil moisture from pths as low as 330 cm. Some longer roots obably grew deeper, but their number was not gh enough to determine measurable moisture riations.--Copyright 1973, Biological Abstracts, c.
74-08682

UDIES ON THE DEVELOPMENT OF THE EMATODE RHABDOCHONA (FILOCHONA) RGENSI MORAVEC, 1968,
skoslovenska Akademie Ved, Prague. razitologicky Ustav.
Moravec.
olia Parasitol (Prague). Vol 19, No 4, p 321-333, 72. Illus.
entifiers: *Filochonk, Habroleptoides-modesta, ayfly, *Nematodes, Noemacheilus-barbatulus, abdochona-ergensi, Subgenus, Helminth, *Fish rasites.

e development of the nematode R. ergensi rasitizing the intestine of the fish Noemacheilus rbatulus was studied experimentally. As interediate hosts only mayfly nymphs Habroleptides modesta (Hag) were employed that were ccessfully infected with eggs of this helminth. In e body of the intermediate host the larvae of R. gensi molt twice before they reach the third inctive larval stage (after 22 days at water temrature 13-15 C) which becomes encysted. The velopment, however, does not cease and the lare in the intermediate host can molt once more d change into the 4th-stage larvae. The infected ayfly nymphs were fed to the fish N. barbatulus. this definitive host the larvae of R. ergensi olted once more (the 4th molt), before they atined maturity; the male developed within 20 ys, juvenile females within 33 days, the depositg of mature eggs was observed after 43 days.-opyright 1973, Biological Abstracts, Inc.
74-08684

ANGE EXTENSIONS OF CORBICULA ANILENSIS (PHILIPPI) IN THE ATLANTIC RAINAGE OF THE UNITED STATES,
cademy of Natural Sciences of Philadelphia, Pa.
L. H. Fuller, and C. E. Powell, Jr.
autilus. Vol 87, No 2, p 59, 1973.
entifiers: *Atlantic coastal region, *Corbiculaanilensis, Drainage, *United States, Delaware iver, Savannah River, Pee Dee River.

orbicula manilensis is newly recorded from the avannah, Pee Dee, and Delaware river systems in e Atlantic drainage of the USA.--Copyright 973, Biological Abstracts, Inc.
74-08685

TUDIES OF THE HELMINTH FAUNA OF ORWAY, XXVI: THE DISTRIBUTION OF YATHOCEPHALUS TRUNCATUS (PALLAS) N THE INTESTINE OF BROWN TROUT ALMO TRUTTA L.),
ologisk Museum, Oslo (Norway).
. Halvorsen, and S. MacDonald.
Norw J Zool. Vol 20, No 4, p 265-272,1972. Illus.
Identifiers: *Brown trout, Cripidostomummetoecus, *Cyathocephalus-Truncatus, Distribution, *Helminth fauna, Intestine, *Norway, Salmo-Trutta, *Fish parasites.

C. truncatus attached preferentially in the anterior caeca of the intestine of the brown trout, S. trutta. Site selection was particularly marked in the small group of caeca which lie dorsally to the intestine in an area adjacent to the bile duct opening. In trout parasitized only by digenean Cripidostomum metoecus the anterior caeca were again the preferred site.--Copyright 1973, Biological Abstracts, Inc.
W74-08699

2J. Erosion and Sedimentation

ECOLOGICAL HISTORY OF WETLANDS,
Yale Univ., New Haven, Conn. Dept. of Biology.
For primary bibliographic entry see Field 2L.
W74-08165

EROSION CONTROL ON HIGHWAY CONSTRUCTION.
National Academy of Sciences, Washington, D.C. Highway Research Board.
For primary bibliographic entry see Field 4D.
W74-08178

CONCEPTS OF CONSERVATION TILLAGE SYSTEMS USING SURFACE MULCHES,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W74-08277

SEDIMENTOLOGY AND BAR FORMATION IN THE UPPER KICKING HORSE RIVER, A BRAIDED OUTWASH STREAM,
Illinois Univ., Chicago. Dept. of Geological Sciences.
N. D. Smith.
Journal of Geology, Vol 82, No 2, p 205-223, March 1974. 17 fig, 24 ref. NSF Grant GA-28727.

Descriptors: *Sedimentology, *Braiding, *Glacial drift, *Alluvial channels, *Canada, Sedimentary structures, Sedimentation, Sediment sorting, Gravels, Sands, Silts, Mud, Sand bars.
Identifiers: *Kicking Horse River(BC), Outwash.

Bar formation and sediment distribution patterns were examined in a 4-mile braided reach of the upper Kicking Horse River at Field, British Columbia, which is mainly supplied by meltwater from icefields. Marked diurnal variations in discharge, suspended sediment concentration, and water temperature occur during peak summer melting periods when rates of sediment transport and bar formation are greatest. Bed material is mostly limestone and dolomite gravel which undergoes rapid fining in the downstream direction. Gravel bars occurring in a wide variety of shapes and sizes are the dominant bed forms. Most exposed braid bars have undergone complex depositional and erosional histories and rarely show simple or consistent patterns of grain size or structures, either internal or superficial. Active bars with simple histories and predominantly depositional morphologies are termed unit bars. Four general unit bar forms are recognized in the Kicking Horse, with a variety of intermediate forms existing among them; longitudinal, transverse, point, and diagonal. The first three generally form parallel to channel flow; they tend to fine downstream, fine upward, and consist of finer-grained material than adjacent channels. Growth may be downstream or sideways, depending on characteristics of local flow and channel morphology. Diagonal bars form with long axes oblique to flow and appear to lack the grain-size trends of the other unit bar forms. Stratification is mostly massive or horizontal. (Knapp-USGS)
W74-08297

MINERALOGY OF SURFACE SEDIMENTS FROM THE PANAMA BASIN, EASTERN EQUATORIAL PACIFIC,
Oregon State Univ., Corvallis. School of Oceanography.
G. R. Heath, T. C. Moore, Jr., and G. L. Roberts.
Journal of Geology, Vol 82, No 2, p 145-160, March 1974. 13 fig, 23 ref. ONR Contract N00014-67-A-039-0007.

Descriptors: *Clay minerals, *Bottom sediments, *Pacific Ocean, *Mineralogy, Distribution patterns, Ocean currents, Illite, Kaolinite, Currents(Water), Sediment sorting.
Identifiers: *Panama Basin, Chlorite.

Sediments of the Panama Basin contain more than 90% nonbiogenous components adjacent to Central and South America, but less than 5% in the area west of the Galapagos Islands. The nearshore deposits are quartz-rich, with clay fractions consisting of roughly equal amounts of chlorite, illite, and kaolinite. These sediments are dispersed over distances of several hundred kilometers by currents in waters of intermediate depth (below the photic zone, but not deep enough to be affected by bottom topography), and to a lesser extent by bottom currents that flow through the deepest parts of the basin. In the outer parts of the basin, the nonbiogenous deposits are quartz-poor, with clay fractions dominated by authigenic montmorillonite. Winnowing and lateral reworking at the sea floor, which strongly affect the distribution of biogenous components, have little effect on the patterns of occurrence of the clay minerals. (Knapp-USGS)
W74-08298

SUSPENDED SOLIDS ANALYSIS USING ERTS-A DATA,
Pennsylvania Univ., Philadelphia. Moore School of Electrical Engineering.
H. Kritikos, L. Yorinks, and H. Smith.
Remote Sensing of Environment, Vol 3, No 1, p 69-78, 1974. 6 fig, 4 tab, 19 ref.

Descriptors: *Remote sensing, *Turbidity, *Suspended load, Rivers, Satellites(Artificial), Surveys, Pollutant identification, *Potomac River.

Suspended solids were measured in the Potomac River using data from magnetic digital tapes of the imagery obtained by ERTS-A on September 23, 1972. A statistical analysis of all four bands was carried out. Band III is useful in determining the water-to-land interface. Data on bands II suggest the existence of three distinct types of water--those having low, medium, and high reflectivity. The areas of high reflectivity were identified as containing high concentrations of suspended solids. Areas of low reflectivity were identified as having relatively lower concentrations of suspended solids. A commonly used computer technique with some additional refinements was used to generate thematic maps which identify the above areas and show their geographical distribution. (Knapp-USGS)
W74-08301

LIMNOLOGICAL STUDIES AND REMOTE SENSING OF THE UPPER TRUCKEE RIVER SEDIMENT PLUME IN LAKE TAHOE, CALIFORNIA-NEVADA,
California Univ., Davis. Inst. of Ecology.
C. R. Goldman, R. C. Richards, H. W. Paerl, R. C. Wrigley, and V. R. Oberbeck.
Remote Sensing of Environment, Vol 3, No 1, p 49-67, 1974. 8 fig, 1 tab, 17 ref. EPA Grant DBU 16010 and NSF RANN Grant GI-22.

Descriptors: *Remote sensing, *Aerial photography, Lakes, *Turbidity, Path of pollutants, Suspended load, Nutrients, Eutrophication, *California, *Nevada, Sedimentation, Productivity.
Identifiers: *Lake Tahoe, *Sediment plumes.

The Upper Truckee River sediment plume in Lake Tahoe was studied using aerial photography and simultaneous measurements in the lake. The studies covered river discharge conditions during the snowmelt-runoff period in the spring of 1971. Color and multispectral aerial photography allowed delineation of the extent and relative density of four to five units within each plume. Simple correlation coefficients are high between these units and measures of suspended sediment, dissolved inorganic carbon, and light penetration, as well as measures of primary productivity and heterotrophic activity. Corelations are inconsistent between the above variables and nutrients. Two studies were conducted in the morning and afternoon of a single day; the plume's eastward shift during the day was recorded photographically and with limnological measurements. High correlations between sediment plumes and biological conductivity coupled with evidence that silt particles and associated nutrients stimulate bacterial growth indicate that sediment plumes are accelerating the eutrophication of Lake Tahoe. (Knapp-USGS)
W74-08302

SOME RATES OF GEOMORPHOLOGICAL PROCESSES,
Geological Survey, Washington, D.C.
L. B. Leopold, and W. W. Emmett.
Geographia Polonica, Vol 23, p 27-35, 1972. 3 fig, 3 tab, 3 ref.

Descriptors: *Geomorphology, *Creep, *Mass wasting, *Channel morphology, Slopes, Alluvial channels, Urbanization, Erosion, Sedimentation, *Potomac River.

The rate of movement of soil on hillslopes was measured, especially movement by mass movement or slow gravitational creep. Downhill motion increases slightly with gradient but is less sensitive to gradient than is surface erosion. Where local gradient is less than 15 deg the hillslopes studied do not experience either surface erosion or downslope mass movement. At Cabin John, Md., despite the thick layer of regolith, downhill creep was measurable only in the upper 3 to 6 cm. The amount of this motion was less than the measurement error in 2 out of 6 pits. The amount of movement varied from 0 to 9 mm in 7 years. Changes in the channel of a small perennial stream, Watts Branch, a tributary to the Potomac River, were measured. The land use in the surveyed zone has been pasture. During the 17 years urbanization has encroached on portions of the headwaters. The progressive decrease of channel area can at least in part be attributed to the increased loads of suspended sediment attributed to land opened for construction. The construction of houses has decreased the amount of drainage area devoted to farming, but in 1970 the majority of the area was still farmland. In 17 years the channel has decreased in cross-sectional area on average of 1.7% per year. For those cross sections measured during the full 17 years, the 1970 channel is 0.66 that existing in 1953, a loss of 28 square feet out of an original 83 square feet. Most of this is due to narrowing by the plastering of silt on channel banks. The width-depth ratio has decreased. The streambed elevation has risen 0.4 foot but the channel slope has not changed significantly. The largest lateral movement on any cross section was 20 feet or about one channel width. (Knapp-USGS)
W74-08304

SEDIMENT ROUTING IN IRRIGATION CANAL SYSTEMS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
K. Mahmood.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 100, No IR1, Paper 10401, p 49-67, March 1974. 8 fig, 3 tab, 12 ref, append. US AID Contract, No AID/csd-2162.

Descriptors: *Sediment transport, *Irrigation water, Routing, Sedimentation, Canals, Sediment control, Simulation analysis, Numerical analysis, Bed load.

The routing of bed material load through a branching irrigation canal system may be calculated in such a way as to insure sediment discharge equilibrium. All the sediment entering the system is disposed of with the water. The system equilibrium can be more easily achieved if smaller sediment concentrations are allocated to irrigation diversions from smaller channels. An approximate numerical model predicts the bed material load from farm turnouts. (Knapp-USGS)
W74-08385

CLARKS FORK YELLOWSTONE RIVER REMOTE SENSING STUDY,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
J. F. Ruff, J. W. Keys, III, and M. M. Skinner.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY6, Paper 10584, p 719-729, June 1974. 5 fig, 1 tab, 8 ref.

Descriptors: *Remote sensing, *Sediment transport, *Wyoming, *Montana, Sediment load, Sedimentation, Aerial photography, Infrared radiation, Surveys, Turbidity, Path of pollutants.
Identifiers: *Clarks Fork Yellowstone River(Wyo-Mont).

The Clarks Fork Yellowstone River of Montana and Wyoming was investigated by remote sensing to locate points at which sediment loads enter the river and to estimate the relative magnitude of sediment concentrations in the tributary flows. Remote sensing techniques were selected for the study to provide adequate coverage of a large portion of the river and to evaluate its use in monitoring and studying sediment movements in a river system. The basic procedure for the investigation involved the ground-truth data program to collect physical information from the study area, aerial flights to obtain the necessary color infrared photographs and thermal imagery, and the interpretation and analysis of results from these data collection programs. Aerial color infrared photography and thermal infrared imagery are efficient and practical tools for locating and identifying inflow of sediment-laden water to a river system. (Knapp-USGS)
W74-08386

MECHANISM FOR STREAMFLOW MEANDERING,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W74-08388

RADIAL PARTICLE-SIZE SEGREGATION DURING PACKING OF PARTICULATES INTO CYLINDRICAL CONTAINERS,
Geological Survey, Menlo Park, Calif.
C. D. Ripple, R. V. James, and J. Rubin.
Powder Technology, No 8, p 165-175, 1973. 9 fig, 1 tab, 15 ref.

Descriptors: *Particle size, *Sediment sorting, Soil tests, *Soil investigations, Bulk density.
Identifiers: *Soil packing.

Soil columns produced by deposition and simultaneous vibratory compaction in cylinders were dense and axially uniform but showed significant radial segregation of particle sizes. Similar results were obtained with depositions and simultaneous impact-type compaction when the impacts resulted in significant container bouncing. The procedure, modified to minimize bouncing, produced dense uniform soil columns showing little radial particle-size segregation. Other procedures tested (deposition alone and deposition followed by compaction) did not result in radial segregation, but produced columns showing either relatively low or axially nonuniform density. Radial particle-size segregation is mainly due to vibration-induced particle circulation in which particles of various sizes have different circulation rates and paths. (Knapp-USGS)
W74-08447

EROSION CONTROL AND BANK STABILIZATION IN METROPOLITAN TORONTO-5 YEAR PROGRAMME AND 5 YEAR PROJECT
Metropolitan Toronto and Region Conservation Authority, Downsview (Ontario).
For primary bibliographic entry see Field 4D.
W74-08488

THE NATIONAL SHORELINE STUDY.
Corps of Engineers, Portland, Oreg.
For primary bibliographic entry see Field 2L.
W74-08671

2K. Chemical Processes

SURFACE-WATER AVAILABILITY, COLBERT COUNTY, ALABAMA.
Geological Survey, Tuscaloosa, Ala.
For primary bibliographic entry see Field 4A.
W74-08187

WATER AVAILABILITY, COOSA COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, Ala.
For primary bibliographic entry see Field 4A.
W74-08188

SURFACE-WATER AVAILABILITY, LIMESTONE COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, Ala.
For primary bibliographic entry see Field 4A.
W74-08189

SURFACE-WATER AVAILABILITY, ETOWAH COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, Ala.
For primary bibliographic entry see Field 4A.
W74-08190

THERMODYNAMICS OF SOIL WATER: IV. CHEMICAL POTENTIAL OF SOIL WATER,
National Inst. of Agricultural Sciences, Nishigahara (Japan).
For primary bibliographic entry see Field 2G.
W74-08191

RETENTION AND RELEASE OF APPLIED MOLYBDENUM TO SOILS UNDER PERMANENT WATER-LOGGED CONDITION,
Jawaharlal Nehru Agricultural Univ., Jabalpur (India).
For primary bibliographic entry see Field 2G.
W74-08209

INORGANIC TRANSFORMATION OF ADDED PHOSPHORUS IN SOIL RELATION TO SOIL

CHARACTERISTICS AND MOISTURE REGIME,
Kalyani Agricultural Univ. (India). Dept. of Agricultural Chemistry and Soil Science.
For primary bibliographic entry see Field 2G.
W74-08258

EFFECTS OF STRAW, CALCIUM CHLORIDE, AND SUBMERGENCE ON A SODIC SOIL,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W74-08274

A NEW APPROACH TO SOIL TESTING: II. IONIC EQUILIBRIA INVOLVING H, K, CA, MG, MN, FE, CU, ZN, NA, P, AND S,
Pennsylvania Agricultural Experiment Station, University Park.
For primary bibliographic entry see Field 2G.
W74-08281

EFFECT OF PHOSPHATE SALTS AS SATURATING SOLUTIONS IN CATION-EXCHANGE CAPACITY DETERMINATIONS,
Chile Univ., Santiago.
For primary bibliographic entry see Field 2G.
W74-08285

GROUND WATER QUALITY EFFECTS ON DOMESTIC WATER UTILIZATION,
Univ. of Alaska College. Inst. of Water Resources.
For primary bibliographic entry see Field 5B.
W74-08287

RECORDS OF WATER WELLS, SPRINGS, OIL- AND GAS-TEST HOLES, AND CHEMICAL ANALYSES OF WATER FOR THE MADISON LIMESTONE AND EQUIVALENT ROCKS IN THE POWDER RIVER BASIN AND ADJACENT AREAS, NORTHEASTERN WYOMING,
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 4B.
W74-08296

ELECTROANALYTICAL STUDIES OF METHYLMERCURY IN AQUEOUS SOLUTION,
Hercules Research Center, Wilmington, Del.
For primary bibliographic entry see Field 5A.
W74-08362

RECONNAISSANCE OF THE CHEMICAL QUALITY OF SURFACE WATERS OF THE RIO GRANDE BASIN, TEXAS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 5B.
W74-08373

SOIL POTASSIUM FORMS IN RELATION TO AGROCLIMATIC CONDITIONS IN MAHARASHTRA,
College of Agriculture, Dapoli(India).
For primary bibliographic entry see Field 2G.
W74-08378

A SIMPLY CONSTRUCTED AND ADJUSTABLE MERCURY VAPOR CELL MOUNT,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7B.
W74-08379

USE OF HYDROCHEMISTRY FOR INTERPRETING GROUND-WATER FLOW SYSTEMS IN CENTRAL NEVADA,
Nevada Univ., Las Vegas. Desert Research Inst.
For primary bibliographic entry see Field 2F.
W74-08453

CARBONATE COMPENSATION DEPTH: RELATION TO CARBONATE SOLUBILITY IN OCEAN WATERS,
California Univ., Los Angeles. Dept. of Geology.
S. Ben-Yaakov, E. Ruth, and I. R. Kaplan.
Science, Vol 184, No 4140, p 982-984, May 31, 1974. 2 fig, 11 ref.

Descriptors: *Calcite, *Saturation, *Sea water, *Water chemistry, On-site investigations, Carbonates, Calcium carbonate, Solubility.
Identifiers: Carbonate saturometer.

The intermediate water masses of the central Pacific Ocean are close to saturation with respect to both calcite and local carbonate sediment. The carbonate compensation depth, located at about 3700 meters in this area, appears to represent a depth above which waters are essentially saturated with respect to calcite and below which waters deviate toward undersaturation with respect to calcite. The study was conducted in two adjacent areas, one south of the Hawaiian Islands chain and the other about 1300 km northeast of the islands. Direct determinations of CaCO3 solubility were conducted with an in situ carbonate saturometer. (Knapp-USGS)
W74-08582

WATEQ, A COMPUTER PROGRAM FOR CALCULATING CHEMICAL EQUILIBRIA OF NATURAL WATERS,
Geological Survey, Menlo Park, Calif.
A. H. Truesdell, and B. F. Jones.
Journal of Research of the U.S. Geological Survey, Vol 2, No 2, p 233-248, March-April 1974. 4 tab, 76 ref.

Descriptors: *Computer programs, *Water chemistry, Water analysis, Equilibrium, Solutes, Aqueous solutions, Thermodynamics, Water quality, Chemical analysis, Temperature, Hydrogen ion concentration, Oxidation-reduction potential.

The computer program, WATEQ, calculates the equilibrium distribution of inorganic aqueous species of major and important elements in natural waters using the chemical analysis and in situ measurements of temperature, pH, and redox potential. From this model, the states of reaction of the water with solid and gaseous phases are calculated. Thermodynamic stabilities of aqueous species, minerals, and gases were selected from a careful consideration of all available experimental data. The program is written in PL-1 for IBM 360 computers. (Knapp-USGS)
W74-08606

RATES OF SALT SOLUTION IN THE PERMIAN BASIN,
Geological Survey, Denver, Colo.
F. A. Swenson.
Journal of Research of the U S Geological Survey, Vol 2, No 2, p 253-257, March-April 1974. 1 fig, 13 ref.

Descriptors: *Salts, *Sodium chloride, *Leaching, *Radioactive waste disposal, Karst hydrology, Groesticides, Environmental effects, Aquatic environment, Aquatic animals, Aquatic plants, Estuarine environment.
Identifiers: Seeding oil spills, Bacterial seeding, Crude oils, Pollutant effects, Marine environment, Freshwater environment.

Thirty-two papers constitute the proceedings of the workshop which was held to determine the present status of knowledge concerning the use of microorganisms in facilitating oil biodegradation, to assess future areas of investigation, to promote cooperative research projects, and to promote exchange of information. Papers are separately abstracted. (See W74-08610 thru W74-08641) (Sinha - OEIS)
W74-08608

WATER: A COMPREHENSIVE TREATISE. VOLUME 1. PHYSICS AND PHYSICAL CHEMISTRY OF WATER.
For primary bibliographic entry see Field 1A.
W74-08665

WATER: A COMPREHENSIVE TREATISE. VOLUME 2. WATER IN CRYSTALLINE HYDRATES: AQUEOUS SOLUTIONS OF SIMPLE NONELECTROLYTES.
For primary bibliographic entry see Field 1B.
W74-08666

WATER: A COMPREHENSIVE TREATISE. VOLUME 3. AQUEOUS SOLUTIONS OF SIMPLE ELECTROLYTES.
For primary bibliographic entry see Field 1B.
W74-08667

POTENTIOSTATIC COULOMETRIC DETERMINATION OF VANADIUM, VANADIUM-MANGANESE AND VANADIUM-IRON MIXTURES AND THE INFLUENCE OF CHROMIUM ON THE PROCESS,
Exeter Univ., (England). Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W74-08674

BIOLOGICAL METHODS FOR THE ASSESSMENT OF WATER QUALITY. A SYMPOSIUM PRESENTED AT THE SEVENTY-FIFTH ANNUAL MEETING, JUNE 26-29, 1972.
American Society for Testing and Materials, Philadelphia, Pa.
For primary bibliographic entry see Field 5A.
W74-08675

2L. Estuaries

PROCEEDINGS: FIRST WETLANDS CONFERENCE, JUNE 20, 1973,
Connecticut Univ., Storrs. Inst. of Water Resources.
T. Helfgott, M. W. Lefor, and W. C. Kennard.
Available from the National Technical Information Service as PB-232 430; $5.75 in paper copy, $1.45 in microfiche. Conference held at Storrs, Connecticut. Connecticut University Institute of Water Resources Report No 21, December 1973. 199 p, 4 append, 48 ref. OWRR A-999-CONN(14).

Descriptors: *Wetlands, Protection, Hydrology, Soils, *Ecosystems, Geology, Biology, *Tidal marshes, *Connecticut, Environment.
Identifiers: *Inland wetlands, *Environmental policy, Delineation, Holistic view.

The conference, emphasizing inland wetlands, brought together experts in geology, hydrology, soils, water chemistry, floristic and faunistic biology with other ecosystems researchers and with social and political scientists, policy makers and interested laymen. They reviewed what is known on wetlands as well as the limitations of each approach. The general conclusion of this conference was that wetlands are a part of the larger ecosystem and that each worker had contrasting views and different definitions indicating the need for a holistic view of the environment. This would result in a comprehensive definition of wetlands which will be useful in developing policies for effective delineation and protection of such areas. (See W74-08158 thru W74-08172)
W74-08157

THE CONNECTICUT TIDAL WETLANDS SURVEY,
Connecticut Univ., Storrs. Systematic and Evolutionary Biology Section.
For primary bibliographic entry see Field 6E.
W74-08158

THE CONNECTICUT TIDAL WETLANDS SURVEY,
Connecticut Inland Wetlands Project, Middletown.
For primary bibliographic entry see Field 6E.
W74-08159

INLAND WETLAND SOILS,
Connecticut Agricultural Experiment Station, New Haven.
For primary bibliographic entry see Field 2G.
W74-08160

WETLAND GEOLOGY,
Connecticut Univ., Storrs. Dept. of Geology and Geography.
R. F. Black.
In: Proceedings of First Wetlands Conference, Storrs, Connecticut, June 20, 1973: Connecticut University Institute of Water Resources Report No 21, p 42-63, December 1973. 11 fig, 4 tab.

Descriptors: *Wetlands, *Connecticut, *Hydrogeology, *Glaciation, Pleistocene epoch, Swamps, Marshes, Tidal marshes, Sea level, Water levels, Geology, Ecology, Environment.

The geological framework of the wetlands of Connecticut is described. In Connecticut, wetlands are a continuum from the saline areas of the coast, through the brackish estuaries and tidal flats, into the freshwater wetlands of the interior. The first wetlands were formed immediately upon deglaciation of the southeastern part of the State perhaps 15,000 or 16,000 years ago. The rest of the State was clear of ice by 12,500 years ago. None of the present coastal wetlands, however, appeared until after 7,000 years ago when rising ocean waters approached present levels. Moreover, most of those initial coastal wetlands did not begin to assume characteristics similar to what we see today until after 3,000 years ago. (See also W74-08157) (Knapp-USGS)
W74-08161

INLAND WETLANDS AND GROUND WATER IN EASTERN CONNECTICUT,
Connecticut Univ., Storrs. Dept. of Geology.
For primary bibliographic entry see Field 2F.
W74-08162

WETLAND HYDROLOGY,
Geological Survey, Hartford, Conn. Water resources Div.
J. A. Baker.
In: Proceedings of First Wetlands Conference, Storrs, Connecticut, June 20, 1973: Connecticut University Institute of Water Resources Report No 21, p 84-99, December 1973. 3 fig, 2 tab.

Descriptors: *Wetlands, *Connecticut, *Hydrogeology, Marshes, Swamps, Water table, Aquifers, Till, Glacial drift, Surface-groundwater relationships.

Wetlands are defined as land areas covered with shallow water or subject to intermittent flooding and subsequent slow drainage and which, generally, are characterized by an accumulation of organic matter. Most wetlands in the northeast are areas of groundwater discharge. Wetlands, by storing flood water, may reduce peak discharge, and evapotranspiration of water from wetlands can reduce total streamflow. Wetlands in Connecticut under natural conditions are areas of groundwater discharge. Probably the primary physical hydrologic benefit of wetlands to man is the reduction of peak discharge of streams. A classification of wetlands based on this function would be of great benefit for decision making. (See also W74-08157) (Knapp-USGS)
W74-08163

THE ECOLOGICAL ROLE OF INLAND WETLANDS,
Connecticut Coll., New London. Dept. of Botany.
W. A. Niering.
In: Proceedings of First Wetlands Conference, Storrs, Connecticut, June 20, 1973: Connecticut University Institute of Water Resources Report No 21, p 100-109, December 1973.

Descriptors: *Wetlands, *Ecology, *Hydrogeology, *Connecticut, Streamflow, Water balance, Evapotranspiration, Productivity, Water pollution control, Recreation, Ecosystems.

Probably no set of ecosystems has been more ruthlessly treated as wastelands than the inland wetlands. Filling, draining, and dredging have been practiced nationwide. In Connecticut no precise data are available on wetland losses, but the toll has been severe. In addition to filling for residential and commercial developments, highway construction and solid waste disposal have all had a major impact on the freshwater wetlands of the State. Floodplains are characterized by alluvial soils and are periodically flooded. Marshes, swamps and bogs are sites usually underlain by silty or peaty soils where the water table is at or near the surface throughout much of the year. Marshes are dominated by soft-stemmed herbaceous plants such as cattails. Wooded swamps in Connecticut are dominated by red maple. Bogs constitute a distinctive wetland type usually characterized by evergreen trees and shrubs underlain by peat deposits. One of the most significant roles of wetlands may be their ability to remove pollutants from the water flowing through them. Further destruction of wetlands can only intensify the difficult problem of preserving a high level of environmental quality. Freshwater marshes and swamps are among the most productive biological systems. Wetlands also provide a great recreational outlet. Hunting is still an important form of recreation in Connecticut. Wetlands should be incorporated into the untouched, open spaces of every town, thus becoming a part of the commitment to open lands. (See also W74-08157) (Knapp-USGS)
W74-08164

ECOLOGICAL HISTORY OF WETLANDS,
Yale Univ., New Haven, Conn. Dept. of Biology.
M. B. Davis.
In: Proceedings of First Wetlands Conference, Storrs, Connecticut, June 20, 1973: Connecticut University Institute of Water Resources Report No 21, p 113-122, December 1973. 2 fig.

Descriptors: *Wetlands, *Ecology, *Connecticut, *Sedimentation, Water pollution effects, Water pollution sources, Water pollution control, Environment, Path of pollutants.

Sediment accumulation is characteristic of wetlands. The chemical contents of the sediments reflect the concentrations of these same constituents in the wetland itself; and the remains of animals and plants preserved as fossils reflect numbers and kinds of organisms in the wetlands and on the surrounding landscape. In Connecticut, wetlands have had a complex history, including disturbance by the extensive agriculture of the early 19th century, recovery in some areas as farms were abandoned, and renewed pollution in recent years as the population has increased. The sedimentary record of these changes provides the documentation needed to adopt sensible protective measures. (See also W74-08157) (Knapp-USGS)
W74-08165

INSECTS (CHRYSOPS FLIES) IN CONNECTICUT SALT MARSHES,
Connecticut Agricultural Experiment Station, New Haven.
J. F. Anderson.
In: Proceedings of First Wetlands Conference Storrs, Connecticut, June 20, 1973 Connecticu University Institute of Water Resources Repo No 21, p 125-132, December 1973.

Descriptors: *Wetlands, *Connecticut, *Insec behavior, Insect control, Ecology, Ecosystem Environment.
Identifiers: *Deer flies.

The encroachment of man upon salt marshes an wetlands is associated with insect problems, illus trated by this study of biting flies and man in Con necticut. The marsh provides all the requisites fo the maintenance of populations of deer flies. Es sentially, these are suitable rendezvous sites fo mating, suitable sites for the deposition of eggs and a suitable medium for the growth and surviva of the juvenile forms. The uplands near wetland are often not only residential but also a broke woodland. The roads and sidewalks are often linec with trees as are the yards surrounding the houses Flies rest on the foliage, and at certain times of th day they drop to lower levels when suitable host pass by their resting sites. The number of flie landing on man in the wooded area was signifi cantly higher than in all other sampling sites. (Se also W74-08157) (Knapp-USGS)
W74-08166

LEGAL ASPECTS OF WETLANDS PROTECTION--LIMITS OF THE POLICE POWER,
For primary bibliographic entry see Field 6E.
W74-08167

INLAND WETLANDS FROM THE ADMINISTRATORS VIEWPOINT--BASED ON EXPERIENCES WITH CONNECTICUT'S INLAND WETLANDS AND WATER COURSES ACT,
Connecticut Dept. of Environmental Protection, Hartford.
For primary bibliographic entry see Field 6E.
W74-08168

THE SOIL CONSERVATION AND ITS ROLE IN WETLAND MANAGEMENT FOR CONNECTICUT,
Soil Conservation Service, Storrs, Conn.
For primary bibliographic entry see Field 6E.
W74-08169

FEDERAL POLICY TOWARDS WETLANDS,
Environmental Protection Agency, Edison, N.J. Federal Water Programs.
For primary bibliographic entry see Field 5G.
W74-08170

INDUSTRIAL ASPECTS OF WETLAND USES,
Northeast Utilities Service Co., Hartford, Conn. Environmental Planning Coordination.
For primary bibliographic entry see Field 6E.
W74-08171

PANEL REVIEW AND COMMENTARY,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 6E.
W74-08172

A PARAMETRIC STUDY OF WATER RESOURCE VARIABLES IN A DELTA REGION OF SOUTH LOUISIANA...BAYOU LAFOURCHE VOLUME I - TECHNICAL DISCUSSION, VOLUME II - APPENDICES,
Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
For primary bibliographic entry see Field 5B.
W74-08289

PREDICTING REAERATION COEFFICIENTS FOR POLLUTED ESTUARY,
New Mexico Univ., Albuquerque. Eric H. Wang Civil Engineering Research Facility.
For primary bibliographic entry see Field 5B.
W74-08307

USER'S GUIDE TO NODC'S DATA SERVICES.
National Oceanographic Data Center, Washington, D.C.
For primary bibliographic entry see Field 10A.
W74-08311

DEFINITION OF CRITICAL COASTAL AREAS AND APPROACHES TO STANDARDS FOR MANAGEMENT,
South Carolina Wildlife and Marine Resources Dept., Charleston.
E. A. Laurent, R. R. Wilkinson, T. E. Lewis, and E. L. Cheatum.
Report of the Governor's Conference on Marine Resources, p 15-25, December 17, 18, 1973, Charleston, South Carolina. 11 p, 2 tab.

Descriptors: *Coastal marshes, *Coasts, *Coastal engineering, *Zoning, *Land use, Planning, Standards, State governments, Natural resources, Water utilization, Economic feasibility, Optimum development plans, Environmental effects, Environmental control, Social values, Legal aspects, Regulation.
Identifiers: *Coastal zone management.

Coastal zone management deals with a set of resources whose total quantity is relatively fixed and whose overall quality for many uses is generally eroding. The critical areas concept is much like a zoning or taxing policy, that has been put forward to supercede the market system in allocating coastal resources. In essence, the critical area concept attempts, by allocating to the state strong management powers over a given area, to internalize the diseconomies arising from the use of that area. In other words, the role of critical areas in coastal zone management is to provide for present and anticipated demands that are not reflected adequately in the market system. General considerations in establishing criteria for designating critical areas do exist. A critical area should meet an obvious public need and should aid in avoiding the conflicts that presently plague coastal areas. The criteria should include the economic, social and environmental impacts of the decision, and should also consider the reversibility of a particular use of the coastal zone. Standards which should be employed in management of such critical areas are suggested. (Ritchie-Florida)
W74-08532

LOUISIANA MOVES TOWARD COASTAL ZONE MANAGEMENT.
Louisiana State Univ., Baton Rouge. Sea Grant Legal Program.
For primary bibliographic entry see Field 6E.
W74-08537

FINAL REPORT ANALYZING COASTAL AND MARINE LAW TO DEVELOP AN AUTHORITY FOR COASTAL ZONE MANAGEMENT,
Texas Law Inst. of Coastal and Marine Resources, Houston.
For primary bibliographic entry see Field 6E.
W74-08544

DISTRIBUTION OF FLUORIDE IN WATERS OF TOKYO BAY,
Nagoya Univ. (Japan). Water Research Lab.
For primary bibliographic entry see Field 5B.
W74-08549

COASTAL ZONE MANAGEMENT ACT OF 1972.
For primary bibliographic entry see Field 6E.
W74-08581

RICHARDSON BAY EFFLUENT DILUTION STUDY--A WORKING PAPER.
Environmental Protection Agency, San Francisco, Calif. Region IX.
For primary bibliographic entry see Field 5B.
W74-08604

BACTERIAL DEGRADATION OF PETROLEUM MATERIALS IN LOW TEMPERATURE MARINE ENVIRONMENTS,
Rhode Island Univ., Kingston. Dept. of Plant Pathology-Entomology.
For primary bibliographic entry see Field 5B.
W74-08626

HYDROCARBON BIODEGRADATION IN ALASKAN WATERS,
Alaska Univ., College. Inst. of Marine Sciences.
For primary bibliographic entry see Field 5B.
W74-08627

MICROBIAL ECOLOGY AND THE PROBLEM OF PETROLEUM DEGRADATION IN CHESAPEAKE BAY,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W74-08628

HYDROCARBONS OF SUSPECTED POLLUTANT ORIGIN IN AQUATIC ORGANISMS OF SAN FRANCISCO BAY: METHODS AND PRELIMINARY RESULTS,
California Univ., Berkeley. Naval Biomedical Research Lab.
For primary bibliographic entry see Field 5B.
W74-08630

THE IMPACT OF OIL ON MARSHLAND MICROBIAL ECOSYSTEMS,
Louisana State Univ., Baton Rouge. Dept. of Food Science.
For primary bibliographic entry see Field 5C.
W74-08631

THE RELATIVE CHANGES IN N-ALKANE COMPOSITION IN SURFACE WATER SLICKS,
Florida State Univ., Tallahassee. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W74-08633

ESTUARINE MICROBES AND ORGANOCHLORINE PESTICIDES (A BRIEF REVIEW),
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Environmental Research Lab.
For primary bibliographic entry see Field 5B.
W74-08634

COASTAL ECOSYSTEMS. ECOLOGICAL CONSIDERATIONS FOR MANAGEMENT OF THE COASTAL ZONE,
Conservation Foundation, Washington, D.C.
J. Clark.
Available from The Conservation Foundation, Publications Dept. 1717 Massachusetts Ave, N.W., Washington, DC 20036, $4.00 paper copy. Coastal Ecosystems. Ecological Considerations for Management of the Coastal Zone, March 1974. 191 p, 80 fig, 10 tab, 126 ref. NOAA-04-3-158-68.

Descriptors: *Ecosystems, Coasts, Estuaries, *Ecology, *Land use, *Conservation, *Management, *Environmental effects, Environment, Resource development, Aquatic plants, Aquatic animals, Water quality, Water pollution, Resources, Shore protection.
Identifiers: Environmental impact, Coastal waters, Shorelands, *Coastal ecosystems.

Environmental management of coastal waters and shorelands has as one of its fundamental goals the maintenance of coastal ecosystems in their best condition, or at the level of best achievable ecosystem function, which usually means as near to the natural condition as possible. Whatever its specific goals may be an environmental management program must embrace whole ecosystems. Any attempt to manage separately one of the many interdependent components of a complex ecosystem will very likely fail. So would any attempt to control any one source of environmental disturbance to the system without controlling others. The ecosystem defined must embrace a complete and integral unit, one that includes a coastal water basin (or basins) and the adjacent shorelands to the extent they have significant influence on coastal waters. Development adjacent to estuarine waters will require exceptionally vigorous management attention. For this reason we have given a higher degree of attention to estuaries than to ocean water areas. Many of the principles applying to marine estuaries will be found to apply to the ecosystems of the Great Lakes, not specifically addressed here. (Sinha-OEIS)
W74-08642

DIFFICULTIES AHEAD FOR OREGON REGARDING ESTUARY REGULATIONS, CONTROL AND PROTECTION,
Oregon State Dept. of Environmental Quality, Portland.
L. B. Day.
In: Proceedings 2nd Annual Technical Conference on Estuaries on the Pacific Northwest, March 16-17, 1972, Oregon State Univ., Corvallis (Engineering Experiment Station Circular No. 44), p. 50-54.

Descriptors: *Estuaries, *Protection, *Comprehensive planning, Decision making, Environment, Zoning, Coasts, Management.
Identifiers: Coastal zone.

Estuaries and coastal zones represent one of a country's most valuable resources. Their many uses which include navigation, water supply, waste discharge, and fisheries, may lead to an excessive exploitation. Regional planning, however, does not necessarily mean that the resultant area development will be based on sound ecological planning. Indeed, land use plans can actually abuse the environment. What is needed is a conservation plan which seeks to protect the productivity and fragility of land through an explicit consideration of the ecological, biological, and physical capacities and limitation of the natural system. Experiences in regional planning in Yaquina Bay, Oregon are utilized to provide an example of comprehensive planning. The Bay faced a myriad of problems typically found in estuaries. On the recommendations of the governor's office, the county commissioners created the Yaquina Bay Task Force. As a result of detailed studies, the Task Force developed a comprehensive plan which covered water, sewer, and land use. In 1971 the plan was codified through a zoning ordinance. A second benefit arising from the planning process is the increased public awareness generated. Once the plan was developed, local people recognized that their interests were being protected not encroached upon. (See also W74-07491) (Schroeder-Wisconsin)
W74-08670

THE NATIONAL SHORELINE STUDY,
Corps of Engineers, Portland, Oreg.
H. D. Herndon.
In: Proceedings 2nd Annual Technical Conference on Estuaries on the Pacific Northwest, March 16-17, 1972. Oregon State Univ., Corvallis (Engineering Experiment Station Circular No. 44), p 55-58, 1 fig.

Descriptors: *Erosion, *Seashores, *Shore protection, Beach erosion, Federal government, Erosion control, Public lands, Washington, Oregon, Management, Estuaries, Costs, Sands, Dunes, Pacific Northwest U.S.

The recently completed National Shoreline Study is discussed and its findings for the Pacific Northwest examined. The study can be broken down into three categories: shore erosion inventories; shore protection plans; and shore management guidelines. It indicates where erosion occurs, what remedial actions may be involved and their respective costs; and location and ranking urgent problem areas. In the third category, the type of assistance that is provided to state and local authorities to create and implement coast and shoreline programs, guidelines are suggested for the creation of land-use regulation in coastal areas and coastal areas where little uncertainty exists are identified. The regional inventory of Oregon reveals that 165.5 miles of ocean and estuarine shorelines experience erosion problems; 58.5 miles of ocean shoreline and 5.5 miles estuarine shorelines experience sufficient difficulties to require remedial action. For Washington 77.5 miles of ocean shoreline and 29 miles of estuarine shoreline are experiencing erosion problems, with 2.5 and 5 miles respectively requiring remedial actions. Three areas in Oregon--Clatsop Spit at the mouth of the Columbia River, Bayocean Peninsula at Tillamook Bay, and the mouth of Siuslaw River were found to require remedial action to maintain navigation. (See also W74-07491) (Schroeder-Wisconsin)
W74-08671

TECHNICAL AND ECONOMIC ISSUES IN THE WATER QUALITY MANAGEMENT OF YAQUINA BAY,
Oregon State Univ., Corvallis. Dept. of Agricultural Economics.
H. H. Stoevener, J. B. Stevens, and H. F. Horton.
In: Proceedings 2nd Annual Technical Conference on Estuaries of the Pacific Northwest, March 16-17, 1972. Oregon State Univ., Corvallis (Engineering Experiment Station Circular No 44), p 93-108, 6 fig, 11 tab, 10 ref. WP-00107. Sea Grant 2-35187.

Descriptors: *Decision making, *Input-output analysis, *Waste disposal, *Economic impact, Methodology, Value, Industries, Sport fishing, Pulp wastes, Estuaries, Water pollution control, Aesthetics, *Oregon.
Identifiers: Yaquina Bay(Ore), Transfer costs.

A methodology which identifies alternative pollution control measures and their impacts on the economic and environmental base of a region is suggested and its data requirements utilized Yaquina Bay, Oregon as the empirical setting. The economic base of the region centers around tourism, commercial and recreational fishing, and timber products production. Environmental concerns in the Bay during the late 1950's, the subject matter of this study, centered on the potential impact of effluent from a proposed Kraft mill (KME). The study initially assumes that the bay is free of pollution and evaluates the direct and indirect benefits arising from the recreational resources. Alternative KME disposal methods were then evaluated by engineers. Assuming that the effluent would be disposed through dilution, biologists predicted the loss of economic organisms. The economists converted these loss functions into economic losses based on human responses to a fishing success-effort relationship. Using this approach the best disposal method could then be determined. Conclusions were drawn as to the ability of the decision maker to implement pollution arrangements through existing institutional arrangements. (See also W74-07491) (Schroeder-Wisconsin)
W74-08672

THE BRACKISH WATER CLAM RANGIA CUNEATA AS INDICATOR OF ECOLOGICAL EFFECTS OF SALINITY CHANGES IN COASTAL WATERS,
Texas A and M Univ., College Station. Dept. of Biology.
For primary bibliographic entry see Field 5C
W74-08676

RESEARCH TO DETERMINE THE ENVIRONMENTAL RESPONSE TO THE DEPOSITION OF SPOIL ON SALT MARSHES USING DIKED AND UNDIKED TECHNIQUES.
Skidway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5C.
W74-08677

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

REVERSE OSMOSIS AND ULTRAFILTRATION - A SURVEY OF AUXILIARY APPARATUSES AVAILABLE IN THIS FIELD (UMGEKEHRTE OSMOSE UND ULTRAFILTRATION - EIN UEBERBLICK UEBER DIE AUF DIESEM GEBIET VERFUEGBAREN APPARATIVEN HILFSMITTEL),
Alfa-Laval A.B., Tumba (Sweden).
For primary bibliographic entry see Field 5D.
W74-08218

MANUAL FOR CALCULATION OF CONVENTIONAL WATER TREATMENT COSTS,
Control Systems Research, Inc., Arlington, Va.
I. C. Watson.
Available from the National Technical Information Service as PB-226 791/AS; $3.75 in paper copy, $1.45 in microfiche. Office of Saline Water Report INT-OSW-RDPR-74-917, March 1972. 77 p, 58 fig, 10 tab, 18 ref. (Prepared for Montana Water Resources Board). OSW Contract 14-01-0001-2727.

Descriptors: *Water treatment, *Water costs, *Desalination plants, *Municipal water, *Montana, Waste water treatment, Softening, Iron, Activated carbon, Filtration, Coagulation, Chlorination, Feasibility studies.
Identifiers: *Water treatment costs, Iron removal.

The report is based on supplemental work done in connection with the OSW sponsored study on the Feasibility of Desalting Municipal Water Supplies in Montana - OSW R and D Report No. 783. It provided the necessary basis for estimating the cost of conventional water supplies which was needed for realistic comparison with the cost of desalting. The report updates and provides additions to the cost estimating information found in OSW R and D Report No. 257 (Desalting Cost Calculating Procedures, May 1970) and No. 555 (Manual of Procedures and Methods for Calculating Comparative Costs of Municipal Water Supply from Saline and Conventional Water Sources in Texas, November 1966). It is intended for municipal rather than industrial applications. Water treatments for which cost estimates are given include: (1) Coagulation, sedimentation and filtration; (2) Softening by lime-soda; (3) Iron and manganese; (4) Activated carbon; (5) Chlorination; (6) Defluoridation; (7) Microstraining. (OSW)
W74-08333

REVERSE OSMOSIS MEMBRANE FILTERS FOR SEAWATER PRETREATMENT,
General Atomic Co., San Diego, Calif.
G. E. Foreman, and S. S. Kremen.
Available from the National Technical Information Service as PB-227 802/AS; $5.75 in paper copy, $1.45 in microfiche. Office of Water Report INT-OSW-RDPR-74-926, February 1974. 47 p, 13 fig, 10 tab, 4 ref. OSW Contract 14-30-3094.

Descriptors: *Demineralization, *Desalination, *Membrane processes, Pilot plants, *Reverse osmosis, *Sea water, Filters, Economic feasibility, *Feasibility studies, *California.
Identifiers: Spiral-wound elements, Cellulose acetate, Economic analysis, Pretreatment(Sea water), San Diego(Calif).

The objective was to establish the technical and economic feasibility of two-stage seawater systems utilizing low pressure spiral elements in a combined pretreatment/first-stage desalting step. Spiral-wound elements containing selected membranes were fabricated and tested on San Diego Bay water, and the effectiveness of low-pressure pretreatment elements was evaluated by testing high-pressure spiral elements. Low pressure elements provided nominal water fluxes of 13 gal/ft2-day with negligible salt rejection at 50 to 180 psi, 20% rejection at 250 psi, and 50% rejection at 500 psi. These elements responded well to the chemical flushing techniques used during testing. Economic analysis based on a plant having a size in the million gallon per day scale indicated that potable water could be obtained from seawater at an initial cost ranging between $1.25 and $1.50/1000 gallons. (OSW)
W74-08334

BRACKISH WATER DESALTING, TESTING AND EVALUATION PROCEDURES WITH MOBILE TEST FACILITY,
Burns and Roe Construction Corp., Paramus, N.J.
E. Ewoldsen, and P. M. Mothes.
Available from the National Technical Information Service as PB-227 451/AS; $11.75 in paper copy, $1.45 in microfiche. Office of Saline Water, Report INT-OSW-RDPR-74-921, January 1974. 160 p, 63 fig, 29 tab. OSW Contract 14-30-2858.

Descriptors: Desalination, *Desalination processes, Membrane processes, *Membranes, Pilot plants, Reverse osmosis, Saline water, Electrodialysis, Ion transport, *Arizona, *Brackish water, Testing, *Test wells, Water treatment.
Identifiers: Hollow fine fibers, Formamide membranes, Cation and anion membranes, Spiral wound membranes, Tubular membranes, Pretreatment methods, Cellulose triacetate membranes, DuPont Permeator, Gila Valley(Ariz), Pretreatment.

A mobile brackish water test facility was operated at Well No. 8 in the South Gila Valley approximately 5 miles from Yuma, Arizona. The tests conducted were part of a continuing program to evaluate the performance of current membrane hardware on brackish water and determine those parameters necessary for design of larger plants. Pretreatment procedures consisted of sand filtration, iron and manganese removal, carbon filtration, lime and lime soda softening, acidification for pH control, and the use of polishing filters. Three types of reverse osmosis modules were evaluated at 60% and 85% recoveries, viz., tubular turbulence promotors, tubular without turbulence promotors and spiral wound elements. Three hollow fine fiber modules were also evaluated. In addition, an Ionics Model 124C electrodialysis unit was tested. (OSW)
W74-08335

DEVELOPMENT OF HIGH-PRESSURE SPIRAL MEMBRANE ELEMENTS FOR SEAWATER DESALINATION,
Gulf Environmental Systems Co., San Diego, Calif.
F. K. Lesan, and R. B. Stackhouse.
Available from the National Technical Information Service as PB-228 061/AS; $4.00 in paper copy, $1.45 in microfiche. Office of Saline Water, Report INT-OSW-RDPR-73-879, September 1973. 80 p, 37 fig. OSW Contract 14-30-2980.

Descriptors: Desalination, *Desalination processes, *Reverse osmosis, *Pilot plants, *Membrane processes, Desalination plants, *Sea water, *California.
Identifiers: Spiral wound modules, High pressure, Cellulose acetate membranes, Brine spacer materials, Tributary configuration, San Diego(Calif).

An 8 inch diameter spiral wound reverse osmosis module element and module, capable of sustained operation at 1000 psi and designed for use in the first pass of two pass reverse osmosis seawater desalting plant, was fabricated and field tested. Each of the elements contain 180 ft2 of active membrane area with the membranes fabricated through use of an Eastman 400-25 cellulose acetate and acetone/formamide system. During field evaluation testing of this module at the OSW San Diego Test Facility for desalting natural seawater, membrane performance was about 30% less than the target goal of 12 gfd producing 3000 ppm TDS or better product water. The unexpectedly low flux experienced was attributable to a lack of sufficient experience and data for very-high salinity feeds. The results should form a strong basis for future work in improving high-salinity membrane performance. (OSW)
W74-08336

ECONOMIC OPTIMIZATION OF THE AVCO CRYSTALLIZATION PROCESS,
AVCO Systems Div., Wilmington, Mass.
J. H. Fraser, and T. A. Olsson.
Available from the National Technical Information Service as PB-226 918/AS, $4.75 in paper copy, $1.45 in microfiche. Office of Saline Water, Report INT-OSW-RDPR-74,916, 114 p, 27 fig, 9 tab, 18 ref. OSW Contract 14-30-2989.

Descriptors: *Desalination, *Optimization, *Crystallization, Economic efficiency, Freezing, Parametric hydrology, *Sea water, Brackish water, *Capital costs, Operating costs, Water costs.

An economic optimization and parametric study has been conducted on a new crystallization process for water desalination. Results indicate that this process should desalinate seawater at a cost which is significantly lower than the costs reported for competitive processes. The process does not require pretreatment of the feed water for most applications. For capacities up to 1 mgd of product, the process equipment can be skid-mounted in automated compact units which reduces field erection costs. Low capital cost is achieved by the use of compact crystallizers, pressurized wash columns and inexpensive materials of construction. The latter is possible due to the low operating temperature of freezing processes. Optimum values of heat transfer surface areas and yield were calculated for minimum water cost. A parametric study of the effects of feed salinity (0.5 to 3.5 percent), feed water temperature (60 to 80F), power cost (0.50 to 1.3 cents/kwhr), fixed charge rate (7 to 13 percent) and plant factor (90 percent) indicated estimated water costs ranging from $0.53 to $1.08 per 1,000 gallons of product water for 1 mgd plants, and installed costs (within the plant boundary) ranging from $0.82 to $0.96 per gallon of daily capacity. In 0.1 mgd plants, the estimated water costs range from $1.64 to $2.54 per 1,000 gallons of product water, and the installed costs range from $2.38 to $2.58 per gallon of daily capacity. (OSW)
W74-08337

DEVELOPMENT OF LARGE SPIRAL MEMBRANE REVERSE OSMOSIS ELEMENTS FOR LOW-COST WATER PURIFICATION AND RECLAMATION,
Gulf General Atomic Co., San Diego, Calif.
J. M. Chirrick, G. E. Foreman, A. B. Riedinger, and W. W. Wight.
Available from the National Technical Information Service as PB-226 023, $4.50 in paper copy, $1.45 in microfiche. Office of Saline Water Report INT-OSW-RDPR-73-901, November, 1973. 115 p, 42 fig, 28 tab, 5 ref. OSW Contract 14-30-3074.

Descriptors: *Desalination, Desalination processes, Membrane processes, *Membranes, Osmosis, *Pilot plants, Saline water, Brackish water, *Reverse osmosis, *Water purification.
Identifiers: Spiral-wound modules, Cellulose acetate membranes.

The objective was to develop a spiral-wound reverse osmosis element, measuring 12 inches in diameter and 36 inches long, for low cost reclamation and purification of low-salinity waters. The results demonstrated the feasibility of a reverse osmosis module measuring 12 inches in diameter and 30 feet in length to produce 100,000 gpd of purified water. (OSW)
W74-08338

BRACKISH WATER DESALTING TESTING AND FIELD EVALUATION WITH REVERSE OSMOSIS AND ELECTRODIALYSIS PILOT PLANTS,
Burns and Roe Construction Corp., Paramus, N.J.
E. G. Kaup.
Available from the National Technical Information Service as PB-225 189; $11.25 in paper copy, $1.45 in microfiche. Office of Saline Water, Report INT-OSW-RDPR-73-899, November 1973. 150 p, 61 fig, 25 tab. OSW Contract 14-01-0001-2245.

Descriptors: *Desalination, Desalination processes, *Electrodialysis, Membrane processes, *Pilot plants, *Reverse osmosis, *New Mexico, Brackish water, *Membranes.
Identifiers: Tubular membranes, Spiral wound membranes, Hollow fine fiber membranes, Roswell(N. Mex).

The report covers work performed during the period July 1969 through June 1971, at the Roswell Test Facility, Roswell, N.M. The Contractor furnished technical and operating personnel to conduct field test evaluation of reverse osmosis and electrodialysis membrane desalting pilot plants. Data are reported on the evaluation of various manufacturers tubular units, spiral wound units, and hollow fine fiber units. A 5000 gpd electrodialysis pilot plant was also tested. The performance characteristics of each unit is summarized. The tests were run using 2000 and 5000 ppm salinity feed waters at ambient temperatures. (OSW)
W74-08339

EVALUATION OF ION EXCHANGE PROCESSES FOR TREATMENT OF MINE DRAINAGE WATERS,
Burns and Roe, Inc., Paramus, N.J.
For primary bibliographic entry see Field 5D.
W74-08341

DEVELOPMENT OF A ONE-PASS HOLLOW FIBER SEAWATER DESALINATION MODULE HAVING A CAPACITY OF 2500-3000 GPD,
Dow Chemical Co., Walnut Creek, Calif.
R. D. Ammons, and H. I. Mahon.
Available from the National Technical Information Service as PB-227 089/AS; $6.50 in paper copy, $1.45 in microfiche. Office of Saline Water, Report INT-OSW-RDPR-74-924, January 1974. 60 p, 18 fig, 18 tab. OSW Contract 14-30-2972.

Descriptors: *Membrane processes, *Desalination processes, Desalination, *Reverse osmosis, Water treatment, Pilot plants, *Sea water.
Identifiers: Hollow fine fiber modules, Cellulose triacetate membranes.

Cellulose triacetate hollow fiber reverse osmosis modules were developed for single-pass desalting of seawater based on scale-up in module size and capacity from a 4-inch diameter, 100 gpd unit to an 8-inch diameter module with a target capacity of 2500 gpd. Seven of the 8-inch diameter hollow fiber cartridges were fabricated. Four of these units were field tested on seawater at the San Francisco Aquarium and at the OSW Test Facility at San Diego. Three of the modules produced potable water (i.e. less than 500 ppm TDS) in a single pass desalting seawater at 700 or 800 psig operating pressure and at recoveries ranging from 10 to 25%. The longest field test of a module producing potable water was 2000 hours. Module producitivities in the field tests were lower than projected because fiber fluxes were low. The highest productivity in the Aquarium tests was 2200 gpd and at San Diego, 1650 gpd. Differences in productivity at the two test sites corresponded to the calculated driving forces and reflected differences in feed water salinity and, in some cases, in operating pressure. (OSW)
W74-08342

DESIGN AND CONSTRUCTION OF A LARGE BRACKISH WATER DESALINATION MODULE,
Dow Chemical Co., Walnut Creek, Calif.
H. I. Mahon, and M. D. Bearden.
Available from the National Technical Information Service as PB-227 177/AS; $8.75 in paper copy, $1.45 in microfiche. Office of Saline Water, Report INT-OSW-RDPR-74-923, January 1974. 102 p, 45 fig, 23 tab. OSW Contract 14-30-2861.

Descriptors: *Membrane processes, *Desalination processes, Desalination, *Reverse osmosis, Water treatment, Pilot plants, *Brackish water, *New Mexico.
Identifiers: Hollow fine fiber modules, Cellulose triacetate membranes, Roswell(N. Mex).

A 30,000 GPD cellulose triacetate hollow fiber reverse osmosis module, for potential use in large-scale brackish water desalting plants, was designed and fabricated. The design selected for final development was based on a two-cartridge canister module utilizing a pressure case, 12 inches in diameter by 10 ft. long. A reverse osmosis test system was also designed and fabricated for shop and field testing of the 30,000 GPD module. The module was subjected to a 60-day continuous field evaluation test at the OSW Test Facility, Roswell, New Mexico on a 3650 ppm TDS brackish feedwater. The purpose of this test was to measure module performance stability at 600 psig operating pressure at the recovery selected to give maximum productivity. Target goals of 30,000 GPD productivity and 90% rejection were exceeded. However, conservative design of the pressure case resulted in lower than target productivity per cubic foot of module volume. Capital and operating cost estimates were also made for large brackish water desalting plants using the 30,000 GPD cellulose triacetate hollow fiber reverse osmosis modules. (OSW)
W74-08343

DEVELOPMENT OF A REVERSE OSMOSIS MODULE FOR WASH WATER RECYCLING IN A SPACE ENVIRONMENT AT 165 DEG F,
Environgenics Systems Co., El Monte, Calif.
For primary bibliographic entry see Field 5D.
W74-08344

FIELD TEST EVALUATION OF THE HIGH TEMPERATURE ELECTRODIALYSIS PROCESS AT WEBSTER, S.D.,
Ionics, Inc., Watertown, Mass.
R. G. Parent, and J. W. Arnold.
Available from the National Technical Information Service as PB-226 673/AS; $6.25 in paper copy, $1.45 in microfiche. Office of Saline Water, Report INT-OSW-RDPR-74-900, January 1974. 71

p, 20 fig, 21 tab, 2 ref. OSW Contract 14-01-001-2101.

Descriptors: *Demineralization, *Desalination plants, *Electrodialysis, Ion transport, Membrane processes, Membranes, Scaling, Pilot plants, *Cost analysis.
Identifiers: *Brackish water, Pretreatment, Stack sliming, Intermembrane spacers, Hi-Temp Stackpack.

The Ionics 10,000 GPD unit was operated at 100F for a total of 5000 hours. The feed water was converted from a salinity of 1200 ppm to a product salinity of 350 ppm at a 90.5% current efficiency and at an average operating current density equal to 70% of the limiting current density value. The D.C. power for this degree of desalting was about 1.5 KWH/1000 gal. Preliminary economics based on the 10,000 GPD pilot unit projected for a 1 MGD facility indicates that the total water costs for operation at 100F would be approximately 90% of the total water costs for equivalent operating performance at a temperature of 50F, provided heat recovery from the blowdown stream is practiced. The value of turbulence promoters at higher temperatures (above 140F) and at higher velocities (above 40 cm/sec) was marginal. (OSW)
W74-08345

FEASIBILITY STUDY ON DESALTING BRACKISH WATER FROM THE MT. SIMON AQUIFER IN NORTHEASTERN ILLINOIS.
Illinois State Water Survey, Urbana.
Available from the National Technical Information Service as PB-230 755/AS $9.50 in paper copy, $1.45 in microfiche. Report INT-OSW-RDPR-74-938, 1973. 120 p, 45 fig, 30 tab, 52 ref. OSW Constract 14-30-2924.

Descriptors: *Desalination, *Artesian aquifers, Sand aquifers, Computer models, Water costs, Conjunctive use, *Feasibility studies, *Illinois, *Water supply, Sandstones, Dissolved solids, Minerals, Water wells, Injection wells, *Brachish water.
Identifiers: Mt. Simon Aquifer(Ill), Chicago(Ill), *Saline water, Aquifer.

The feasibility of desalting saline waters stored in a deep artesian aquifer, the Mt. Simon sandstone in northeastern Illinois, was determined as an aid in meeting projected water deficits in the Chicago region. The aquifer is from 1200 to 2800 feet thick. The total dissolved minerals (TDM) increase gradually with depth from less than 500 mg/l to almost 90,000 mg/l at the bottom of the aquifer. Predictions of the mineral quality of feedwater withdrawn from wells were simulated by digital computer analysis as an aid in desalting plant design. Analysis indicated that feedwater mineral concentration increases non-linearly with time of pumping complicating system design. Important feedwater characteristics for desalting plant design are its high hardness and high concentrations of iron and TDM. Injection of waste brines to the lower part of the aquifer was selected as the most practical disposal method. The reverse osmosis and freezing processes were considered feasible for 1 million gallons per day (mgd) plants. Costs, including wells, transmission lines, desalting plants, and brine disposal, ranged from 133 cents/1000 gal for the 1 mgd reverse osmosis plant to 185 cents/1000 gal for the 5 mgd distillation plant. Costs are much lower (74 cents/1000 gal in one area) when used in conjunction with available potable groundwater. (OSW)
W74-08499

BRINE CONCENTRATION BY ELECTRODIALYSIS, PHASE I,
Dow Chemical Co., Freeport, Tex. Texas Div.
D. R. Jordan, T. Miyake, and W. F. McIlhenny.
Available from the National Technical Information Service as PB-229 128/AS, $5.00 in paper copy, $1.45 in microfiche. Office of Saline Water Report INT-OSW-RDPR-74-930, March 1974. 145 p, 31 fig, 21 tab, 12 ref. OSW Contract 14-30-2676.

Descriptors: *Desalination, *Electrodialysis, *Membrane processes, Descaling, Membranes, Pilot plants, Saline water, Brines, *Brines disposal, Sealing, Ion exchange
Identifiers: Ion exchange memebranes, Cost estimates.

A summary is presented of the development of brine concentration from sea water by electrodialysis. A single stage pilot plant using commercial size electrodialyzer components in a sixty cell pair stack was designed and constructed. The pilot plant was successfully operated to produce brine concentrations in excess of 20 wt-% with high chloride, high sulfate, and mixed chloride-sulfate feed waters. The maximum brine concentration achieved was 25 wt-% with the chloride-sulfate solubility limit in the vicinity of 22 wt-%. The effect of membrane scaling was studied. Calcium carbonate was eliminated by adjusting brine pH to 6.5. Gypsum deposition under operating conditions was studied with and without sodium hexametaphosphate injection to the recirculated concentration stream. The gypsum saturation level, based on the bulk stream concentration of calcium and sulfate was found to be 0.0105 equiv. 2/liter2 in the high chloride brine. The cost of product water was 27 - 32 cents per 1000 gallons. (See also W74-08501) (OSW)
W74-08500

BRINE CONCENTRATION BY ELECTRODIALYSIS, PHASE II,
Dow Chemical Co., Midland, Mich.
D. R. Jordan, M. D. Bearden, R. Komori, and W. F. McIlhenny.
Available from the National Technical Information Service as PB-229 629/AS, $5.75 in paper copy, $1.45 in microfiche. Office of Saline Water, Report INT-OSW-RDPR-74-931, March 1974. 205 p, 30 fig, 34 tab. OSW Contract 14-30-3031.

Descriptors: *Desalination, *Reverse osmosis, *Electrodialysis, Pilot plants, Descaling, Ion exchange, *Membrane processes, Membranes, Brackish water, Gypsum, Brines.
Identifiers: Hollow fine fibers, Spiral-wound membranes, SV-3 electrodialyzer, Ion exchange membranes, Cation exchange. Resins, Sodium hexametaphosphate.

A summary is presented of work to determine the feasibility of concentrating waste brines by electrodialysis (ED) and the beneficial effect of combining reverse osmosis (RO) and ED in a single high recovery desalting system. Laboratory and pilot scale runs were made using a GESCO spiral-wound RO unit and a Dow hollow fine fiber RO unit with the existing Asahi sv-1/2 ED brine concentrator at the Roswell Test Facility. The combined RO-ED system was demonstrated by a 7-week stable operation at a total capacity of 20,000 gpd of product water, a recovery of greater than 90% using 3960 ppm Roswell blended water. A systems analysis of complete water plants incorporating the combined RO-ED system was made. The effect of operating parameters on the cost of water was investigated by computer simulation of three specific test sites. The use of sodium herametaphosphate at a level of 100 ppm allowed operation at 350% of equilibrium saturation in chloride/sulfate waters and nearly 200% in high sulfate waters. (See also W74-08500) (OSW)
W74-08501

HIGH REJECTION HOLLOW FIBER MEMBRANES FOR DESALINATION OF SEA WATER,
Dow Chemical Co., Walnut Creek, Calif.
E. L. Dance, T. E. Davis, and H. I. Mahon.
Available from the National Technical Information Service as PB-226 735/AS, $5.75, in paper copy, $1.45 in microfiche. Office of Saline Water, Report INT-OSW-RDPR-74-922, January 1974. 69 p, 29 fig, 10 tab. OSW Contract 14-30-2799

Descriptors: *Membrane processes, *Desalination processes, Desalination, *Reverse osmosis, Water treatment, Pilot plants, *Sea water, California, Potable water
Identifiers: Hollow fine fiber modules, Cellulose triacetate membranes

Small scale, 100 gpd, reverse osmosis modules using cellulose triacetate hollow fiber membranes were developed for single-stage desalination of seawater. The modules were tested in a once-through system for periods of up to 3600 hours. All the modules produced potable water in a single-stage from seawater with 98.9% to 99.9% salt rejection efficiency. The hollow fiber membrane flux varied from 0.4 to 1.1 gfd at test pressures of 800, 900, and 1000 psig and at recoveries ranging from 15 to 59%. Eight 100 gpd cartridges were tested on seawater at the Steinhart Aquarium in San Francisco, California. The small experimental cartridges were designed for radial flow of the seawater over the outer surface of the fibers. Fiber dimensions were: inside diameter 30 microns and outside diameter 82 to 105 microns. The active length of individual fibers in the cartridges was approximately 7 inches. Design studies were also made of field scale modules with capacities in the range of 3,000 to 4000 gpd. (OSW)
W74-08502

DEVELOPMENT OF A PRODUCTION TECHNIQUE FOR POROUS STAINLESS STEEL TUBES,
Universal Oil Products Co., Dearborn Heights, Mich. Wolverine Tube Div.
For primary bibliographic entry see Field 8G.
W74-08503

IN-SITU FORMED CONDENSATION POLYMERS FOR REVERSE OSMOSIS MEMBRANES,
North Star Research and Development Inst., Minneapolis, Minn.
J. E. Cadotte, and L. T. Rozelle.
Available from the National Technical Information Service as PB-229 337/AS, $5.00 in paper copy, $1.45 in microfiche. Office of Saline Water, Report INT-OSW-RDPR-74-927, November, 1972. 32 p, 8 fig, 11 tab, 4 ref. OSW Contract 14-30-2882.

Descriptors: *Reverse osmosis, *Membranes, *Permselective membranes, *Semipermeable membranes, *Desalination, Seawater, Demineralization, Thin films, Pressure, Fouling, Polymers.
Identifiers: Condensation polymers, In situ-cast membranes.

A significant new nonpolysaccharide membrane has been developed for single stage seawater desalination by reverse osmosis. Designated NS-1, it consists of a polyethylenimine-coated microporous support (polysulfone) reacted with m-tolylene 2,4-diisocyanate fabricated in four steps: (1) preparation of the polysulfone support film; (2) coating of the polyethylenimine (PEI) on the polysulfone support; (3) reaction of the PEI-coated polysulfone support with tolylene diisocyanate (TDI); and (4) heat curing of the resulting composite membrane. The desalination barrier is believed to consist of PEI crosslined with TDI at the PEI surface. Important requirements included a PEI concentration of two percent in the aqueous coating bath and a TDI concentration of 0.5 percent (in hexane) in the reacting solution. The fabrication procedure required only ambient temperatures (except for heat curing) and pressures. The current improved NS-1 membrane has exhibited an average product water flux of 24 plus or minus 1 gfd at 99.5 plus or minus 2 percent rejection under seawater conditions in flat cells (3.5 percent synthetic seawater feed, 1500 psi, 25C). Extended

term tests (800 hours) showed a low flux decline (primarily due to iron oxide fouling). The NS-1 membrane was not degraded and operated without a significant decline in reverse osmosis performance at pH's up to 12; at pH's below 2 the salt rejection dropped sharply. The rejection of urea by this new membrane was high (up to 85 percent at 1500 psi using 1000 ppm urea feed). (OSW)
W74-08504

3B. Water Yield Improvement

FOG MODIFICATION--A TECHNOLOGY ASSESSMENT,
Air Force Cambridge Research Labs., Bedford, Mass.
B. A. Silverman, and A. I. Weinstein.
Available from NTIS, Springfield, Va. 22151 as AD-762 207, Price $3.75 printed copy; $1.45 microfiche. Technical Report 73-0159, March 1973. 38 p, 16 fig, 4 tab, 13 ref.

Descriptors: *Fog, *Ice fog, *Weather modification, Cloud seeding, Cloud physics, Meteorology.
Identifiers: *Fog dispersal.

From the standpoint of modification and prevention of fog, it is most appropriate to classify fog according to its constitution and temperature. Ice fog occurs at temperatures below-30deg C and is composed of ice particles. Supercooled fog is composed of liquid water droplets at temperatures below 0 deg C. Warm fog has, in general, the same drop size and number concentration as supercooled fog, but occurs at temperatures above freezing. Visibility is inversely related to fog particle number concentration, and inversely related to the square of fog particle size. Hence, visibility can be improved by decreasing the number of particles or decreasing the size of the particles by a much smaller amount. Evaporation methods are the most practical of all known fog dispersal techniques. Supercooled fog is the most amenable to dispersal by artificial means. The modification techniques involve the creation of ice particles that grow at the expense of the droplets and eventually fall out. Of the three fog types, warm fog is by far the most common in the midlatitudes where fog causes the greatest problems. The most promising technique, but also the most expensive from the standpoint of initial investment, is the use of ground-based heat to raise the air temperature and thus cause the droplets to evaporate. Ice fog has, so far, resisted all tested methods of dispersal. Prevention can best be achieved by very careful control of the manmade moisture moisture sources that lead to the formation of the fog. (Knapp-USGS)
W74-08177

WOODY PHREATOPHYTES ALONG THE COLORADO RIVER FROM SOUTHEAST RUNNELS COUNTY TO THE HEADWATERS IN BORDEN COUNTY, TEXAS,
Geological Survey, Austin, Tex.
D. C. Larner, R. M. Marshall, A. E. Pfluger, and S. C. Burnitt.
Texas Water Development Board Report 182, April 1974. 19 p, 23 fig, 5 tab, 14 ref.

Descriptors: *Phreatophytes, *Texas, Surveys, *Tamarisk, Mesquite, Evapotranspiration, Reservoirs, Alluvial channels, Water balance.
Identifiers: *Colorado River(Tex).

The increase in saltcedar acreage in the upper Colorado River of Texas corresponds closely with the construction dates of reservoirs along this section of the river. Lake Colorado City was completed in 1949, Lake J. B. Thomas in 1952, and Champion Creek Reservoir in 1959. A decrease in the magnitude and frequency of floods, because of reservoir construction, is favorable to a more rapid spread of phreatophytes in the stream below the reservoir. With the construction of additional reservoirs along the river, the channel area below the reservoirs becomes much more favorable for saltcedar spread. Saltcedar covered approximately 2,000 acres in the upper portion of Lake J. B. Thomas, and saltcedar and willow covered an additional 2,026 acres. Mesquite originally covered 35,025 acres, but 25,663 acres have had brush control work applied - aerial sprayed, root plowed, tree dozed, cabled, or chained - leaving 9,362 acres of untreated mesquite in the flood plain. There were 823 acres of light density, 1,156 acres of medium density, and 7,383 acres of heavy mesquite untreated. Most of the saltcedar acreage is in reservoir areas and along the river channel where a full supply of water is readily available for use. As much as 3 acre-feet of annual water salvage per acre could be expected in these areas. One acre-foot saving per acre could also be made on the bottomlands by replacing the saltcedar with adapted grasses. Based on these findings, it can safely be assumed that at least 10,200 acre-feet of water could be saved annually with control programs. It can be expected that the coverage of saltcedar will expand as the lake levels decline during summer and drought periods and the medium and low flows of the Colorado River continue. (Knapp-USGS)
W74-08371

WATER RESOURCES DEVELOPMENT IN WEST MALAYSIA,
Drainage and Irrigation Dept., Kuala Lumpur, (Malaysia).
Cheong Chup Lim, and Goh Kiam Seng.
In: Water Resources, Environment and National Development--Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 100-102, 1972.

Descriptors: *Water resources development, *Planning, *Water balance, Data collections, Hydrologic data, Streamflow, Rainfall, Irrigation water, Water utilization, Water supply.
Identifiers: *Malaysia.

The annual rainfall in West Malaysia averages 100 inches. However, because of the high potential evapotranspiration which has been estimated to reach nearly 70 inches per annum, the water resources available for use are only moderate. The Northeast Monsoon often brings heavy rains. Continuous heavy rain can exceed 24 inches within 24 hours. The east and northwest coasts of West Malaysia are occasionally subject to droughts up to 3 months' duration. Rivers in West Malaysia are generally short and steep for the greater part of their courses, generally with an absence of natural lakes or storage areas. Due to rapid economic development in recent years, utilization is fast approaching the limit of surface water in many localities. The problems posed by the diminishing uncommitted water resources and the rapid rate of water resources developed call for a rational utilization of water and a concerted effort towards water conservation. This in turn necessitates a total water resources planning approach. Basic to this requirement is a proper inventory of the available surface and groundwater resources, and an account of water resources that have already been committed for various uses. (See also W74-08454) (Knapp-USGS)
W74-08463

THE SEVIER COUNTY WATER PLAN,
Tennessee Dept. of Conservation, Nashville. Div. of Water Resources.
For primary bibliographic entry see Field 6D.
W74-08493

HYDROLOGIC EFFECTS OF PATCH CUTTING OF LODGEPOLE PINE,
National Oceanic and Atmospheric Administration, Fort Collins, Colo.
For primary bibliographic entry see Field 4C.
W74-08603

AN APPRAISAL OF THE GROUNDWATER RESOURCES OF THE UPPER CAPE FEAR RIVER BASIN, NORTH CAROLINA,
Geological Survey, Raleigh, N.C.
For primary bibliographic entry see Field 4B.
W74-08605

3C. Use Of Water Of Impaired Quality

DRAINAGE OBSERVATIONS IN LATIN AMERICA,
Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering.
For primary bibliographic entry see Field 4A.
W74-08268

SALINE-SEEP DEVELOPMENT IN DRYLAND SOILS OF NORTHEASTERN MONTANA,
Agricultural Research Service, Sidney, Mont.
A. D. Halvorson, and A. L. Black.
Journal of Soil and Water Conservation, Vol 29, No 2, p 77-81, March-April 1974. 3 fig, 3 tab, 19 ref.

Descriptors: *Saline soils, *Leaching, *Seepage, Evapotranspiration, *Montana, Percolation, Infiltration, Groundwater movement, Topography, Soil water movement.
Identifiers: *Saline seeps.

The relationship of saline-seep development and growth to precipitation, soil water content, and water use by spring grains in a crop-fallow rotation was studied in northeastern Montana. When precipitation exceeds the amount needed to recharge the soil profile, water percolates below the crop root zone and accumulates above a layer of nearly impermeable, dense clay. Permeable layers of degraded sandstone, siltstone, and lignite conduct the perched groundwater laterally to a point where the water-conducting layers are truncated by glacial till of lower permeability. By capillarity, water moves upward in the till to the soil surface where it evaporates, leaving precipitated salts (Na, Mg, and Ca sulfates) on the soil surface in the seep area. Factors that enhance deep percolation of water below the root zone include above-average annual precipitation, unusually high fall and spring precipitation when evapotranspiration potentials are low, increased use of summer fallow, and improved soil water storage efficency and conservation practices during fallow. Intensive cropping systems, using small grains, grasses, and deep-rooted crops, with minimum summer fallow in flexible crop rotations are needed to prevent loss of soil water by deep percolation and to alleviate the development of saline seeps. (Knapp-USGS)
W74-08300

SALINITY-OZONE INTERACTIONS ON PINTO BEAN: INTEGRATED RESPONSE TO OZONE CONCENTRATION AND DURATION,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
G. Ogata.
Journal of Environmental Quality, Vol 2, No 3, p 400-404, July-September, 1973. 2 fig, 2 tab, 13 ref.

Descriptors: *Salinity, *Air pollution effects, *Air pollution, Plant growth, *Beans, Leaves, *Ozone, Oxidation, Osmotic pressure, Water pollution effects.

This investigation was conducted to determine the integrated effects of concentration and duration of ozone exposure on the injury, growth, and mineral composition of pinto bean during rapid vegetative growth and to evaluate the interactive effects of

salinity. Plants were grown in controlled environment chambers in non-saline and two saline nutrient solution cultures having osmotic potentials of -0.4, -2.4, and -4.4 bars, respectively. Ozone-free plants were compared with plants treated daily for 2 weeks with ozone doses of from 0.15 to 0.90 ppm-hour. Plant injury and reduction in growth were sigmoidal functions of ozone dose. Plant tolerance thresholds were found for both concentration and duration of ozone exposure. Daily exposures above threshold levels produced cumulative injury that progressed from the primary leaves to subsequent trifoliate leaves. Although salinity suppressed plant growth, it extended the tolerance thresholds for duration of ozone exposure and significantly reduced the injury by ozone. Ozone decreased Ca, Mg, K and N contents of the leaves, increased stem contents of these elements, and had relatively little effect on root contents. (Skogerboe-Colorado State)
W74-08330

HEAVY METALS IN AGRICULTURAL LANDS RECEIVING CHEMICAL SEWAGE SLUDGES,
Toronto Univ. (Ontario). Inst. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5E.
W74-08397

3D. Conservation In Domestic and Municipal Use

PROBLEMS ARISING FROM OVER EXPLOITATION OF THE NATURAL WATER RESERVOIR IN THE URBAN DISTRICT OF MILAN (I PROBLEMI POSTI DAL SOVRASFRUTTAMENTO IDRICO DEL SERBATOIO NATURALE NELLA CONURBAZIONE MILANESE),
For primary bibliographic entry see Field 4B.
W74-08354

APPRAISAL OF THE WATER RESOURCES OF EASTERN PALM BEACH COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 4B.
W74-08445

DIFFICULTIES IN PLANNING WATER SUPPLY SCHEMES IN WEST MALAYSIA,
Malaysia Dept. of Water Supply, Kuala Lumpur.
For primary bibliographic entry see Field 6B.
W74-08462

SUMMARY REPORT ON POLLUTION CONTROL IN INDONESIA,
Ministry of Public Works and Electrical Energy, Djakarta (Indonesia). Planning and Urban Development.
For primary bibliographic entry see Field 5G.
W74-08484

EROSION CONTROL AND BANK STABILIZATION IN METROPOLITAN TORONTO--10 YEAR PROGRAMME AND 5 YEAR PROJECT.
Metropolitan Toronto and Region Conservation Authority, Downsview (Ontario).
For primary bibliographic entry see Field 4D.
W74-08488

THE METROPOLITAN TORONTO AND REGION WATERFRONT PLAN, 1972-1976.
Metropolitan Toronto and Region Conservation Authority, Downsview (Ontario).
For primary bibliographic entry see Field 6B.
W74-08489

RIVERFRONT DEVELOPMENT: THE POLITICS OF MASTER PLANNING,
Illinois Univ., Urbana. Inst. of Government and Public Affairs.
D. R. Judd, and R. E. Mendelson.
In: Politics of Urban Planning: The East Saint Louis Experience, University of Illinois Press, Urbana, 1973, p 73-117

Descriptors: *Planning, *Area redevelopment, *Political aspects, *Political constraints, Comprehensive planning, Project planning, Decision making, Government, Legal aspects, Eminent domain, *Illinois.
Identifiers: *Riverfront development, *East St Louis(Ill), Terminal Railroad Association, Railroads.

The 400 acres that comprise the East St. Louis, Illinois riverfront is primarily railroad trackage and wasteland. Although numerous redevelopment plans have been made, none have been implemented. The railroads and a lack of funding have been the major obstacles. Until very recently, the railroads vehemently opposed renewal proposals and refused to give up any of their riverfront land which is owned by the Terminal Railroad Association, and its subsidiary, the Wiggins Ferry Company. Severe financial reverses and the unsuitability of the riverfront for rail needs have tempered their position. However, funds have not been available to purchase land from the railroads or to subsidize their relocation. The municipality of East St. Louis has not been fiscally able to assist in land acquisition site improvement, or land write-down. Requests by East St. Louis for state and federal funding have been rejected. One example of the impact of inadequate resources was the failure to build any of the proposed internal roads, sightseeing roads, or connections with the Great River Road that would make the area accessible, a necessary prerequisite to any development. Other development proposals, ranging in scope from the location of the National Museum of Transport on the riverfront to the city-within-a-city concept of PACE (Progress and Action by Citizens' Efforts) ended in failure. In 1971 a new riverfront planning study by the East-West Gateway Coordinating Council was announced. Its success will depend on political constancy - on whether or not it will be backed by the legal powers and resources of all levels of government. (Hoffman-North Carolina)
W74-08495

WATER AND SEWER SUPPLY DECISIONS: A CASE STUDY OF THE WASHINGTON SUBURBAN SANITARY COMMISSION,
Virginia Univ., Charlottesville.
For primary bibliographic entry see Field 5G.
W74-08497

SYSTEMS PLANNING DESIGN: CASE STUDIES IN MODELING, OPTIMIZATION, AND EVALUATION,
Massachusetts Inst. of Tech., Cambridge. Center for Transportation Studies.
For primary bibliographic entry see Field 6A.
W74-08506

SYSTEMS ANALYSIS OF LARGE-SCALE PUBLIC FACILITIES: NEW YORK CITY'S WATER SUPPLY NETWORK AS A CASE STUDY,
Massachusetts Inst. of Tech., Cambridge. Center for Transportation Studies.
R. de Neufville.
In: Systems Planning and Design: Case Studies in Modeling, Optimization, and Evaluation (Ed. by R. de Neufville and D. H. Marks), Prentice Hall, Inc., Englewood Cliffs, New Jersey, p 30-47 (Chapter 4), 1974. 5 fig, 13 ref.

Descriptors: *Systems analysis, *Design, *Water supply development, *Computer models, *Simulation analysis, Evaluation, *Alternative planning, *Economics, Tunnel design, Reliability, Water distribution(Applied), Optimization, Economies of scale, Institutional constraints, Mathematical models, Networks, New York, Facilities.
Identifiers: Capacity expansion, *New York City, *Cost-effectiveness.

The strengths and weaknesses of systems analysis are explored by means of a case study: the designing of a large-scale civil engineering facility: the billion-dollar additions to New York City's water supply system. Amid disagreement between budgetary authorities and a municipal design agency, the Board of Water Supply, systems analysis were called upon to determine relevant criteria for evaluation, develop system models to explore alternatives, and recommend an economically optimal design and implementation strategy. A five-step iterative process was derived. Alternatives were evaluated utilizing mathematical models of the water supply system which could be used in a computer to explore hundreds of possible configurations. The evaluation was conducted in terms of a cost-effectiveness analysis. Included were a distributional and a reliability objective. The systms analysis indicated that economies of up to 50% were possible over the anticipated cost of the original proposal generated by the traditional engineering design process. Although the planners could choose specifically what kind of design they thought most effective, significant institutional constraints precluded the use of some forms of economically desirable systems. The systems analyst can at best hope to achieve a compromise. (See also W74-08506) (Bell-Cornell)
W74-08507

ANALYSIS OF WATER REUSE ALTERNATIVES IN AN INTEGRATED URBAN AND AGRICULTURAL AREA,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5D.
W74-08510

MUNICIPAL WATER PREFERENCE STATUTES: THE TEXAS WAGSTAFF ACT,
Utah Univ., Salt Lake City. Coll. of Law.
For primary bibliographic entry see Field 6E.
W74-08546

WATER FROM THE COASTAL PLAIN AQUIFERS IN THE WASHINGTON, D.C., METROPOLITAN AREA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 4B.
W74-08597

3E. Conservation In Industry

INDUSTRIAL ASPECTS OF WETLAND USES,
Northeast Utilities Service Co., Hartford, Conn. Environmental Planning Coordination.
For primary bibliographic entry see Field 6E.
W74-08171

PROBLEMS ARISING FROM OVER EXPLOITATION OF THE NATURAL WATER RESERVOIR IN THE URBAN DISTRICT OF MILAN (I PROBLEMI POSTI DAL SOVRASFRUTTAMENTO IDRICO DEL SERBATOIO NATURALE NELLA CONURBAZIONE MILANESE),
For primary bibliographic entry see Field 4B.
W74-08354

SOME USEFUL IDEAS ON WASTE WATER REDUCTION,
Western Electric Co., Inc., New York, N.Y.
For primary bibliographic entry see Field 5D.
W74-08355

PULP, PAPER, AND BOARD IN THE ENVIRONMENT -- PART 8: ENVIRONMENTAL PROBLEMS OF THE WEST GERMAN PULP, PAPER, AND BOARD INDUSTRY.
For primary bibliographic entry see Field 5G.
W74-08405

A 6000 GALLON/TON FINE PAPER MACHINE WATER SYSTEM,
American-Israeli Paper Mills Ltd., Hadera (Israel).
For primary bibliographic entry see Field 5D.
W74-08424

POLLUTION ABATEMENT IN EFFLUENTS FROM CONSTRUCTIONAL FIBERBOARD MANUFACTURE (Z BADAN NAD REDUKCJA OBCIZENIA SCIEKOW W PRZEMYSLE PLYT PILSNIOWYCH),
A. Nowak.
Prace Instytutu Technologii Drewna, Vol 19, No 1/2, p 211-223, 1972. 3 fig, 11 tab, 12 ref. (English summary).

Descriptors: *Pulp wastes, *Waste water(Pollution), *Pollution abatement, *Water conservation, *Water pollution sources, Hydrolysis, Chemical degradation, Neutralization, Acids, Alkalis(Bases), Sodium hydroxide, Wood wastes, Effluents, Biochemical oxygen demand, Chemical oxygen demand, Pulp and paper industry, Europe. Identifiers: Asplund pulp, Fiberboard(Building board), Pulp yield, Wood chips, *Poland.

The wet-process manufacture of fiber building boards by the Asplund method involves steam treatment of wood chips (usually at 170-185 C for 1-15 min), followed by defibration (fiber separation) in a mechanical refiner, and normally yields highly polluted effluents with 5-day BOD of ca. 50 kg oxygen per ton of board. Rather than engaging in costly and unsatisfactory effluent purification trials, efforts in Poland concentrated on reductions of freshwater consumption (from 70-100 to ca. 30 cu m per ton) and on process modifications aimed at minimizing hydrolytic degradation products. This was achieved both in laboratory and industrial experiments by pretreating the chips with NaOH for 0.5-18.0 hr, thereby converting acidic wood components into their water-soluble sodium salts. The addition of 0.5-0.7% NaOH (calculated as sodium oxide, based on oven-dry wood weight) was found to reduce the effluent's COD by 16.3% and its 5-day BOD by 27.2%, at the same time improving the yield of defibrator pulp by ca. 6% without affecting its quality. Higher alkali doses impaired the quality of pulp boards and did not further reduce the effluent's pollution load. (Stapinski-IPC)
W74-08426

POLLUTION OF THE DRAMMENS RIVER BY THE WOOD-PROCESSING INDUSTRY (TREFOREDLINGSINDUSTRIENS UTSLIPP TIL DRAMMENSVASSDRAGET),
For primary bibliographic entry see Field 5B.
W74-08428

SOME RESULTS OF WATER PURIFICATION AT VISCOSE RAYON FACTORIES (NEKOTORYE ITOGI RABOTY VODOOCHISTNYKH SOORUZHENNII PREDPRIYATII VISKOZNYKH VOLOKON),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Iskusstvennogo Volokna, Leningrad (USSR). Leningradskii Filial.
For primary bibliographic entry see Field 5D.
W74-08429

PULP INDUSTRY AND ENVIRONMENTAL PROTECTION (ZELLSTOFF-INDUSTRIE UND UMWELTSCHUTZ),
For primary bibliographic entry see Field 5D.
W74-08436

LAMELLAR SEDIMENTATION OF FIBER-CARRYING WASTE WATERS (LAMELLSEDIMENTERING AV FIBERHOLDIG VANN),
Norwegian Pulp and Paper Research Inst., Oslo.
For primary bibliographic entry see Field 5D.
W74-08437

WATER RESOURCES, ENVIRONMENT AND NATIONAL DEVELOPMENT--VOLUME I: SUMMARY OF PROCEEDINGS, AND VOLUME II: SELECTED PAPERS.
For primary bibliographic entry see Field 5G.
W74-08454

DISPOSAL OF INDUSTRIAL TRADE EFFLUENTS FROM THE FOOD INDUSTRIES,
Singapore Inst. of Standards and Industrial Research.
For primary bibliographic entry see Field 5D.
W74-08468

POLLUTION CONTROL OF DISCHARGES INTO RIVERS, STREAMS AND SEA,
BP Refinery Singapore Pty. Ltd.
For primary bibliographic entry see Field 5G.
W74-08469

PETROLEUM REFINERY EFFLUENT QUALITY CONTROL,
Esso Research and Engineering Co., Linden, N.J.
For primary bibliographic entry see Field 5D.
W74-08473

3F. Conservation In Agriculture

ANIMAL WASTE UTILIZATION FOR POLLUTION ABATEMENT TECHNOLOGY AND ECONOMICS. PHASE II,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W74-08231

OBJECTIVES OF IRRIGATION MANAGEMENT COMMITTEE,
Agricultural Research Service, Fort Collins, Colo.
D. F. Heermann.
Paper No 72-769 presented at Winter Meeting of the American Society of Agricultural Engineers, December 11-15, 1972, Chicago, Illinois. 10 p, 53 ref.

Descriptors: Irrigation, Irrigation practices, *Irrigation programs, *Management, Water management(Applied).

The Irrigation Group of the American Society of Agricultural Engineers has reorganized and established a committee for Irrigation Management. The scope and objectives of the committee are presented. The interaction of the Irrigation Management Committee and other committees in the Society are discussed. The challenge for the new committee is to improve the management and operation of irrigation systems. (Skogerboe-Colorado State)
W74-08264

GROW WHEAT AND GRAIN SORGHUM WITH LESS WATER.
Irrigation Age, Vol 6, No 11, p 7-10, June, 1972.

Descriptors: *Irrigation practices, *Irrigation programs, Soil moisture, Crop response, Irrigation systems, *Wheat, *Grain sorghum, *Texas.

Methods for obtaining maximum yield from limited irrigation water are discussed for wheat and milo. A brief summary is presented of work performed at the Southwestern Great Plains Research Center in Bushland, Texas. Surprisingly good yields from very limited water supplies have been demonstrated. (Skogerboe-Colorado State)
W74-08265

IRRIGATION NUMBER--A NEW TECHNIQUE TO EVALUATE IRRIGATION ADVANCE DISTANCE,
Indian Inst. of Tech., Kharagpur. Dept. of Agricultural Engineering.
G. Sastry, and S. C. Agarwal.
Journal of Agricultural Engineering Research, Vol 18, No 3, p 189-195, September, 1973. 1 fig, 1 tab, 12 ref.

Descriptors: *Irrigation design, *Irrigation engineering, *Irrigation practices, Surface irrigation, Irrigation efficiency, Irrigation systems, *Forecasting.

Prediction of irrigation advance distance for a given set of initial conditions such as slope of land surface, inflow stream per unit top width of flow, infiltration characteristics and hydraulic conductivity of soil bed, is important in order to design efficient surface irrigation systems. A dimensional analysis of variables involved in water advance phenomenon has been made to derive a satisfactory equation. Available data have been analyzed and fitted by least square method of curve fitting to yield an equation of the type $M = A (N) B$. The slope of each curve B is observed to be fairly constant and coefficient A has been related with irrigation number. An irrigation advance function relating these dimensional parameters is proposed. (Skogerboe-Colorado State)
W74-08266

REFLECTANCE DISCRIMINATION OF COTTON AND CORN AT FOUR GROWTH STAGES,
Agricultural Research Service, Weslaco, Tex.
H. W. Gausman, W. A. Allen, R. Cardenas, and A. J. Richardson.
Agronomy Journal, Vol 65, No 2, p 194-198, March-April, 1973. 6 fig, 1 tab, 12 ref.

Descriptors: *Remote sensing, *Reflectance, Infrared radiation, Instrumentation, Surveys, *Corn(Field), *Cotton.

Increasing leaf age of corn within four growth stages had little effect on near-infrared light reflectance whereas mature leaves of cotton had higher near-infrared light reflectance than young leaves. Reflectance was linearly correlated with chlorophyll concentration for the four growth stages of corn at the 550-nm wavelength: the linear correlation of reflectance with chlorophyll for the four growth stages of cotton was significant at the 650-nm wavelength. The largest differences among reflectances of corn leaves of different ages within growth stages occurred when tassels were appearing in the leaf whorls: this may be the best time to discriminate corn from other vegetation with remote sensors. Reflectance differences among cotton leaves within the four growth stages were similar. Spectral wavelength intervals centered aroung the 680-, 850-, 1,650-, and 2,200-nm wavelengths provide for the optimum discrimination of vegetation. (Skogerboe-Colorado State)
W74-08269

INFILTRATION AND ROOT EXTRACTION FROM SUBSURFACE IRRIGATION LATERALS,
Minnesota Univ., St. Paul. Dept. of Agricultural Engineering. Saint Paul.
J. R. Gilley, and E. R. Allred.
Paper No 72-743 presented at Winter Meeting of the American Society of Agricultural Engineers, December 11-15, 1972, Chicago, Illinois. 27 p, 11 fig, 4 tab, 29 ref.

Descriptors: *Irrigation, *Subsurface irrigation, Irrigation practices, Soil moisture, Soil water movement, Soil physics, *Infiltration, Model studies.

An analytical solution to the soil moisture flow equation was used to simulate flow in partially saturated soils during steady infiltration from buried line sources. A series of plane sinks was used to model water consumption by plants. The resulting model was used to determine optimum lateral placement to obtain desired crop extraction patterns. (Skogergoe-Colorado State)
W74-08270

CROP COOLING WITH SPRINKLERS,
Department of Agriculture, Lethbridge (Alberta). Research Station.
E. H. Hobbs.
Canadian Agricultural Engineering, Vol 15, No 1, p 6-8, June, 1973. 3 fig, 1 tab, 15 ref.

Descriptors: *Temperature control, *Sprinkling, Coolants, Water, Temperature, Irrigation practices, Surface irrigation, Sprinkler irrigation, Climates, Potatoes, *Beans, Evaporation control.

Irrigated plots of potatoes and bush beans were sprinkled intermittently with water whenever the ambient air temperature exceeded 80 degrees Fahrenheit. Conventional but low-volume irrigation equipment was used to apply the cooling water at a net theoretical application rate of 0.026 inches per hour. Over a 3-year period and 88 applications this sprinkling rate effectively reduced plant canopy air temperature. The average temperature reduction was 6 Fahrenheit degrees but reductions as large as 16 Fahrenheit degrees occurred. The amount of cooling achieved was dependent upon the weather prevailing during cooling. Humidity exerted the greatest single influence, maximum air temperature was next in importance, and wind was less well related. The multiple regression equations indicate the amount of temperature reduction likely to be achieved with field-type sprinkler irrigation equipment. (Skogerboe-Colorado State)
W74-08271

SOIL MOISTURE PROFILE UNDER STEADY INFILTRATION,
Auburn Univ. Ala. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W74-08273

DETERMINATION OF WATER INTAKE RATE OF ADVANCE,
Pant Coll. of Technology Pantnagar (India).
P. Singh, and H. S. Chauhan.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 16, No 6, p 1081-1084, November-December, 1973. 4 fig, 14 ref.

Descriptors: *Infiltration rates, *Soils, Infiltration, *Infiltrometers, Moisture meters, Infiltration, *Surface irrigation.

The relationship obtained is an attempt to improve existing methods for estimating intake rate in surface irrigation based on rate of water advance data. The comparison of the relationship with experimental data suggests that the cylinder in infiltrometers under-estimate intake rate at small values of time and over-estimate the intake rate at large values of time. The inflow-outflow method also may not represent actual intake rate because of errors due to surface storage. The method based on rate of water advance provides a good estimate of intake rate in surface irrigation. (Skogerboe-Colorado State)
W74-08275

CONCEPTS OF CONSERVATION TILLAGE SYSTEMS USING SURFACE MULCHES,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
H. D. Wittmuss, G. B. Triplett, Jr., and B. W. Greb.
Technical Paper No. 1. Presented at National Conservation Tillage Conference, March 28-30, 1973, Des Moines, Iowa. 14 p, 1 tab, 43 ref.

Descriptors: *Soil conservation, *Erosion, Soil erosion, Water conservation, *Cultivation, Erosion control, Erosion rates.

A brief summary of the need and effects of conservation tillage is presented. Effects on soil erosion of some tillage practices are listed. (Skogerboe-Colorado State)
W74-08277

PROBLEMS AND SCS SPECIFICATIONS FOR LOW HEAD PVC PIPELINES,
Soil Conservation Service, Bozeman, Mont.
For primary bibliographic entry see Field 8B.
W74-08278

CONTROLLING SOIL CRUSTING WITH PHOSPHORIC ACID TO ENHANCE SEEDLING EMERGENCE,
Agricultural Research Service, Kimberly Idaho. Snake River Conservation Research Center.
C. W. Robbins, D. L. Carter, and G. E. Leggett.
Agronomy Journal, Vol 64, No 2, p 180-183, March-April, 1972. 3 tab, 15 ref.

Descriptors: *Soil physics, *Soil aggregates, Soil management, *Sugar beets, Fertility, Phosphorus, Soil structure, Soil treatment, *Crop production.
Identifiers: Soil crusting, *Phosphoric acid.

A study was conducted to determine if spraying dilute phosphoric acid in narrow bands along the seeded rows would increase sugar beet seedling emergence by preventing or minimizing soil crusting and provide the needed nutritional P for crop production. Dilute phosphoric acid was sprayed along rows seeded to sugar beets on a Portneuf silt loam. Several acid concentrations and P rates were applied. Stand counts were made before and after thinning, and P concentrations were measured in sugar beet petioles sampled at three dates during the growing season. Laboratory studies were conducted to determine the effects of the phosphoric acid on soil properties. Applying 69 kg P/ha as dilute phosphoric acid in liquid volumes of 650 to 1,300 liters/ha reduced crusting by increasing aggregate stability in the soil surface, increased sugar beet seedling emergence, and provided the P needed by the sugar beet crop. (Skogerboe-Colorado State)
W74-08279

A COMPUTER MODEL FOR PREDICTING NITRATE AND OTHER SOLUTES OF AGRICULTURAL DRAIN WATER,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 5B.
W74-08280

CONSIDERING IRRIGATED GRASS. TAKE A TIP FROM NEW MEXICO.
Irrigation Age, Vol 6, No 10, p 18-19, 32, 34, 35, May, 1972. 2 fig.

Descriptors: *Grasses, *Range grasses, Wheatgrasses, Switchgrass, Plant groupings, Hay, Pastures, Ranges, *Irrigation, *New Mexico.

Row cropping irrigated grass in Curry County, New Mexico is described. The crop pays dividends when the net return is compared to irrigated wheat and milo. Farmers in the area are literally farming the grass. Several farmers in and around Clovis have records to show $70, $80 and more net profit per acre from irrigated grass. An extensive economic study revealed a net of $7.81 per acre for irrigated wheat and $16.21 per acre for irrigated milo. Most popular grasses to date in the area are Jose Tall Wheatgrass for the cool season pasture and Blackwell Switch Grass for the warm season species. (Skogerboe-Colorado State)
W74-08282

CENTER PIVOT PROBLEMS.
Irrigation Age, Vol 6, No 9, p 38-40, April, 1972. 1 tab.

Descriptors: *Irrigation practices, Surface irrigation, *Sprinkler irrigation, Irrigation systems, Irrigation design, Application equipment.
Identifiers: *Center pivot sprinklers.

The problem associated with center pivot sprinkler systems are outlined. Reasons for not using marginal land are given. A chart for determining chances of success is presented. (Skogerboe-Colorado State)
W74-08283

GATED PIPE AND REUSE SYSTEM.
Irrigation Age, Vol 6, No 9, p 18-20, 45, April, 1972. 2 fig.

Descriptors: *Irrigation practices, Surface irrigation, Furrow irrigation, *Irrigation systems, Irrigation design, *Water reuse, *Pipes, *Nebraska.

The layout of a 160-acre farm irrigation system using gated pipe and a tailwater reuse system is presented. (Skogerboe-Colorado State)
W74-08284

MONITORING FLOOD DAMAGE WITH SATELLITE IMAGERY,
South Dakota State Univ., Brookings. Remote Sensing Inst.
For primary bibliographic entry see Field 4A.
W74-08294

MAXIMUM CORN YIELDS WITH MINIMUM WATER.
Irrigation Age, Vol 7, No 10, p 18-20, 22-23, May, 1973. 1 fig, 4 tab.

Descriptors: *Irrigation practices, *Surface irrigation, Soil moisture, Soil water, Crop response, *Corn(Field), Root zone, *Crop production.

The development of automated irrigation has introduced the possibility of a new concept to irrigation water management. That is, not completely refilling the root zone each irrigation; thereby leaving soil moisture storage capacity within the root zone to take advantage of any rainfall that occurs during the irrigation season. The old recommendation of refilling the root zone each irrigation is wasteful in both fertilizer and water. It is wasteful in that if rainfall occurred soon after the field was irrigated, water would percolate below the root zone carrying soluble nutrients such as nitrates with it. (Skogerboe-Colorado State)
W74-08312

RECOVERY OF N15-LABELED FERTILIZERS IN FIELD EXPERIMENTS,
Illinois Univ., Urbana. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W74-08315

OPERATION AND MAINTENANCE OF IRRIGATION AND DRAINAGE SYSTEMS: SECTION III--OPERATION.
American Society of Civil Engineering, New York. Committee on Operation and Maintenance of Irrigation and Drainage Systems.
For primary bibliographic entry see Field 4A.

W74-08318

UNIFORM IRRIGATION WITH LOW-PRESSURE TRICKLE SYSTEMS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
L. E. Myers, and D. A. Bucks.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 98, No IR3, p 341-346, September, 1972. 2 fig, 7 ref.

Descriptors: *Irrigation systems, *Applications systems, *Orifices, *Irrigation practices, Pipe flow, Water distribution(Applied), Distribution systems, Irrigation design, Irrigation engineering, Irrigation, Irrigation efficiency.
Identifiers: *Trickle irrigation.

Application uniformity from low-pressure trickle irrigation systems can be greatly improved by varying emitter sizes to compensate for friction-induced pressure changes in the lateral pipe. Low-pressure systems using simple emitter sizes suffer from nonuniform emitter because friction-induced pressure changes are a large percentage of total pressure. High-pressure trickle systems alleviate this problem by using high head emitters. Low-pressure systems, using simple emitters, can have several advantages over high-pressure systems in reduced manufacturing and operating costs, larger orifices to reduce clogging, and simpler flow control devices. Comparable application uniformity can be obtained by varying emitter sizes in the low-pressure systems. Procedures for designing low-pressure multiple-emitter size trickle systems by computer or by a simplified computation and graphic method were developed. (Skogerboe-Colorado State)
W74-08323

AGRICULTURAL CHEMICALS IN RELATION TO ENVIRONMENTAL QUALITY: CHEMICAL FERTILIZERS, PRESENT AND FUTURE,
Tennessee Valley Authority, Muscle Shoals, Ala. Div. of Agricultural and Chemical Development.
For primary bibliographic entry see Field 5B.
W74-08325

CHEMICAL AND BIOCHEMICAL CONSIDATIONS FOR MAXIMIZING THE EFFICIENCY OF FERTILIZER NITROGEN,
Agricultural Research Service, Baton Rouge, La.
For primary bibliographic entry see Field 5B.
W74-08326

COMPUTER SIMULATION OF CROP PRODUCTION - POTENTIAL AND HAZARDS,
North Carolina State Univ., Raleigh. Dept. of Agricultural Engineering.
H. D. Bowen, R. F. Colwick, and D. G. Batchelder.
Agriculutral Engineering, Vol 54, No 10, p 42-45, October, 1973. 2 fig, 20 ref.

Descriptors: *Computer models, *Plant growth, *Cotton, Yield equations, *Crop production, Plant populations, *Simulation analysis, *Southwest U.S.

Work completed by various investigators in the field of computer simulation is reviewed. The purpose and progress of Project S-69 is described. A committee from cotton producing states in the Southwest is studying the computer simulation of the growth of cotton plants. Hazards are discussed. (Skogerboe-Colorado State)
W74-08331

RECONNAISSANCE OF THE CHEMICAL QUALITY OF SURFACE WATERS OF THE RIO GRANDE BASIN, TEXAS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 5B.
W74-08373

HYDRODYNAMICS OF SURFACE IRRIGATION-ADVANCE PHASE,
California Univ., Davis. Dept. of Water Science and Civil Engineering.
For primary bibliographic entry see Field 8B.
W74-08384

SEDIMENT ROUTING IN IRRIGATION CANAL SYSTEMS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W74-08385

IMPROVED WATER MANAGEMENT FOR PADDY RICE PRODUCTION IN THE PHILIPPINES,
National Irrigation Administration, Manila (Philippines). Water Management Project.
S. I. Julian.
In: Water Resources, Environment and National Development--Volume II: Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 103-120, 1972. 6 fig, 3 tab.

Descriptors: *Water management(Applied), *Rice, *Irrigation practices, Land management, Irrigation water.
Identifiers: *Philippines.

Improved water management for paddy rice production includes the intergrated processes of diversion, conveyance, regulation, measurement, distribution, and application of the right amount of water at the proper time and removal of excess water from farms to promote increased production in conjunction with improved cultural practices. The Improved Water Management Project for paddy production in the Philippines has 4 distinct objectives: to work out and demonstrate the most suitable water management practices to increase the crop area served; to work out and demonstrate a more suitable cropping pattern to increase productivity; to organize irrigators association for the successful implementation of a well coordinated water distribution; and to adopt the pilot area as a training center for on-the-job training of National Irrigation Administration personnel and farmers. (See also W74-08454) (Knapp-USGS)
W74-08464

RESEARCH ON THE CULTURE OF CERTAIN COMMON MARINE ORGANISMS IN SINGAPORE WATERS,
Singapore Univ. Fisheries Biology Unit.
Ah Kow Tham, Thia Eng Chua, Swee Ling Yang, Chang Man To, and Seng Keh Teng.
In: Water Resources, Environment and National Development--Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 251-255, 1972. 6 ref.

Descriptors: *Fish farming, *Oysters, *Mussels, Algae, Aquiculture, Fish management, Shellfish farming, Artificial substrates, Commercial shellfish, *Copepods, *Rhodophyta, *Shrimp.
Identifiers: *Singapore.

In Singapore, some research effort is devoted to the study of the biology of the more common marine organisms. Some of the problems studied are the diminishing supply of oysters, mussels, certain seaweeds, marine prawns, exotic marine aquarium fish and certain species of marine food fish used for the restaurant trade. The experimental cultivation of Eucheuma spinosum, a local red alga, which is being harvested by fishermen in increasing quantities and exported to the USA, Europe and other developed countries is described. The experimental cultivation of the local green mussel, Mytilus viridis, a local oyster, Crassostrea cucullata and certain marine prawns as well as a marine copepod, Paracalanus crassirostris are also described. (See also W74-08454) (Knapp-USGS)
W74-08477

HYDROLYSIS AND AVAILABILITY OF PYROPHOSPHATE IN TROPICAL SOILS,
International Inst. of Tropical Agriculture, Ibadan (Nigeria).
For primary bibliographic entry see Field 2G.
W74-08498

THE EFFECT OF SOIL MOISTURE ON THE FREE AMINO ACID LEVEL IN WINTER WHEAT, (IN RUSSIAN),
G. A. Rzaev.
Izv Akad Nauk Az SSR Ser Biol Nauk. 2 p 26-31. 1972, Illus.
Identifiers: *Amino acid, *Soil moisture, *Wheat(Winter), Metabolism, Nitrogen compounds, Protein.

Studies of the effect of the soil humidity content on the free amino acid level in winter wheat shows that increased humidity contents cause more radical changes in the synthesis and in the metabolism of nitrogen compounds than reduced humidity levels. Considerable decrease in the protein N content in both vegetative organs and grains due to reduced moisture content was observed.--Copyright 1973, Biological Abstracts, Inc.
W74-08541

NATURAL FORAGE RESERVE OF TURKMEN SSR AND WAYS OF ITS IMPROVEMENT TO DEVELOP SHEEP-RAISING, (IN RUSSIAN),
Desert Inst., Ashkhabad (USSR).
V. N. Nikolaev.
Probl Osvoeniya Pustyn. 6 p 16-22, 1972. (English summary).
Identifiers: *Forage reserves, Protein, *Sheet raising, *USSR(Turkman-SSR), *Droughts.

Of a total of 49.8 million ha, 38.7 are desert ranges and 2.3 are mountainous. Annual grazing capacity is 5.7-6.6 million sheep. The deficiency of water is the main reason of ranges' insufficient utilization. Yield capacity and nutritional value of forage decrease considerably from spring to winter: forage reserves by 2-2.5, forage units by 5, content of digestible protein by 16. The latter causes protein deficiency in the animals. To increase forage reserve it is necessary to organize 15-25 specialized farms on the irrigated lands.--Copyright 1973, Biological Abstracts, Inc.
W74-08547

THE PROBLEMS OF INCREASED LIFE-ACTIVITY OF HYDROPONIC PLANTS, (IN RUSSIAN),
V. V. Kazaryan.
Biol Zh Arm. Vol 25, No 1, p 48-53, 1972. Illus.
Identifiers: Corn(Field), Cucumber, *Hydroponic plants, Sunflower, *Crop response, Organic matter, Nitrogen, Phosphorus, Photosynthesis.

A comparison of sunflower, corn and cucumber plants grown in soil and grown under hydroponic conditions is presented. The development of roots and leaf mass was higher in the hydroponic plants. The roots of plants grown in soil were more branched that the hydroponic ones. However, comparison of N and P content in roots of plants grown under both conditions showed that hydroponic plants contained almost twice as much of these elements. Leaves had a higher photosynthetic activity in the hydroponic plants. The amino acid protein-N and P-containing organic matter content was higher in the hydroponic plants, indicating a higher metabolic activity.--Copyright 1973, Biological Abstracts, Inc.
W74-08688

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

THE USE OF QUESTIONNAIRES IN COLLECTING INFORMATION FOR URBAN FLOOD CONTROL PLANNING,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 6F.
W74-08151

PROBABILISTIC MODELS IN THE DESIGN AND OPERATION OF A MULTI-PURPOSE RESERVOIR SYSTEM,
Univ., of California, Los Angeles. Dept. of Engineering Systems.
S. Arunkumar, and W. W-G. Yeh.
Available from the National Technical Information Service as PB-232 410; $3.25 in paper copy, $1.45 in microfiche. California Water Resources Center, University of California, Davis Contribution No 144, December 1973. Technical Completion Report, 27 p, 2 fig, 10 tab, 20 ref. OWRR A-043-CAL(1).

Descriptors: *Regulation, *Mathematical models, Water utilization, *California, Model studies, *Optimal development plans, Probability, *Multiple-purpose reservoirs, *Reservoir operation, *Reservoir design.

The problem of determining optimal regulation policies for single and multi-reservoir systems is considered. The optimal policies are analytically characterized in terms of certain critical numbers for which upper and lower bounds are obtained. Necessary and sufficient conditions are derived in the case of a single reservoir, for the optimal policies for the finite horizon problem to be also optimal for the infinite planning horizon. These analytical characterizations lead to substantial savings in computation time needed to solve large problems. Numerical results are presented using the theoretical results developed in this report as well as for a reservoir system in California. (Snyder-California)
W74-08153

LOW-FLOW CHARACTERISTICS OF KENTUCKY STREAMS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-08173

A PLAN FOR THE IMPROVEMENT OF THE LOW FLOW DATA NETWORK IN ALABAMA,
Geological Survey, University, Ala.
For primary bibliographic entry see Field 7A.
W74-08175

ROAD LOG AND GUIDE--GEOLOGY AND HYDROLOGY FOR PLANNING, ANCHORAGE AREA.
Geological Survey, Anchorage, Alaska.
Alaska Geological Society Symposium Report, September 1973. 34 p, 22 fig, 16 ref.

Descriptors: *Hydrogeology, *Alaska, *Landslides, *Earthquakes, Artificial recharge, Water pollution control, Erosion, Conferences.
Identifiers: *Anchorage(Alaska).

Following the destructive 1964 earthquake, the need for a better understanding of the physical setting of the Anchorage area of Alaska became apparent. Increased geological and hydrological studies were initiated to provide base-line data so that development of the area might minimize environmental damage. This field trip guidebook highlights some of the problem areas and provides general background information of the geologic and hydrologic setting of the Anchorage area. (Knapp-USGS)
W74-08180

SURFACE-WATER AVAILABILITY, COLBERT COUNTY, ALABAMA.
Geological Survey, Tuscaloosa, Ala.
A. L. Knight, D. M. O'Rear, and J. R. Harkins.
Alabama Geological Survey Map 109, 1972. 5 fig, 1 tab, 1 map, 15 ref.

Descriptors: *Surface waters, *Maps, *Alabama, Streamflow, Reservoirs, Rivers, Water quality, Water balance, Water yield, Data collections, Hydrologic data.
Identifiers: *Colbert County(Ala)

Surface-water information for Colbert County, Alabama, is presented in a map so that a visual appraisal of surface-water availability and comparison with other counties can be made. The average runoff from Colbert County is about 1 mgd per square mile. The Tennessee River, the largest potential source of surface water in the county, has an average flow of 32,800 mgd. Bear and Town Creeks have average flows of 870 and 260 mgd, respectively, at their mouths. The Tennessee River has a median annual 7-day low flow greater than 1,000 mgd. Other streams in the county have median annual 7-day low flows less than 2 mgd except the lower reach of Spring Creek which is greater than 10 mgd. Average monthly flows of streams in the county are 4 to 12 times greater than the recorded lowest monthly flows, and record highest monthly flows are 2 to 8 times greater than average monthly flows. Surface water generally contains less than 130 milligrams per liter dissolved solids. Water temperature ranges from 4 deg C in January to 29 deg C in June, July, and August. (Knapp-USGS)
W74-08187

WATER AVAILABILITY, COOSA COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, Ala.
G. C. Lines, and J. C. Scott.
Alabama Geological Survey Map 111, 1972. 7 fig, 4 tab, 16 ref.

Descriptors: *Surface waters, *Groundwater, *Maps, *Alabama, Streamflow, Reservoirs, Rivers, Hydrogeology, Water quality, Water balance, Water yield, Data collections, Hydrologic data.
Identifiers: *Coosa County(Ala).

Surface-water supplies of 10 million gallons per day or more are available in Coosa County, Alabama, from the lower reaches of Hatchet Creek without storage and larger supplies are available from the impounded backwaters along the Coosa and Tallapoosa Rivers. Supplies of 1 million gallons per day are available from the upper reaches of Hatchet Creek, and from Weogufka, Socapatoy, Weoka, and Swamp Creeks. Ponds are used for agricultural purposes on farms which have intermittent streams and limited groundwater supplies. Surface water is of good chemical quality and is suitable for most uses. Coosa County is underlain by sedimentary, igneous, and metamorphic rocks ranging in age from Precambrian to Triassic. Rock type, depth of wells, thickness of saprolite, and topographic location all affect the availability of groundwater in the county. Supplies of 20 to 50 gallons per minute can be obtained from individual wells penetrating diorite, amphibolite, chlorite schist, and schist with fractured quartz veins. The chemical quality of groundwater is generally good; however, the iron content and hardness of water are objectionable in some areas of the county. (Knapp-USGS)
W74-08188

SURFACE-WATER AVAILABILITY, LIMESTONE COUNTY, ALABAMA.
Geological Survey, Tuscaloosa, Ala.
J. R. Willmon, D. M. O'Rear, and J. R. Harkins.
Alabama Geological Survey Map 110, 1972. 5 fig, 1 map, 1 tab, 17 ref.

Descriptors: *Surface waters, *Maps, *Alabama, Streamflow, Reservoirs, Rivers, Water quality, Water balance, Water yield, Data collections, Hydrologic data.
Identifiers: *Limestone County(Ala).

Surface-water information for Limestone County, Alabama, is presented in a map so that a visual appraisal of surface water availability and comparison with other counties can be made. The average rate of runoff for Limestone County is about 1.05 mgd square mile. The Tennessee River, the largest source of surface water in Limestone County, has an average flow of 28,800 mgd, a 7-day Q2 (median annual 7-day low flow) in excess of 1,000 mgd, and storage of 1,150,000 acre-feet when Wheeler Lake is at pool elevation of 556.28 feet. Elk River and Sugar, Limestone, and Piney Creeks have average flows in excess of 100 mgd and 7-day Q2 excess of 2 mgd. The chemical quality of water in streams in Limestone County is relatively uniform and suitable for most uses. Water temperature ranges from 3 deg C in January to 20 deg C in June, July, and August. (Knapp-USGS)
W74-08189

SURFACE-WATER AVAILABILITY, ETOWAH COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, Ala.
J. R. Harkins.
Alabama Geological Survey Map 108, 1972. 4 fig, 1 map, 1 tab, 12 ref.

Descriptors: *Surface waters, *Maps, *Alabama, Streamflow, Reservoirs, Rivers, Water quality, Water balance, Water yield, Data collections, Hydrologic data.
Identifiers: *Etowah County(Ala).

Basic information on the surface-water resources of Etowah County, Alabama, is presented in a map so that a quick visual appraisal of water availability can be made. The streams of Etowah County potentially will provide moderate to large supplies of water for municipal, industrial, and other uses. Two streams, Coosa River and Big Wills Creek, are capable of yielding 10 mgd without storage. With storage, streams draining areas in excess of 10 sq mi have the potential of yielding 10 mgd. Many sites in the county are topographically and geologically suitable for surface reservoirs. Average annual precipitation is 54 inches. Average streamflow is about 1.0 mgd per sq mi. The Coosa River has an average flow of 5,400 mgd where it enters the county and 6,200 mgd where it leaves the county. Water in the county, in general, is relatively low in total dissolved solids, is of good chemical quality, and is suitable for most uses. (Knapp-USGS)
W74-08190

THE POTENTIAL APPLICATION OF SATELLITES IN RIVER REGULATION,
Institute of Hydrology, Wallingford (England).
R. B. Painter.
Water and Water Engineering, Vol 77, No 934, p 487-491, December, 1973. 1 tab, 14 ref.

Descriptors: *River regulation, *Reservoirs, Data transmission, Measurement, Satellites(Artificial), *Remote sensing, Cost-benefit analysis.
Identifiers: *Great Britain.

Some of the problems of efficient operation of regulating reservoirs are discussed with particular reference to the measurement and transmission of data. Remote sensing systems and existing methods of transmission of ground data via satellites are described, and their potential use in river

lation is discussed. Satellites are potentially most suitable platform for operational remote ing, due to their capability for repeated rage of large areas. Viability was proven by a rous cost/benefit comparison between a satel- based system and conventional measuring niques. A satellite based system has the poten- to be considerably cheaper than a landline d system. Whether it will be depends on many ors, such as required frequency of transmis- , which might necessitate a geostationary lite. (Merritt-FIRL)
-08206

IEF CONCEPT CONCERNING MIXED ERS (ENTLASTUNGS-KONZEPTIONEN MISCHSYSTEM),
primary bibliographic entry see Field 5D.
-08246

V ROLLER GATE IMPROVES THE RIVER LK.
primary bibliographic entry see Field 8A.
-08250

LITARIAN LEISURE FOR BURNHAM-ON-
.
primary bibliographic entry see Field 5D.
-08262

OMATED FLOW-RECORDING SYSTEM FIELD DRAINAGE MONITORING--ECT DATA COMPILATION OF SURFACE SUBSURFACE DRAIN FLOW,
cultural Research Service, South Burlington,

rnstein, H. A. Preston, W. M. Winant, and G. enoit.
nal of Agricultural Engineering Research, Vol No 1, p 31-35, March, 1973. 3 fig, 4 ref.

criptors: *Drainage, *Flow measurement, ta collections, Data storage and retrieval, Data smission, Data processing, *Subsurface nage.

automatic recording console has been loped to accept water stage data from remote s and flumes and store the data on magnetic . The sensing-transmitting-cycling-recording ponents can economically replace the hanical-manual systems for converting flow its to card or tape data ready for computer ysis. A sequence of problems that had ented operation was solved and is reported. gerboe-Colorado State)
-08267

AINAGE OBSERVATIONS IN LATIN AMER-
,
State Univ., Logan. Dept. of Agricultural Irrigation Engineering.
Christiansen.
er No 72-705 presented at Winter Meeting of American Society of Agricultural Engineers, ember 11-15, 1972, Chicago, Illinois. 4 p.

criptors: *Drainage, *Surface drainage, surface drainage, Tile drainage, *Salinity, er table, Soil water movement, Saline soil.
tifiers: *South America.

ough there are many excellent irrigation ems in most of the Latin American countries, roblem of drainage and salinity generally has neglected. There are many areas where, use of lack of adequate natural drainage, high r tables and acute salinity conditions have loped. (Skogerboe-Colorado State)
-08268

PROBLEMS AND SCS SPECIFICATIONS FOR LOW HEAD PVC PIPELINES,
Soil Conservation Service, Bozeman, Mont.
For primary bibliographic entry see Field 8B.
W74-08278

CENTER PIVOT PROBLEMS.
For primary bibliographic entry see Field 3F.
W74-08283

GATED PIPE AND REUSE SYSTEM.
For primary bibliographic entry see Field 3F.
W74-08284

FLOODFLOWS FROM SMALL DRAINAGE AREAS IN OKLAHOMA: PROGRESS REPORT AND DATA COMPILATION,
Geological Survey, Oklahoma City, Okla.
For primary bibliographic entry see Field 2E.
W74-08292

MONITORING FLOOD DAMAGE WITH SATELLITE IMAGERY,
South Dakota State Univ., Brookings. Remote Sensing Inst.
L. A. Benson, and F. A. Waltz.
Available from NTIS, Springfield, Va. 22151, N73-21361 - Price $3.00 printed copy; $1.45 microfiche. Interim Report 73-07, March 1973. 11 p, 5 fig, 3 ref. NASA Contract NGL 42-003-007.

Descriptors: *Remote sensing, *Floods, *Satellites(Artificial), *Land use, Water injury, Damages, *Flood damage.
Identifiers: ERTS.

During analysis of ERTS-1 imagery for land-use patterns a large impoundment of water was observed in a location that was normally farmland. Subsequent investigation revealed that the satellite had recorded the remaining floodwaters from a severe local rainstorm that had occurred four days prior to the overpass. The inundated area was measured using an automatic planimeter. The area measurement coupled with estimates of the land use and productivity of the region permitted an estimate of the crop damage loss for the inundated area. (Knapp-USGS)
W74-08294

A DETAILED PROCEDURE FOR THE USE OF SMALL-SCALE PHOTOGRAPHY IN LAND USE CLASSIFICATION,
National Aeronautics and Space Administration, Houston, Tex. Lyndon B. Johnson Space Center.
P. L. Vegas.
Available from NTIS, Springfield, Va. 22151, NASA TN D-7542 - Price $3.00 printed copy; $1.45 microfiche. Technical Note D-7542, March 1974. 38 p, 3 fig, 7 tab, 1 ref, 3 append.

Descriptors: *Mapping, *Land use, *Aerial photography, Satellites(Artificial), *Land classification, Urbanization, Farms, Forests, Wetlands, Grasslands, Highways.

A procedure was developed to produce accurate land use maps from available high-altitude, small-scale photography. Land use classification maps are constructed from small-scale photographs by using 12 basic land use categories and 6 subcategories, or a total of 18 categories. The basic and alternative procedures were tested over a six-county area and in demonstration projects. The most significant single feature of the procedure is the capability to produce a final product in a relatively short time, usually within 60 to 90 days after receipt of data. In addition, the procedure can be accomplished with the skills and types of personnel normally available on the staffs of local planning agencies. The personnel skills required are photointerpreters and draftsmen. The equipment required consists of standard light tables, 9- to 10-power stereoscopes, and standard drafting supplies. The photographic processing service and supplies can be provided by commercial firms in most large cities. (Knapp-USGS)
W74-08299

SALINE-SEEP DEVELOPMENT IN DRYLAND SOILS OF NORTHEASTERN MONTANA,
Agricultural Research Service, Sidney, Mont.
For primary bibliographic entry see Field 3C.
W74-08300

FLOODS IN PUNALUU-HAUULA AREA, OAHU, HAWAII,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-08310

OPERATION AND MAINTENANCE OF IRRIGATION AND DRAINAGE SYSTEMS: SECTION III--OPERATION.
American Society of Civil Engineering, New York. Committee on Operation and Maintenance of Irrigation and Drainage Systems.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 99, No IR3, p 237-338, September, 1973. 36 fig, 28 ref.

Descriptors: *Drainage, *Drainage systems, *Irrigation, *Irrigation systems, *Operation and maintenance, Water distribution(Applied), *Water management(Applied), Water reuse.

The subject of operation is treated by a discussion of the factors essential to good water management on an irrigation and drainage system; the staff necessary to accomplish the work and its responsibility; operating practices and procedures for the handling, movement, disposal or reuse of water; and the value of good records and communications in these operations. The irrigation system referred to is that generally referring to movement of water from its source to the user, and is that system prevalent in arid and semiarid areas as well as in humid areas. The use of the term drainage system refers to systems in which removal of excess surface water seasonally is normally a necessity. (Skogerboe-Colorado State)
W74-08318

WOODY PHREATOPHYTES ALONG THE COLORADO RIVER FROM SOUTHEAST RUNNELS COUNTY TO THE HEADWATERS IN BORDEN COUNTY, TEXAS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 3B.
W74-08371

HYDRODYNAMICS OF SURFACE IRRIGATION-ADVANCE PHASE,
California Univ., Davis. Dept. of Water Science and Civil Engineering.
For primary bibliographic entry see Field 8B.
W74-08384

FLOOD CONTROL AND WATER CONSERVATION WORKS IN BUKIT TIMAH CATCHMENT, SINGAPORE,
Singapore Dept. of Public Works. Drainage and Marine Branch.
D. Chow Siong Keng, and Chang Kin Koon.
In: Water Resources, Environment and National Development--Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 26-43, 1972. 10 fig, 13 ref.

Descriptors: *Flood control, *Water resources development, *Reservoirs, Canals, Water storage, Water supply, Runoff, Hydrographs, Water conservation, Drainage.

Identifiers: *Singapore.

Land drainage works in the Bukit Timah Catchment in the south-central area of the Island of Singapore were constructed to achieve the dual objectives of flood control and water conservation for water supply. The works consist of three stages: diversion, improvement of existing channels, and a reservoir. The flood alleviation schemes and drainage improvement works are implemented in conjunction with land development. More than 70% of the land area or about 147 sq mi in the Island is rural area. (See also W74-08454) (Knapp-USGS)
W74-08456

HYDROLOGICAL ACTIVITIES IN SINGAPORE,
Singapore Dept. of Public Works. Drainage and Marine Branch.
For primary bibliographic entry see Field 7C.
W74-08457

DEVELOPMENT OF WATER SUPPLY IN VIETNAM,
Ministry of Health, Saigon (Vietnam). Environmental Sanitation Service.
For primary bibliographic entry see Field 5G.
W74-08460

IMPROVED WATER MANAGEMENT FOR PADDY RICE PRODUCTION IN THE PHILIPPINES,
National Irrigation Administration, Manila (Philippines). Water Management Project.
For primary bibliographic entry see Field 3F.
W74-08464

RATIONAL USE OF WATER,
Ministry of Public Works and Electrical Energy, Djakarta (Indonesia). Water Resources Development.
For primary bibliographic entry see Field 6B.
W74-08466

IMPROVEMENT OF SOIL COVER FOR WATER CONSERVATION, PREVENTION OF SEDIMENTATION AND POLLUTION CONTROL IN THE PHILIPPINES,
National Inst. of Science and Technology, Manila (Philippines). Div. of Agriculture and Natural Resources Research.
For primary bibliographic entry see Field 5G.
W74-08481

EFFECTIVE USE OF HIGH WATER TABLE AREAS FOR SANITARY LANDFILL.
VTN, Orlando, Fla.
For primary bibliographic entry see Field 5E.
W74-08486

A GUIDE TO NATURAL RESOURCE INFORMATION OF GEORGIA.
Georgia Dept. of Natural Resources, Atlanta.
For primary bibliographic entry see Field 10C.
W74-08487

FLOOD PLAIN INFORMATION; GRANTS CREEK - TOWN CREEK, CITY OF SALISBURY, NORTH CAROLINA.
Army Engineer District, Charleston. S.C.
June, 1973. 24 p, 11 fig, 39 plates, 7 tab, glossary.

Descriptors: *Flood data, *Design flood, *Regional flood, Flood damage, Peak discharge, *Flood forecasting, Overflow, Flood profiles, Floodwater, Historic floods, *North Carolina, *Data collections.
Identifiers: Grants Creek(N.C.), Town Creek(N.C.), Salisbury(N.C.).

Grants Creek and Town Creek straddle the town of Salisbury, North Carolina. Property along the streams is primarily undeveloped, although land use varies from concentrated residential and commercial development to farm and wooded land. Given the present state of development, an Intermediate Regional Flood would inundate 1.67 square miles along Grants Creek, .03 square miles of which is developed (affecting 19 structures) and .76 square miles along Town Creek, of which .06 square miles is developed (affecting 80 structures). As this land comes under pressure for future development, the impact of flooding will increase. Peak flows along selected points on Grants Creek range from 13,500 to 19,900 cfs during an Intermediate Regional Flood and from 22,200 to 30,600 cfs during a Standard Project Flood. Peak flows along selected points in Town Creek range from 2,700 to 6,000 cfs during an Intermediate Regional Flood and from 4,200 to 9,750 cfs during a Standard Project Flood. Underclearance elevation, lowest elevation of roadway, and water surface elevation during Intermediate Regional and Standard Project Floods are detailed for all bridges and culverts. Overflow areas are delineated on maps of the area. Water surface profiles of the Intermediate Regional and Standard Project Floods are also included. (Hoffman-North Carolina)
W74-08490

FLOOD PLAIN INFORMATION; PETERS CREEK AND LICK RUN, ROANOKE, VIRGINIA.
Prepared for the Roanoke Valley Regional Planning Commission by the Army Corps of Engineers, Wilmington District, N.C. August, 1968. 33 p, 5 fig, 11 plates, 10 tab, glossary.

Descriptors: *Flood data, *Design flood, *Regional flood, Flood damage, *Virginia, Peak discharge, *Flood forecasting, Historic floods, Overflow, Floodwater, Flood profiles, *Data collections.
Identifiers: Peters Creek(Va), Lick Run(Va.), Roanoke(Va.).

Both commercial and residential developments lie within the flood plains along Peters Creek which flows along the western corporate limits and empties into the Roanoke River, and Lick Run which flows through the heart of the business district and empties into Tinker Creek at the eastern corporate limits. Portions of this land have been inundated by floods of the past and a substantially greater area is within reach of the potentially greater floods of the future. Areas which would be flooded during Intermediate Regional and Standard Project Floods are delineated on maps. Approximately 92 structures in the stream reach studied would be flooded by an Intermediate Regional Flood, while a Standard Project Flood would reach approximately 123 structures. During a Standard Project Flood, stream velocities in the channel would range up to 14 feet per second on both Peters Creek and Lick Run. Duration of floods is relatively short on both streams. During the Standard Project Flood on Peters Creek the stream would rise 11 feet in 7 hours with a maximum rate of rise of 2.5 feet per hour and would remain out of banks for about 9 hours. On Lick Run, the Standard Project Flood would rise 13 feet in 6 hours with a maximum rise of 3 feet per hour. The stream would remain out of banks for about 7 hours. During an Intermediate Regional Flood, flood crests would reach 4,850 cfs on Peters Creek and 3,700 cfs on Lick Run. Peak discharge during a Standard Project Flood would be 7,900 cfs on Peters Creek and 5,240 cfs on Lick Run. (Hoffman-North Carolina)
W74-08491

THE SEVIER COUNTY WATER PLAN,
Tennessee Dept. of Conservation, Nashville. Div. of Water Resources.
For primary bibliographic entry see Field 6D.
W74-08493

SYSTEMS PLANNING DESIGN: CASE STUI IN MODELING, OPTIMIZATION, EVALUATION,
Massachusetts Inst. of Tech., Cambridge. Ce for Transportation Studies
For primary bibliographic entry see Field 6A.
W74-08506

SYSTEMS ANALYSIS OF LARGE-SC PUBLIC FACILITIES: NEW YORK CI WATER SUPPLY NETWORK AS A C STUDY,
Massachusetts Inst. of Tech., Cambridge. Ce for Transportation Studies
For primary bibliographic entry see Field 3D.
W74-08507

ECONOMICS OF INLAND WATER TRA PORT,
Peat, Marwick, Mitchell and Co., Washing D.C.
J. F. Hoffmeister, III, and R. de Neufville
In: Systems Planning and Design: Case Studie Modeling, Optimization, and Evaluation (Ed R. de Neufville and D. H. Marks). Prentice H Inc., Englewood Cliffs, New Jersey. p 6 (Chapter 6), 1974. 12 fig, 1 tab, 10 equ, 11 ref.

Descriptors: *Inland waterways, *Transportat *Water supply, *Economic efficiency, *Des *Barges, Optimization, Economic predict Marginal return, Return to scale, Rivers, (rents(Water), Demand, Streams, Constra Physical properties, Costs, Size, Channel, De Width, Equations, Operations research.
Identifiers: Production function, *Towbo Isoquants, Tradeoffs, Flotilla, Power, Tonn Horsepower, Expansion path.

Ultimately, design optimization of any transpo tion systems requires joint consideration of sup and demand. Often, however, a planner can foresee demands accurately; thus, he must k his supply possibilities so he can focus on a nar set of appropriate alternatives. Optimal config tions for supplying inland water transport defined. A production function is developed reference to physical measurements) and plored. The production function itself represented by means of its isoquants or conto of equal output. Expansion paths are the loc optimal design for specific set of economic cumstances and, specifically, of costs for sev inputs. Examined are the existence of diminish marginal returns, returns to scale, the effects stream currents, and the effects of constra such as a maximum limit on the length of the ba flotilla. The effect of stream current is to dis the isoquants of the production function in fa of increased horsepower. Returns to scale shown to vary according to the nature of waterway. Generally, the effect of diminish marginal returns, and decreasing returns to sc associated with the constraints, is to yield a c vex feasible region for output, for which i possible to find specific optimal designs. The a ysis focuses on the use of relatively shallow d towboats and barges. Results show the supply water transport is characterized by diminish marginal returns and increasing returns to sc (See also W74-08506) (Bell-Cornell)
W74-08508

THE COMBINED USE OF OPTIMIZATI AND SIMULATION MODELS IN RIVER BA PLANNING.,
Massachusetts Inst. of Tech., Cambridge. Sl School of Management.
H. D. Jacoby, and D. P. Loucks.
In: Systems Planning and Design: Case Studies Modeling, Optimization, and Evaluation (Ed. R. de Neufville and D.H. Marks), Prentice H Inc., Englewood Cliffs, New Jersey, p 237- (Chapter 17), 1974. 2 fig, 1 tab, 27 equ, 15 ref.

Descriptors: *Optimization, *Simulation analysis, *River basins, *Planning, *Computer programs, *Delaware River, Digital computers, Alternative planning, Mathematical models, Systems analysis.

Simulation models have proved to be extremely useful in aiding river basin planning. However, all suffer a common difficulty, since the analyst himself must formulate the physical design to be studied in each computer run. If the basin is large and offers a variety of development opportunities, the number of alternative system plans from which he must choose can be extremely large. Reported is an investigation of the use of analytical optimization models to 'screen' the set of possible plans and to select a small number worthy of simulation analysis. Deterministic and stochastic optimization models have been developed and applied to both static and dynamic (multiperiod) planning problems; the Delaware River basin is used as an example. The resulting designs have been analyzed by using a large-scale digital simulation model of the basin so that the ability of the screening models to identify high-valued alternatives can be evaluated. In this context the results indicate considerable promise for the combined use of optimization and simulation models. (See also W74-08506) (Bell-Cornell)
W74-08512

DETERMINATION OF THE DISCHARGE POLICY FOR EXISTING RESERVOIR NETWORKS,
Hydro-Quebec, Montreal.
G. Leclerc, and D. H. Marks.
In: Systems Planning Design: Case Studies in Modeling, Optimization, and Evaluation (Ed. by R. de Neufville and D.H. Marks), Prentice Hall, Inc., Englewood Cliffs, New Jersey, p 257-272 (Chapter 18), 1974. 4 fig, 6 tab, 25 equ, 3 ref.

Descriptors: *Multiple-purpose reservoirs, Networks, *Linear programming, *Reservoir releases, Discharge(Water), *Drawdown, Management, Optimization, Costs, Design, *Canada, Economics, Recreation, Water supply, Streamflow, Rivers, Constraints, Reservoir capacity, Systems analysis, Mathematical models, Stochastic processes, Digital computers.
Identifiers: *Discharge policy, Operating policy, *Riviere du Nord(Quebec-Canada), Chance-constrained programming, Screening, Cost minimization.

Optimization models are used to examine the question of operating a small existing reservoir system to meet various conflicting objectives that are not easily quantifiable in commensurate units. For existing reservoirs, an efficient policy implies maximization of the magnitude of the streamflow guaranteed at a given reliability level. Using a linear programming screening model, the discharge policy for a network of eight small existing reservoirs utilized for recreational activities and for water supply of a city downstream of the network is determined. The optimization problem is formulated by employing a linear operating rule, and chance-constrained programming is adopted to account for the stochasticity of the inflows. Two objective functions are introduced to study the cost of a more 'equitable' distribution of the losses due to surface drawdowns versus the most efficient, which minimizes the total summation of the individual drawdowns; comparison of the solutions leads to quantification of the additional cost that society has to pay for a discharge policy that is equitable rather than efficient. A case study on the Riviere du Nord, Quebec, Canada is presented. Results show that the linear operating rule is valid for existing reservoir analysis; observed also is that chance-constrained programming may have serious ineptitudes for design purposes and for analysis of large existing reservoir networks. The approach, however, is a desirable management tool for systems of small reservoirs, primarily as a screening model. (See also W74-08506) (Bell-Cornell)
W74-08513

MULTIOBJECTIVE ANALYSIS IN WATER RESOURCE PLANNING,
Johns Hopkins Univ., Baltimore, Md. Dept. of Environmental Engineering.
J. L. Cohon, and D. H. Marks.
In: Systems Planning and Design: Case Studies in Modeling, Optimization, and Evaluation (Ed. by R. de Neufville and D.H. Marks), Prentice Hall, Inc., Englewood Cliffs, New Jersey, p 304-321 (Chapter 21), 1974. 4 fig, 3 tab, 16 equ, 16 ref.

Descriptors: *River basin development, *Comprehensive planning, *Regional analysis, *Linear programming, *Economic efficiency, *Resource allocation, Resources development, *Multiple-purpose projects, Decision making, Optimization, Alternative planning, Constraints, Mathematical models, Systems analysis.
Identifiers: Multiobjective analysis, Screening models, Environmental quality, Water resource investment, National objectives, Income benefits, Social welfare.

This study demonstrates how many planning objectives can be integrated into optimization models. An application of multiobjective theory to the analysis of development alternatives for a large-scale river basin is presented. A river and its uses represent a complex stochastic physical system embedded in an economic, social, and institutional framework difficult to model. A screening model endeavors to model analytically the interrelated decision in the context of this physical and nonphysical environment. Such a model solves an optimization problem which maximizes net discounted benefits subject to continuity constraints on water flow, technological constraints on the alternatives, and policy constraints. Presented is a case study of a river system in which development is to be planned according to national and regional objectives. The two planning objectives considered are: net national income benefits and preservation of environmental quality. A linear programming screening model for finding the best set of development alternatives from a national objective point of view is introduced and a brief discussion of methods for handling more than one objective in such models is presented. An analysis of the trade-offs between the two objectives is demonstrated by using a constraintmethod. The transformation curve between net national income benefits from power and irrigation and regional equity as measured by deviation from an equal regional water distribution is shown. (See also W74-08506) (Bell-Cornell)
W74-08514

MULTIOBJECTIVE REDESIGN OF THE BIG WALNUT PROJECT,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
D. C. Major.
In: Systems Planning and Design: Case Studies in Modeling, Optimization, and Evaluation (Ed. by R. de Neufville and D. H. Marks), Prentice Hall, Inc., Englewood Cliffs, New Jersey, p 322-337 (Chapter 22), 1974. 5 fig, 2 equ, 11 ref.

Descriptors: Water resources development, *Multiple-purpose projects, *Design, *Economic efficiency, *Cost-benefit analysis, Evaluation, *Planning, National income, Conservation, *Indiana, Dams, Reservoirs, Flood control, Recreation, Water supply, Water quality control, Optimization, Estimating, Systems analysis, Mathematical models.
Identifiers: *Big Walnut Creek(Ind.), Multiobjective analysis, Redesign, Environmental quality, Wabash River Basin(Ind.), Bluffs, Transformation curve.

Multiobjective analysis is a generalization of traditional efficiency-oriented benefit-cost analysis; it allows recognition of many planning objectives, many of which have often heretofore been ignored or given secondary consideration, such as regional development for example. Herein, multiobjective analysis is applied to the redesign of a water resource project, the proposed Big Walnut dam and reservoir in Indiana, which was previously designed by conventional techniques. The formulation of the project in terms of relevant multiobjectives requires: (1) choice of pertinent objectives; (2) analysis of preferences of different interest groups; and (3) development of a transformation curve which shows the frontier of tradeoffs between objectives. These are discussed consecutively and in detail. The primary objectives for reformulation of the Big Walnut project are increasing national income and improvement of environmental quality. Planning preferences of the Corps of Engineers, who are opting to maximize national efficiency benefits, differ from those of the conservationists. A transformation curve is derived which shows the maximum combinations of net income and ecological areas saved. An estimate is made of the optimal efficiency allocation of each level of storage at the Big Walnut site to each of the system outputs: flood control, recreation, and water supply and water quality control. The transformation curve is only illustrative; a more thorough study of all information for estimating both efficiency and environmental benefits and costs should be made, probably using simulation to capture the highly stochastic nature of the system. (See also W74-08506) (Bell-Cornell)
W74-08515

PORT EVERGLADES HARBOR, BROWARD COUNTY, FLORIDA (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 8A.
W74-08518

SPUR CHANNEL TO ASTORIA WATERFRONT, EAST RIVER, NEW YORK (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District,New York.
For primary bibliographic entry see Field 8A.
W74-08519

OPERATION AND MAINTENANCE OF NEW BEDFORD HURRICANE BARRIER (FINAL ENVIRONMENTAL STATEMENT).
New England Div. Corps of Engineers, Waltham, Mass.
For primary bibliographic entry see Field 8D.
W74-08520

LOWER RIO GRANDE FLOOD CONTROL PROJECT, TEXAS.
International Boundary and Water Commission, El Paso, Tex.
For primary bibliographic entry see Field 8A.
W74-08521

WATER RESOURCES COUNCIL REPORT ON THE PEARL RIVER COMPREHENSIVE BASIN STUDY MISSISSIPPI AND LOUISIANA.
Water Resources Council, Washington, D.C.
Available from the National Technical Information Service, Springfield, Va. 22151, as EIS-MS-73-1758-F, for $5.25 paper copy; $1.45 microfiche. May 1972. 47 p, 1 map.

Descriptors: Water resources development, *Watershed management, *River basins, *Multiple purpose reservoirs, *Flood protection, *Environmental effects, Flood routing, Flood plain zoning, *Mississippi, *Louisiana, Area redevelopment, Recreation, Non-structural alternatives, Land resources, Water resources.
Identifiers: *Environmental impact statement, *Pearl River(Miss).

The effect of a proposed basin-wide program in the Pearl River Basin in Mississippi and Louisiana is examined. The Pearl River Basin Coordinating

Committee provided guidance for this proposal from the Water Resources Council (WRC). Both plans are compared and discussed in detail. Projections of increased population growth and economic activity provide the basis for formulation of the plan for development of the basin. Needs include both water and related land resources development and many areas need protection from recurring floods. Flood control storage in both upstream and downstream areas is shown as the best solution to this problem. The WRC plan includes three multiple purpose reservoirs, various land treatment measures, and development of a long recreational boatway, as well as several nonstructural methods. The plan would result in reduction in flooding, permanent inundation of land, reduction in erosion, reduced nutrient flows, probable upgrading of water use classification, and a change from a free flowing stream environment to a lake environment. It would adversely affect about 10,000 acres of farm and forest wildlife habitat, disrupt aquatic and streambank terrestrial ecosystems and 52,000 acres of bottomland forest would have to be cleared. (Sutton-Florida)
W74-08522

BOUNDARY AND LAND DEVELOPMENT REGULATION RECOMMENDATIONS FOR THE BIG CYPRESS AREA OF CRITICAL STATE CONCERN.
Florida Bureau of Land Planning, Tallahassee.
October 1973. 1 p, 1 map, 2 append.

Descriptors: *Florida, *Water resources development, *Land management, Legislation, Administration, Planning, State jurisidction, Water conservation, Swamps, *Regulation, Ecology, Land resources, Parks, Legal aspects.
Identifiers: *Big Cypress(Fla).

Under the 1973 Florida Big Cypress Conservation Act the Division of State Planning was directed to recommend a definitive boundary and land development regulations for the Big Cypress Area of Florida to the Administrative Commission. Included in this summary of the project are a map and a legal description of this area as well as proposed land development regulations aimed at protecting the vital water resources within the Big Cypress Critical Area. (Whisler-Florida)
W74-08543

NAVIGATION AND NAVIGABLE WATERS--FLOOD CONTROL REGULATIONS.
Federal Register, Vol 37, No 16, p 1106, 1107, January 25, 1972. 2 p.

Descriptors: *Kansas, *Administrative agencies, *Dams, *Water control, *Flood control, Civil engineering, Flow control, Water storage, Federal government, Flow rates, Water control.

The storage capacity allocated for flood control purposes in Waconda Lake by the operation of Glen Elder Dam on the Solomon River in Kansas in governed by this regulation. The Bureau of Reclamation, Department of Interior, is given the power to regulate the Glen Elder Dam in the interest of flood control. Flood control storage space between elevations 1455.6 and 1488.3 are to be regulated for flood control on the Solomon and Smokey Hill Rivers. The objective is to limit flow in th Solomon River to 7,500 cubic feet per second and to limit flow in the Smokey Hill River to 25,000 cubic feet per second. (Flowers-Florida)
W74-08551

SELECTIVE WITHDRAWAL FROM MAN-MADE LAKES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
J. P. Bohan, and J. L. Grace, Jr.
Available from NTIS, Springfield, Va 22151 as AD-757 595, price $3.00 printed copy; $1.45 in microfiche. Army Engineer Waterways Experiment Station Technical Report H-73-4, March 1973. 51 p, 9 fig, 25 plate, 12 ref

Descriptors: *Stratified flow, *Density stratification, *Reservoir releases, Water quality control, *Withdrawal, Reservoir operation, Hydraulic models.
Identifiers: Selective withdrawal.

Withdrawal-zone characteristics created in a randomly density-stratified impoundment were studied by releasing flow through a submerged orifice, over a free and submerged weir, or through a combination of these. Generalized relationships were developed for describing the vertical limits of the withdrawal zone and the vertical velocity distribution within the zone. Techniques were developed for handling conditions in which the water surface or bottom boundary controlled the limits of the withdrawal zone and for describing the composite velocity profile resulting from withdrawal zones which overlapped. If the velocity profile and the reservoir width are known, a vertical flow rate distribution can be determined This flow rate distribution can then be applied as a weighting function to the reservoir profile of any water-quality parameter to determine its value in the reservoir release. (Knapp-USGS)
W74-08585

ESTIMATING LOW-FLOW FREQUENCY FOR PERENNIAL MISSOURI OZARKS STREAMS,
Geological Survey, Rolla, Mo.
J. Skelton.
Available from NTIS, Springfield, Va. 22151, as PB-229 617/AS, Price $3.00 printed copy; $1.45 microfiche. Water-Resources Investigations 59-73, February 1974. 19 p, 4 fig, 2 tab, 5 ref.

Descriptors: *Low flow, *Missouri, *Statistical models, *Regression analysis, Streamflow forecasting.
Identifiers: *Ozarks region(Missouri).

A linear regression model utilizes as an independent variable the flow area of a stream. The model was developed for use in estimating minimum streamflow at ungaged sites in the Ozarks region of Missouri. Low-flow characteristics at any point on perennial Ozarks streams are significantly related to the average width and depth or flow area of the minimum flows. (Knapp-USGS)
W74-08599

FINAL ENVIRONMENTAL STATEMENT, WEST TERRE HAUTE LEVEE, WABASH RIVER, INDIANA, WABASH RIVER BASIN.
Corps of Engineers, Louisville, Ky.
For primary bibliographic entry see Field 8D.
W74-08660

4B. Groundwater Management

OPTIMIZATION OF THE ASSIMILATIVE WASTE CAPACITY OF THE UNSATURATED AND SATURATED ZONES OF AN UNCONFINED AQUIFER SYSTEM,
Univ., of California, Los Angeles. School of Engineering and Applied Science.
For primary bibliographic entry see Field 5B.
W74-08152

PROBABILISTIC MODELS IN THE DESIGN AND OPERATION OF A MULTI-PURPOSE RESERVOIR SYSTEM,
Univ., of California, Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 4A.
W74-08153

GROUND WATER POLLUTION FROM SU SURFACE EXCAVATIONS. PART III. MOB ON POLLUTION FROM WELLS.
Environmental Protection Agency, Washingto D C
For primary bibliographic entry see Field 5B
W74-08184

GROUND WATER POLLUTION FROM SU SURFACE EXCAVATIONS.
Environmental Protection Agency Washingto D C Office of Air and Water Program
For primary bibliographic entry see Field 5
W74-08185

INVESTIGATIONS OF THE RESPONSE OF A UNCONFINED AQUIFER TO LOCALIZE RECHARGE,
Maryland Univ., College Park Dept of Civil E gineering.
For primary bibliographic entry see Field 2F
W74-08234

INTERSTATE AND INTERNATIONA AQUIFERS,
Bittinger (M.W.) and Associates, Inc., Fort Co lins, Colo
For primary bibliographic entry see Field 6E.
W74-08276

GROUND WATER QUALITY EFFECTS O DOMESTIC WATER UTILIZATION,
Univ. of Alaska College. Inst. of Water Resource
For primary bibliographic entry see Field 5B.
W74-08287

IDENTIFICATION AND CONTROL OF POLLU TION FROM SALT WATER INTRUSION.
Environmental Protection Agency, Washington D.C. Div. of Water Quality and Non-Point Sourc Control.
For primary bibliographic entry see Field 5B.
W74-08293

RECORDS OF WATER WELLS, SPRINGS, OIL AND GAS-TEST HOLES, AND CHEMICA ANALYSES OF WATER FOR THE MADISON LIMESTONE AND EQUIVALENT ROCKS I THE POWDER RIVER BASIN AND ADJACENT AREAS, NORTHEASTERN WYOMING,
Geological Survey, Cheyenne, Wyo.
W. G. Hodson.
Cooperative Data Report, 1974. 26 p, 1 fig, 3 tab, ref.

Descriptors: *Hydrologic data, *Wyoming *Water wells, *Aquifers, *Data collections, Dril lers logs, Boreholes, Springs, Water quality Groundwater basins.
Identifiers: *Madison Limestone, *Powder Rive basin(Wyo).

Records of 56 water wells and springs developed in the Madison Limestone in the Powder Rive basin of Wyoming, 222 water wells and oil- and gas-test holes that reached the Madison, and 7 chemical analyses of Madison waters are tabulated in three tables. (Knapp-USGS)
W74-08296

PROBLEMS ARISING FROM OVER EX-PLOITATION OF THE NATURAL WATER RESERVOIR IN THE URBAN DISTRICT OF MILAN (I PROBLEMI POSTI DAL SOVRAS-FRUTTAMENTO IDRICO DEL SERBATOIO NATURALE NELLA CONURBAZIONE MILANESE),
S. Mazzarella.
Inquinamento, Vol 15, No 6, p 25-34, August 1973. 11 ref.

Descriptors: *Groundwater management, *Water resources, *Water table, Cities, Reservoirs, *Industrial water, *Municipal water, Exploitation, Withdrawal, Drawdown.
Identifiers: *Italy(Milan).

Problems arising from the overexploitation of the natural groundwater resources in the urban and industrial districts of Milan are described, and solutions to this problem are proposed. The ever increasing industrial activity, and especially the concentration of large water consuming industries in a limited area in and around Milan has resulted in a steady, considerable lowering of the water table. The phreatic layer has lowered, in one district of Milan, from about 6 m in 1934 to 41 m in 1971. The industries settled in the Milan area draw from available water supplies in an uncontrolled manner. The volume of the water drawn for municipal use has not increased at the same rate as the population. It is recommended that the major industries responsible for the lowering of the groundwater table in the Milan area should be required to adopt adequate techniques for water recycling to reduce their water consumption, and to use surface wells for water capture. They may be allowed to use water from deep layers of transitional and marine sediments in a controlled manner. It is further recommended that industries with high potential water consumption should no longer be allowed to settle in the Milan area. (Merritt-FIRL)
W74-08354

A VESSEL FOR COLLECTING SUBSURFACE WATER SAMPLES FROM GEOTHERMAL DRILLHOLES,
Department of Scientific and Industrial Research, Wairakei (New Zealand). Chemistry Div.
L. E. Klyen.
Geothermics, Vol 2, No 2, p 57-60, June 1973. 4 fig, 2 tab, 2 ref.

Descriptors: *Sampling, *Geothermal studies, *Geochemistry, Water chemistry, Thermal water, Boreholes, Equipment.
Identifiers: Borehole samplers.

A sampler for geothermal studies features a breakoff tube sealed in series with a non-return valve. During downhole tests the vessel was successfully operated at temperatures up to 300 deg C and pressures up to 150 atm. It remained uncorroded by waters ranging in salinity from 1500 to 300,000 mg/kg sodium chloride, and with pH as low as 2.5. (Knapp-USGS)
W74-08366

GROUNDWATER LEVELS IN NEBRASKA, 1973,
Geological Survey, Lincoln, Nebr.
M. J. Ellis.
Nebraska Water Survey Paper No 36, May 1974. 106 p, 11 fig, 1 tab, 20 ref.

Descriptors: *Basic data collections, *Water levels, *Groundwater, *Nebraska, Hydrologic data, Data collections, Well data.

In Nebraska during 1973 more than 3,200 water-level measurements were made in 1,260 observation wells. These data, together with more than 5,000 water-level measurements from 63 wells equipped with automatic recorders and about 1,550 water-level measurements made in 422 wells were entered into computer storage. This report contains data on the 1973 fall water levels for 708 selected wells. Records of any water-level measurements in these wells at other times of the year and water-level data for other observation wells in the state are also available. (Knapp-USGS)
W74-08367

STOCHASTIC ANALYSIS OF GROUNDWATER LEVEL TIME SERIES IN THE WESTERN UNITED STATES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W74-08368

GROUND-WATER RESOURCES OF DUVAL COUNTY, TEXAS,
Geological Survey, Austin, Tex.
G. H. Shafer.
Texas Water Development Board Report 181, March 1974. 117 p, 22 fig, 11 tab, 30 ref.

Descriptors: *Groundwater, *Texas, Water quality, *Hydrologic data, Water resources, Water wells, Water yield, Data collections, Artesian aquifers, Hydrogeology.
Identifiers: *Duval County(Tex).

The geologic formations that yield fresh to moderately saline water in Duval County, Texas are the Catahoula Tuff, Oakville Sandstone, and Goliad Sand. All other geologic formations underlying the county are not known to yield water to wells or they yield only saline water. About 5.3 mgd of groundwater was used in 1970. Of this amount 0.6 mgd was pumped from the Catahoula Tuff, 0.7 mgd from the Oakville Sandstone, and 4.0 mgd from the Goliad Sand. Most of the large groundwater supplies are obtained from wells in the Goliad Sand. During 1931-69, water levels declined as much as 55 feet in the artesian zone of the Goliad Sand in the east-central and southeastern parts of the county, as a result of pumping for irrigation, public supply, and industrial use. Changes in water levels in wells in the Catahoula Tuff have been relatively small. Probably only slight changes in water levels have occurred regionally in the Oakville Sandstone. The groundwater is characteristically high in dissolved solids, chloride, and hardness. Most of the water sampled does not meet the quality standards of the U.S. Public Health Service for drinking water. Water from the Goliad Sand is more suitable for irrigation than water from the Oakville Sandstone and Catahoula Tuff; however, water from any of the three aquifers should be used with careful management and as a supplement to rainfall. The groundwater resources of the county are only partly developed. A total of 23 mgd (6 mgd from the Catahoula, 7 mgd from the Oakville, and 10 mgd from the Goliad) of fresh to slightly saline water is available on a long-term basis without depleting the supply. This total is slightly more than four times as much water as was used for all purposes in 1970. (Knapp-USGS)
W74-08372

TRANSIENT RESPONSE OF A LAYERED, SLOPING SOIL TO NATURAL RAINFALL IN THE PRESENCE OF A SHALLOW WATER TABLE: EXPERIMENTAL RESULTS,
Agricultural Research Service, University Park, Pa. Northeast Watershed Research Center.
For primary bibliographic entry see Field 2A.
W74-08375

WATER-LEVEL RECORDS FOR THE NORTHERN HIGH PLAINS OF COLORADO, 1970-74,
Geological Survey, Denver, Colo.
W. E. Hofstra, and T. J. Major.
Colorado Water Resources Basic-Data Release No 33, 1974. 36 p, 1 fig, 1 tab.

Descriptors: *Basic data collections, *Water levels, *Groundwater, *Colorado, Hydrologic data, Data Collections, Well data.
Identifiers: *High Plains(Colo).

Water-level measurements were made during the winter prior to the 1974 irrigation season in more than 1,000 wells in the northern High Plains of Colorado. Measurements for the 4 preceding winters are also included to serve as references illustrating declining or rising water levels. The 9,500 square-mile area includes all or part of 11 counties. Irrigation supplies are derived almost entirely from wells tapping the Ogallala Formation. The Ogallala, of Pliocene and locally of Miocene age, consists of sand, gravel, silt, and clay, and ranges in thickness from a few feet on the west to as much as 400 feet in places near the eastern State line. (Knapp-USGS)
W74-08381

APPRAISAL OF THE WATER RESOURCES OF EASTERN PALM BEACH COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
L. F. Land, H. G. Rodis, and J. J. Schneider.
Florida Bureau of Geology Report of Investigations No 67, 1973. 64 p, 40 fig, 5 tab, 21 ref.

Descriptors: *Water resources, *Florida, *Groundwater, Surface-groundwater relationships, Water pollution, Water quality, Hydrogeology, Municipal water, Hydrologic data.
Identifiers: *Palm Beach County(Fla).

Rapid population growth in the eastern coastal areas of Palm Beach County, Florida, places increasing demands on the water resources of the area and locally has created critical problems. Groundwater from the shallow aquifer, a hydrologic unit including the Biscayne, Pamlico and Anastasia Formations, underlies the entire area and is the principal source of water for most uses. Specific capacities of municipal wells range from about 10 to more than 350 gallons per minute per foot of drawdown. Municipal pumping averaged about 75 million gallons per day during 1970. West Palm Beach is the only community which uses surface water for municipal supply. Several municipal well fields are beset with problems of saltwater intrusion caused by increasing pumpage during droughts. Total dissolved solids of the freshwater in the shallow aquifer system ranges from 200 to 300 mg/liter in the coastal ridge to more than 500 mg/liter in the western areas. The dissolved-solid content of the surface water is less than that of groundwater. Water in the shallow aquifer is slightly contaminated at shallow depths in the immediate vicinity of the Cross State Solid Waste Disposal Area. The contaminants probably stay near the water table and are filtered out by the sand. (Knapp-USGS)
W74-08445

WELL YIELDS IN THE BEDROCK AQUIFERS OF MARYLAND,
Geological Survey, Parkville, Md.
L. J. Nutter.
Maryland Geological Survey Information Circular 16, 1974. 24 p, 5 fig, 3 tab, 18 ref.

Descriptors: *Hydrogeology, *Maryland, *Water yield, Specific capacity, Fractures(Geologic), Data collections, Hydrologic data, Water wells, Water supply, Statistics, Frequency analysis.

Well yields from the bedrock aquifers west of the Fall Line in Maryland are extremely variable and difficult to predict at specific sites because the groundwater is transmitted mainly through a complex and variable fracture system in the rocks. At least 80% of the well records published in Maryland groundwater reports are of domestic and farm wells, which in many cases are located on ridgetops or upland areas where there is little probability of obtaining high-yielding wells. Furthermore, in the construction of domestic wells there is seldom an effort made to obtain the maximum yield. In contrast to domestic wells, municipal and industrial wells are usually drilled for maximum yields, and in many cases only the most productive of several test wells are used for the water supply. Estimates of optimum well yields in generalized groups of bedrock aquifers were made

using cumulative-frequency graphs of specific capacity based on available well records. On the basis of this analysis, the estimated average yields of wells drilled under optimum conditions for generalized groups of bedrock aquifers range from 40 gallons per minute for granite and gneiss to 195 gpm for limestone and dolomite. (Knapp-USGS)
W74-08446

GROUNDWATER INVESTIGATIONS IN SINGAPORE,
Singapore Public Utilities. Water Planning Unit.
Chou Tai Choong.
In: Water Resources, Environment and National Development--Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 3-16, 1972. 7 fig, 2 tab.

Descriptors: *Groundwater, *Hydrogeology, *Alluvium, Investigations, Recharge, Aquifer characteristics, Water yield.
Identifiers: *Singapore.

The groundwater potential in the Older Alluvium covering the eastern part of Singapore is very limited because of poor natural recharge from the ground surface and the unfavorable lithology of the sediments forming the alluvial basin. Small quantities of groundwater for limited private supplies may be abstracted from the thin sand layers. The exact quantity can only be determined from sustained pumping tests. The cost of abstraction from such low yielding sources will be very expensive and uneconomical. (See also W74-08454) (Knapp-USGS)
W74-08455

FEASIBILITY STUDY ON DESALTING BRACKISH WATER FROM THE MT. SIMON AQUIFER IN NORTHEASTERN ILLINOIS.
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 3A.
W74-08499

WASTE DISPOSAL SYSTEMS FROM A GROUNDWATER HYDROLOGY AND POLLUTION POINT OF VIEW,
Ministry of the Environment, Ottawa (Ontario). Water Quality Branch.
For primary bibliographic entry see Field 5E.
W74-08594

GEOLOGY AND WATER RESOURCES OF THE GIRDWOOD-ALYESKA AREA, ALASKA,
Geological Survey, Anchorage, Alaska.
C. Zenone.
Geological Survey open-file report, 1974. 22 p, 5 fig, 5 tab, append.

Descriptors: *Hydrogeology, *Alaska, *Glacial drift, Water pollution, Septic tanks, Alluvial channels, Gravels, Urbanization, Recreation, Skiing.
Identifiers: *Girdwood(Alaska).

The unconsolidated sediments which overlie the bedrock of Glacier Creek valley, Alaska, are composed of materials originally transported to the valley by large Pleistocene glaciers. The material has been reworked by glacier ice, melt-water streams, and marine waters. Groundwater supplies adequate for single-family dwellings are generally available within 100 feet of the ground surface throughout the valley, except on the steep mountain slopes near the valley margins. The most favorable sites for development of larger-yield, public-supply wells are along Glacier Creek in the central part of the valley. Abundant surface water is available from Glacier Creek and its tributaries. The flow regimen of these streams is to some extent regulated by the storage of water in the basin's glaciers and snowfields and the subsequent release of melt water. The inorganic chemical quality of the valley's groundwater and surface water is acceptable for domestic use; suspended sediment in the larger streams may at times preclude their use as potable supplies prior to removal of the glacial silt. Damaging floods have occurred in historic times and are probable in the future. The low flood-plain along Glacier and California Creeks is the most flood prone area. A high-water table and poor infiltration characteristics of the clayey and silty deposits in some parts of the valley create conditions unsuitable for septic-tank sewage disposal. Instances of pollution by sewage have already occurred in the Alyeska village area. (Knapp-USGS)
W74-08595

WATER FROM THE COASTAL PLAIN AQUIFERS IN THE WASHINGTON, D.C., METROPOLITAN AREA,
Geological Survey, Washington, D.C.
S. S. Papadopulos, R. R. Bennett, F. K. Mack, and P. C. Trescott.
Circular 697, 1974. 11 p, 7 fig, 20 ref.

Descriptors: *Hydrogeology, *Coastal plains, *District of Columbia, *Water supply, Groundwater, Water yield, Cities, Municipal water.

The Atlantic Coastal Plain aquifers were studied in the vicinity of the Washington, D.C., metropolitan area to estimate the water-supply potential of these aquifers and to determine the possibility of developing an emergency water supply during droughts. The water-supply potential within an assumed 30-mile radius of Washington, D.C., is about 170 million gallons per day. Aquifers which are now furnishing an estimated 60 million gallons per day could be developed to supply an additional 110 million gallons per day on a continuous basis. This quantity might be even larger if a significant amount of water is derived from leakage through finer grained confining beds, but further studies would be necessary to determine the amount of leakage and the long-term effects of large-scale continuous use. Furthermore, under intermittent pumping conditions, an assumed emergency supply of 100 million gallons per day could probably be developed from well fields within a 30-mile radius of Washington. (Knapp-USGS)
W74-08597

AN APPRAISAL OF THE GROUNDWATER RESOURCES OF THE UPPER CAPE FEAR RIVER BASIN, NORTH CAROLINA,
Geological Survey, Raleigh, N.C.
E. O. Floyd, and R. R. Peace.
North Carolina Office of Water and Air Resources Groundwater, Raleigh, Bulletin No 20, May 1974. 17 p, 5 fig, 4 tab, 5 ref.

Descriptors: Water resources, *Groundwater, *North Carolina, Hydrogeology, Aquifers, Water wells, Hydrologic data, Data collections, Water pollution sources.
Identifiers: *Cape Fear River basin(N.C.).

Large amounts of water are stored in the rocks underlying the upper part of the Cape Fear River basin, North Carolina. Dependable groundwater supplies can be developed from these rocks in all parts of the basin if the hydrologic conditions are properly evaluated and the wells and well fields are designed accordingly. The chemical quality of the groundwater in the basin is generally suitable for most uses. However, excessive concentrations of iron, hardness, and chloride occur in some local areas. (Knapp-USGS)
W74-08605

SALT-WATER INTRUSION AND ITS CONTROL,
California Univ., Berkeley. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W74-08662

4C. Effects On Water Of Man'S Non-Water Activities

EROSION CONTROL ON HIGHWAY CONSTRUCTION.
National Academy of Sciences, Washington, D.C. Highway Research Board
For primary bibliographic entry see Field 4D
W74-08178

THE CONTROL OF POLLUTION FROM HYDROGRAPHIC MODIFICATIONS.
Environmental Protection Agency, Washington D.C. Office of Air and Water Programs
For primary bibliographic entry see Field 5G
W74-08186

RUNOFF OF OILS FROM RURAL ROADS TREATED TO SUPPRESS DUST,
Edison Water Quality Research Lab., Edison, N.J.
For primary bibliographic entry see Field 5B.
W74-08236

ENVIRONMENTAL RESEARCH AND HIGHWAYS,
For primary bibliographic entry see Field 5B.
W74-08251

HYDROLOGICAL EFFECTS OF URBANIZATION,
L. A. Heindle.
Transactions, American Geophysical Union, Vol 55, No 4, p 190-191, April, 1974.

Descriptors: *Urbanization, *Urban hydrology, Urban sociology, Hydrology, Organizations, Water management(Applied), Water resources development, *Research priorities.

A total of 54 experts from 23 countries participated in the International Workshop on the Hydrological Effects of Urbanization, in Warsaw, Poland Nov. 8-10, 1973. The workshop completed its set task of reviewing a draft report. The report, which will be published by the time of the End-of-Decade Conference in 1974, describes the effects of urbanization on the hydrological cycle and identified research needs for the next few years. The report is directed primarily at researchers in hydrology, but will have a special summary of interest to water managers. (Merritt-FIRL)
W74-08257

WATER POLLUTION AND ASSOCIATED EFFECTS FROM STREET SALTING,
Environmental Protection Agency, Edison, N.J.
For primary bibliographic entry see Field 5B.
W74-08306

OUR GREAT LAKES.
Wisconsin Univ., Madison. Sea Grant College Program.
For primary bibliographic entry see Field 2H.
W74-08531

TIME OF CONCENTRATION--A KINEMATIC WAVE APPROACH,
Metropolitan Sanitary District of Greater Chicago, Ill, Sewer Design Section.
For primary bibliographic entry see Field 2E.
W74-08593

DIGITAL SIMULATION OF THE EFFECTS OF URBANIZATION ON RUNOFF IN THE UPPER SANTA ANA VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
T. J. Durbin.

vailable from NTIS, Springfield, Va. 22151, as B-231 303/AS, Price $3.75 printed copy; $1.45 icrofiche. Water-Resources Investigations 41-73, ebruary 1974. 44 p, 23 fig, 6 tab, 18 ref.

escriptors: *Urban hydrology, *Simulation analsis, *Urban runoff, *Urbanization, Flood requency, Storm runoff, Peak discharge, Mathetatical models, Rainfall-runoff relationships, uburban areas, *California.
dentifiers: *Santa Ana Valley(Calif), Stanford Vatershed Model.

he Stanford Watershed Model was used to simute the effects of urbanization on the discharge om five drainage basins in the upper Santa Ana alley, California, an area with an average annual recipitation of 15 inches. The drainage areas nged in size from 3.72 to 83.4 square miles. sing the model, synthetic records of streamflow r each watershed were generated to represent arious degrees of urban development. Examinaon of the synthetic records indicated that uranization has the following effects on streamflow the area: (1) average annual runoff from a atershed covered by 10% effective impervious ea is approximately 2 inches, and increases by 1 ch for each increase in effective impervious ver equal to 10% of the drainage area; (2) uranization can increase the magnitude of peak scharge and daily mean discharge with a recurence interval of 2 years by a factor of three to six; nd (3) peak discharges and daily mean discharges at have recurrence intervals greater than a limitg value ranging from 50 to 200 years or more are ttle affected by urbanization. (Knapp-USGS)
/74-08598

YDROLOGIC EFFECTS OF PATCH CUTTING F LODGEPOLE PINE,
Iational Oceanic and Atmospheric Administraon, Fort Collins, Colo.
. L. Dietrich, and J. R. Meiman.
olorado State University Hydrology Paper No 6, April 1974. 31 p, 21 fig, 28 tab, 32 ref, 2 append. SBR Contract 14-06-6598.

escriptors: *Water yield improvement, *Clearutting, *Colorado, Forest management, Vatershed management, *Cutting management, nowpacks, Water management(Applied).

he effects of patch cutting for timber harvest ere studied in paired plot studies of soil water nd snow water equivalent conducted from 1968 to 973 in lodgepole pine on the Eastern Slope of the olorado Front Range. Small patch cuts ranging in ze from 0.29 acre to 0.61 acre were cut in the fall f 1971. The average increase in water potentially vailable for streamflow from the cut areas was 1.8 cm. Increase in snow on a relatively small part f the cut areas accounted for 21% of the increase. he remainder of the increase is attributed to educed evapotranspiration as a result of three emoval. Although the results are site-specific and or only the first full hydrologic year after treatent, there does appear to be a very high potential or water yield increase by small patch cuts from ites similar to those studied. (Knapp-USGS)
/74-08603

D. Watershed Protection

ROSION CONTROL ON HIGHWAY CONTRUCTION.
Iational Academy of Sciences, Washington, D.C. Highway Research Board.
vailable from Highway Research Board, Naonal Academy of Science, 2101 Constitution venue, Washington, D.C. 20418 Price $4.00. Naonal Cooperative Highway Research Program, ynthesis of Highway Practice 18, 1973. 52 p, 29 g, 3 tab, 8 ref, 7 append.

Descriptors: *Erosion control, *Road construction, *Highways, Mulching, Slopes, Erosion, Scour, Sediment control.

Highway construction specifications include protective measures for land and water. However, erosion and the resulting sedimentation from highway construction continue to be a problem. Construction activities that are subject to high erosion risks include right-of-way clearing, earthwork, ditch construction, haul roads, culvert installation, channel changes, pier or abutment work in streams, temporary stream crossings, borrow pit operation, and hydraulic or mechanical dredging. Factors in addition to exposed area that affect erosion and sediment production are: rainfall intensity, slope, soil type, rate of runoff, and depth and velocity of runoff. Erosion potential must be assessed during the route study and location phases. Soil types, anticipated cuts and embankments, grades, proximity to critical areas, and channel change requirements should be studied and costs estimated if special protection is necessary. Sediment traps, settling basins, stage seeding and mulching, temporary slope drains, special berms, terraces, ditches and dikes, temporary seeding, sodding, contouring, benching, serrated slopes, and erosion control mesh are placed in the construction contract. Special attention may be directed to the timely paving of ditches, placing of riprap, or other permanent erosion control measures. Rough slopes hold water, seed, and mulch. (Knapp-USGS)
W74-08178

FLOODFLOWS FROM SMALL DRAINAGE AREAS IN OKLAHOMA: PROGRESS REPORT AND DATA COMPILATION,
Geological Survey, Oklahoma City, Okla.
For primary bibliographic entry see Field 2E.
W74-08292

IMPROVEMENT OF SOIL COVER FOR WATER CONSERVATION, PREVENTION OF SEDIMENTATION AND POLLUTION CONTROL IN THE PHILIPPINES,
National Inst. of Science and Technology, Manila (Philippines). Div. of Agriculture and Natural Resources Research.
For primary bibliographic entry see Field 5G.
W74-08481

EROSION CONTROL AND BANK STABILIZATION IN METROPOLITAN TORONTO--10 YEAR PROGRAMME AND 5 YEAR PROJECT.
Metropolitan Toronto and Region Conservation Authority, Downsview (Ontario).
November, 1973, 32 p, 5 tab. W.C.-60.

Descriptors: *Erosion control, *Bank stabilization, *Water management(Applied), *Classification, Cost sharing, Drainage, Valleys, Watercourses(Legal aspects), Retaining walls, Floodplain, Grading, Land development, *Canada.
Identifiers: *Toronto(Canada), Stream classification, Stream inventory.

The rapid urbanization of the Metropolitan Toronto area has caused increasing peak load runoffs from storm drainage, causing increasing erosion along the major water arteries. Valley wall slopes have been made unstable by the construction of poorly engineered retaining walls. A study of 6 major streams determined that 17-63% of their lengths required some erosion control and of 1435 valley wall segments 10% showed high scores of instability, while 16% showed high hazard scores. The solutions proposed for the erosion problem are: definition of areas of responsibilities for municipal agencies, naming of an agency to control, monitor, and prepare programs, prevention of further erosion damage, strengthening of legislation to enable positive action, the creation of a central data bank, the development of a long term program with funds, and the public acquisition of slopes. The ten year programme will include the classification of all streams in the Metropolitan Toronto region. The criteria used for the classification is the significance of the waterway to Metropolitan Toronto and the categories established are: major (Metropolitan Toronto assumes cost of remedial action) intermediate (Metropolitan Toronto decides distribution of cost for remedial action) and minor (Boroughs and City of Toronto assume cost). Major and minor remedial works will be performed on both public and private lands, and the owners of private lands will be assessed a part of the cost. Legislation will be proposed to control grading and drainage on new developments. The budget for the 5 year starting project is $500,000/yr. with 1/2 paid by Metropolitan Toronto and 1/2 by the Province of Ontario. (LaPointe-North Carolina)
W74-08488

A BILL TO AMEND THE SOIL CONSERVATION AND DOMESTIC ALLOTMENT ACT.
For primary bibliographic entry see Field 6E.
W74-08554

5. WATER QUALITY MANAGEMENT AND PROTECTION

GROUND WATER POLLUTION FROM SUBSURFACE EXCAVATIONS.
Environmental Protection Agency, Washington, D.C. Office of Air and Water Program.
Available from Sup Doc, GPO, Washington, D.C. 20402 price $2.25. Report EPA-430/9-73-012, 1973. 217 p, 9 fig, 21 tab, 125 ref, append.

Descriptors: *Water pollution sources, *Path of pollutants, *Groundwater, Waste water disposal, Malenclaves, Waste disposal wells, Septic tanks, Cesspools, Pit recharge, Excavation, Water pollution control.
Identifiers: Federal water pollution control act.

Every hole in the ground, whether natural or manmade, is a potential source of groundwater contamination. There are three basic mechanisms by which groundwater becomes polluted: The natural filtering system of vegetation, soil, silt, sand, gravel and rocks that protects groundwater is bypassed by polluting substances beyond its capacity to handle them, or by substances that are unfilterable; and the hydraulic or chemical balance in the subsurface is altered so that polluting substances move to, within, or between aquifers. The use of subsurface excavations for the disposal of wastes is growing, the types of materials so disposed of are legion, and the placement and isolation of these materials so as to avoid adverse environmental impacts (particularly groundwater quality degradation) is a difficult and complicated problem. The states, in order to avoid the long-term pollution of huge quantities of usable water, must continue to devote careful and expert attention to the protection of the subsurface environment to assure their citizens of a continuing supply of good quality groundwater. (Knapp-USGS)
W74-08185

5A. Identification Of Pollutants

A BIBLIOGRAPHY ON THE POLLUTION ASPECTS OF COKE OVENS,
British Steel Corp., (Sheffield) (England). Strip Mills Div.
For primary bibliographic entry see Field 5B.
W74-08183

AUTOMATED METHOD FOR ORTHO-, ORTHO-PLUS HYDROLYZABLE AND TOTAL

PHOSPHATE IN SURFACE AND WASTE-WATERS,
Proctor and Gamble Co., Cincinnati, Ohio. Ivorydale Technical Center.
Q. W. Osburn, D. E. Lemmel, and R. I. Downey.
Environmental Science and Technology, Vol 8, No 4, p 363-366, April, 1974. 2 fig, 5 tab, 7 ref.

Descriptors: *Phosphates, *Measurement, *Colorimetry, *Automation, Methodology, Turbidity, Neutralization, Surface waters, Waste water(Pollution), *Pollutant identification.
Identifiers: Orthophosphates.

All the titled classifications of phosphates are concurrently measured colorimetrically as orthophosphate using appropriate modifications of the Murphy and Riley reagent. Features of the method include a means of compensating for the high bias effect of turbidity on orthophosphate results and elimination of a need for neutralization of the acidic sample streams of the hydrolyzable and total phosphate determinations prior to color development. (Sandoski-FIRL)
W74-08208

MEASUREMENT AND MONITORING UNITS FOR WASTE WATER (MESS-UND UEBERW-WACHUNGSGERAETE FUER ABWASSER),
C. G. Enke.
Wasser, Luft and Betrieb, Vol 18, No 1, p 20-25, 1974. 12 fig, 1 ref.

Descriptors: *Measurement, *Monitoring, *Instrumentation, Equipment, *Waste water treatment, Hydrogen ion concentration, Treatment facilities, Oxygen requirements, Turbidity, Conductivity, Chemical oxygen demand, *Pollutant identification.

Measurement and monitoring units for wastewater include pH measuring instruments which check the pH of the cleaned water leaving purification plants. Rake cleaning facilities are used for better operation of the purification plants and pumping stations with new automatic devices that remove the material from the rakes in the opposite direction to the water flow. Oxygen measurement mains and battery-operated oxygen analyzers are available whose measurement ranges between 0 and 30 mg O2/liter and are stabilized against the ambient temperature. A COD measuring unit involving the use of bichromate oxidation is illustrated, with the consumed quantity of bichromate being the measurement for the COD value. Descriptions of electric CO2 meters and conductivity analyzers are included. (Sandoski-FIRL)
W74-08219

THE COUNTING OF AEROBIC ACTINOMYCETES IN WATER SAMPLES (DENOMBREMENT DES ACTINOMYCETES AEROBIES DE L'EAU),
Institut Pasteur, Lille (France). Laboratoire d'Hydrobiologie.
C. Eak-Hour, and H. Leclerc.
Annales de Microbiologie (Institut Pasteur), Vol 124, Part B, No 4, p 533-546, 1973. 3 tab, 22 ref.

Descriptors: *Methodology, *Water sampling, Soil analysis, Antibiotics(Pesticides), Bacteria, Fungi, Efficiencies, *Water treatment, Water purification, Sediments.
Identifiers: *Antinomycetes, Samples treatment.

A practical method for the quantification of actinomycetes in water and in sediments is described. Factors investigated include: suppression of bacteria and of fungi by the use of antibiotics; the purification, concentration, and homogenization of samples; and, the comparative efficiency of different culture media. Techniques for different types of water samples are suggested. (Sandoski-FIRL)
W74-08220

A BIOASSAY OF TOXICITY USING PROTOZOA IN THE STUDY OF AQUATIC ENVIRONMENT POLLUTION AND ITS PREVENTION,
Institutul de Medicina si Farmacia, Iasi (Rumania). Catedra de Igiena
S. Apostol
Environmental Research, Vol 6, No 4, p 365-372, 1973. 4 fig, 2 tab, 17 ref.

Descriptors: *Toxicity, *Bioassay, Evaluation, *Protozoa, Laboratory tests, Bioindicators, Water pollution effects, *Pollutant identification
Identifiers: *Paramecium.

Methods are described for short-term (acute) and long-term (chronic) toxicity evaluation in order to determine the degree of toxicity of various waterborne contaminants and to establish the tolerance to these agents. The technique consists in exposure of cultures of Paramecium caudatum Ehr. in serial dilution tests for short and extended time intervals. Results may be obtained within a few hours in the acute and within two weeks in the chronic tests. (Sandoski-FIRL)
W74-08221

SUSPENDED SOLIDS ANALYSIS USING ERTS-A DATA,
Pennsylvania Univ., Philadelphia. Moore School of Electrical Engineering.
For primary bibliographic entry see Field 2J.
W74-08301

A SIMPLE DIGESTION PROCEDURE FOR ESTIMATION OF TOTAL NITROGEN IN SOILS AND SEDIMENTS,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W74-08324

THE ACCUMULATION OF ORGANIC AND INORGANIC MERCURY COMPOUNDS BY THE EASTERN OYSTER (CRASSOSTREA VIRGINICA),
Environmental Protection Agency, Dauphin Island, Ala. Gulf Coast Water Supply Research, Lab.
For primary bibliographic entry see Field 5C.
W74-08346

THE USE OF THE DILUTION WATER EFFECT AS A WATER QUALITY CRITERION,
Southeastern Massachusetts Univ., North Dartmouth. Dept. of Biology.
J. L. Cox.
Bulletin of Environmental Contamination and Toxicology, Vol 11, No 3, p 256-257, March 1974. 1 fig, 2 ref.

Descriptors: *Toxins, Aquatic life, *Water quality, *Analytical techniques, Water sources, Dilution, Toxicity, Water pollution effects, Pollutant identification.
Identifiers: *Dilution water.

A principal difficulty in the toxicology of marine organisms has been obtaining dilution water that is free from substances which may affect the response of a test organism to a toxin. The possibility of synergism between unknown chemical constituents in the dilution water and controlled additions of a toxin suggests and entirely different approach to assessing water quality. The dose-response relationship for a particular toxine or pollutant is compared using relatively clean water as a control dilution water source and water suspected of being polluted as the test dilution water source. Experimental procedures are detailed. (Sandoski-FIRL)
W74-08356

WATER QUALITY MONITORING EXPERIENCE IN THE SOMERSET RIVER AUTHORITY AREA, 1968-1972,
B. J. Elvins
Water Pollution Control, Vol 78, No 1, p 33-40, 1974. 4 fig

Descriptors: *Dissolved oxygen, *Temperature, *Monitoring, *Instrumentation, Gaging stations, Data collections, Flow measurement, Water quality, *Pollutant identification.
Identifiers: *United Kingdom(Somerset River).

The Somerset River Authority has concentrated its resources on obtaining continuous information for dissolved oxygen and temperature parameters, supplemented by the use of automatic samplers to give information on other chemical factors. The stations are simple and battery-operated, requiring regular maintenance with the probes being immersed directly in the river. System difficulties are maintaining sufficient flow around the probe when the water is penned and the formation of algal and Sphaerotilus growths on the probe, which prevent accurate readings. The chief problem that occurs in the collection of data from quality stations is the presentation of the information in a form which can be easily related to other factors in the river. The two forms of monitoring described when combined with flow measurement and with regular semi-quantitative biological sampling of rivers, can give most useful information. (Sandoski-FIRL)
W74-08360

A PROGRAMMED SAMPLER FOR RUNOFF AND BEDLOADS,
Agricultural Research Service, Lincoln, Neb.
N. P. Swanson.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 16, No 4, p 790-792, July-August, 1973. 5 fig, 5 ref.

Descriptors: *Feed lots, *Runoff, *Bed load, *Nebraska, Chemical analysis, Rain gauge, Hydrograph analysis, *Sampling, *Pollutant identification, Farm wastes.
Identifiers: Feedlot research, Quantitative analysis.

A programmed, automatic sampler that collects a sequence of composite samples of runoff and accompanying bedloads has been in use on a feedlot research installation near Lincoln, Nebraska, for over four years. The sampler consists of an arm and dipper electrically driven by a gear reduction motor through sprockets and a chain, a tipping bucket that collects the samplings from several rotations of the dipper and delivers them as a single sample, a turntable holding successive sample containers, a gear reduction motor moving the turntable by a friction drive, and a program timer. Composited samples are collected over five minute sampling periods with volumes of about three liters. The sampler can be programmed to obtain individual samples for any of the 144 five-minute periods during 12 total hours of actual operation. The runoff need not be continuous. The time of collection of each sample is recorded to relate to the runoff hydrograph and recording rain gage chart. Bedload particles up to 5/8 inch in diameter can enter the rotating sampler dipper which passes under the discharge. The sampler permits both qualitative and quantitative analyses of runoff with relation to time for an event. Maintenance and field servicing requirements have been minimal. (Merritt-FIRL)
W74-08361

ELECTROANALYTICAL STUDIES OF METHYLMERCURY IN AQUEOUS SOLUTION,
Hercules Research Center, Wilmington, Del.
R. E. Heaton, and H. A. Laitinen.
Analytical Chemistry, Vol 46, No 4, p 547-553, April 1974. 6 fig, 31 ref.

Descriptors: *Electrochemistry, *Polarographic analysis, Analytical techniques, Methane, Mercury, Volumetric analysis, Pollutant identification, Aqueous solutions.
Identifiers: *Methylmercury, Electroanalytical techniques.

The electrochemical reduction of monomethylmercury compounds in solution has been studied using pulse polarography, cyclic voltammetry, and related techniques. Reduction of these compounds at a mercury electrode occurs in two one-electron steps. The first results in the formation of a methylmercuric radical on the electrode. This step is reversible under polarographic conditions, but the polarographic wave is distorted due to involvement of the methylmercuric radical in subsequent chemical reactions. Addition of the second electron results in reduction of the methylmercuric compound to elemental mercury and methane, giving rise to the second polarographic wave. This reduction is irreversible; the wave is distorted. The first pulse polarographic wave has analytical utility arising from a linear peak current vs. concentration curve between concentrations of .0000001 and .0001 M. The analytical implications of the reduction mechanism are discussed; attention is given to effects of coordinating agents and to detection limits. (Prague-FIRL)
W74-08362

AQUATIC ORGANISMS FROM SELECTED SITES ALONG THE PROPOSED TRANS-ALASKA PIPELINE CORRIDOR, SEPTEMBER 1970 TO SEPTEMBER 1972,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 2I.
W74-08369

DETERMINATION OF THE ALKALINITY OF MILL EFFLUENTS (OPREDELENIE SHCHELOCHNOSTI STOCHNYKH VOD),
Vsesoyuznyi-Nauchnyi Planovii Otdel Bumazhnoi Promyshlennost (USSR).
I. G. Alesina, M. M. Krunchak, I. V. Zhukova, and V. P. Semenov.
Bumazhnaya Promyshlennost', No 11, p 20-21, Nov 1973. 1 fig, 1 tab.

Descriptors: *Pulp wastes, Analytical techniques, *Alkalinity, *Waste water(Pollution), *Water analysis, *Conductivity, Volumetric analysis, Effluents, Pulp and paper industry, *Pollutant identification.
Identifiers: Black liquors, Kraft mills.

In determining the alkalinity of pulp and paper mill effluents, such as black liquors from kraft digestions, the standard titration with an indicator or by potentiometry gives inaccurate results, because of the high buffering power of such effluents. Conductometric titration is proposed as being a more sensitive method and shown to offer advantages over conventional titrations in analyses of dilute black liquors and biologically purified black liquors. (Stapinski-IPC)
W74-08411

SIMPLE APPARATUS FOR ON-SITE CONTINUOUS LIQUID-LIQUID EXTRACTION OF ORGANIC COMPOUNDS FROM NATURAL WATERS,
Gotenburg Univ. (Sweden). Dept. of Analytical Chemistry.
M. Ahnoff, and B. Josefsson.
Analytical Chemistry, Vol 46, No 6, p 658-663, May 1974. 4 fig, 5 tab, 26 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, Pesticides, *Aldrin, *Dieldrin, *DDT, Water analysis, *Pollutant identification, *Polychlorinated biphenyls, Analytical techniques, Laboratory tests, On-Site tests, Gas chromatography, *Separation techniques, Solvent extractions.
Identifiers: Lindane, Trace analysis, Gota River, Benzene hexachloride(Hexachlorocyclohexane).

A description and schematic diagram are given of an apparatus for the continuous extraction of trace organic substances (such as pesticides) from natural waters. The apparatus consists of an extraction unit, magnetic stirring device, and pump. Hexane and cyclohexane are suitable extracting agents. The theory for extracting chlorinated hydrocarbon pesticides continuously from water with a stationary immiscible solvent is discussed. In laboratory tests, the recovery of added chlorinated pesticides (e.g., lindane, dieldrin, aldrin, DDT) was 83-96%. Gas-liquid chromatography of extracts of water from the Gota River (Sweden) permitted determination of polychlorinated biphenyls in the concentration range of 0.1-1.0 ng/liter. (Buchanan-IPC)
W74-08414

QUANTITATIVE MEASUREMENTS OF INORGANIC MERCURY AND ORGANOMERCURIALS IN WATER AND BIOLOGICAL MEDIA BY GAS-LIQUID CHROMATOGRAPHY,
North Carolina Univ., Chapel Hill. Dept. of Pathology.
P. Zarnegar, and P. Mushak.
Analytica Chimica Acta, Vol 69, No 2, p 389-407, April 1974. 8 fig, 2 tab, 18 ref.

Descriptors: *Water analysis, *Mercury, *Chromatography, *Gas chromatography, *Analytical techniques, Inorganic compounds, Organic compounds, *Pollutant identification.

Gas-liquid chromatography is used to determine inorganic Hg in the presence or absence of organic Hg compounds in water, blood, and other biological media after alkylation or arylation. Best results for inorganic Hg were realized with pentacyanomethylcobaltate(II) and tetraphenylborate(III) via the generated methyl and phenyl mercurial. Tetraethyltin, forming ethylmercury, was less satisfactory. Lower detection limits with these reagents were in the range of 10-30 ng of Hg/ml of medium. Codetermination of inorganic Hg and various organomercurials was conducted by sequential or simultaneous procedures with several column temperatures and packings. Optimal chromatographic results were achieved with Durapak Carbowax 400 (low K') on Porasil F and 10% DEGS on Anakrom SD. (Brown-IPC)
W74-08415

DETERMINATION OF NITRATE IN WATER WITH A NEW CONSTRUCTION OF ION-SELECTIVE ELECTRODE,
Warsaw Univ. (Poland). Inst. of Fundamental Problems in Chemistry.
A. Hulanicki, R. Lewandowski, and M. Maj.
Analytica Chimica Acta, Vol 69, No 2, p 409-414, April 1974. 3 fig, 2 tab, 6 ref.

Descriptors: *Water analysis, *Nitrates, *Chemical analysis, *Analytical techniques, *Electrodes, *Pollutant identification, Freshwater.

A new design of the liquid-state electrode for nitrate ions is proposed. It contains a porous wick saturated with the liquid ion-exchanger, and has no internal reference solution. The electrode was used to determine nitrate in tap water at the 8-10 ppm level. The effects of chloride and bicarbonate ions are eliminated by addition of silver sulfate and a phosphate buffer, which also maintains constant ionic strength. The precision of a series of measurements is better than 2%, but the results differ by up to 10% from data obtained by the colorimetric brucine procedure. (Brown-IPC)
W74-08420

DETERMINATION OF TOTAL HYDROCARBONS IN SEA WATER AT THE MICROGRAM LEVEL WITH A FLOW CALORIMETER,
Kiel Univ. (West Germany). Institut fuer Meereskunde.
A. Zsolnay.
Journal of Chromatography, Vol 90, No 1, p 79-85, March 13, 1974. 4 fig, 1 tab, 14 ref.

Descriptors: *Water analysis, *Chromatography, *Hydrocarbons, *Sea water, Analytical techniques, Separation techniques, Equipment, Instrumentation, *Pollutant identification.

One liter of water is extracted with 10 ml of 1,2,2-trichlorotrifluoroethane. The extract is concentrated to 100 microliter. A 50-microliter volume is injected into a high-performance liquid chromatographic system with a flow calorimeter that measures the absorbance of hydrocarbons on porous glass beads. A short silica gel column in the system removes non-hydrocarbon material. A chromatogram is obtained within 3 min, and only one peak has to be evaluated. The minimum detectable amount is 4.0 plus or minus 3.4 microgram/liter. These values can be improved by extracting larger volumes. The equipment used is fairly inexpensive and can readily be taken to sea. (Brown-IPC)
W74-08430

THE GAS-CHROMATOGRAPHIC DETERMINATION OF SOME LIGNIN COMPOUNDS IN SURFACE WATERS (DIE GASCHROMATOGRAPHISCHE BESTIMMUNG EINIGER LIGNINVERBINDUNGEN IN OBERFLAECHENGEWAESSERN),
Polish Academy of Sciences, Zabrze. Zaklad Badan Naukowych Gornoslaskiego Okregu Przemyslowego.
J. Paluch, and S. Stangret.
Fortschritte in Wasserchemie and Grenzgebiete, No 14, p 89-100, 1972. 4 fig, 2 tab, 38 ref. English summary.

Descriptors: *Pollutant identification, Water pollution sources, Water analysis, *Lignins, *Sulfonates, Analytical techniques, *Pulp wastes, *Sulfite liquors, Hydrolysis, Sampling, Surface waters, Waste water(Pollution), Monitoring, Chromatography, *Gas chromatography.
Identifiers: Vanillin, Folin-Denis reagent.

The vanillin method for estimation of lignosulfonic acids (LSA) in water involves alkaline hydrolysis of the sample followed by extraction of vanillin with ether and quantitative determination by gas chromatography. Using a spent sulfite pulping liquor of known composition to calibrate the method, LSA determinations were made in river water sampled above and below a pulp and paper mill site. The lignin concentrations found were 20-30% lower than those determined using the Folin-Denis method. (Speckhard-IPC)
W74-08433

PHOSPHORUS IN WASTE WATER.
Scandinavian Pulp, Paper and Board Testing Committee, Stockholm (Sweden).
Norsk Skogindustri, Vol 27, No 11, p 322-323, Nov. 1973. Scan-W8:73.

Descriptors: Water analysis, *Chemical analysis, *Analytical techniques, Waste water(Pollution), *Phosphorus compounds, *Phosphates, *Colorimetry, Spectrophotometry, Standards, Europe, Industrial wastes, Oxidation, *Water quality standards.
Identifiers: Scandinavia.

In this Scandinavian standard test method, samples of waste waters to be analyzed for phosphorus content are subjected first to wet combustion (oxidation) with hydrogen peroxide plus concentrated sulfuric acid to convert all P compounds into orthophosphates. The subsequent addition of molybdic acid produces a yellow complex which is reduced to a blue complex by ascorbic acid. The blue complex is then determined colorimetrically. (Brown-IPC)
W74-08438

AUTOMATIC WASTE SLUDGE SAMPLER,
Hampton Township Water Pollution Control Plant, Allison Park, Pa.
A. Bologna.
Deeds and Data (Water Pollution Control Federation), April 1974, p D4-D5. 2 fig.

Descriptors: *Sampling, Sludge, *Waste water treatment, *Sewage treatment, *Automatic control, Equipment, Treatment facilities, *Municipal wastes, *Sludge treatment, Moisture content, Monitoring.

Odor and solids buildup problems at a municipal waste water treatment plant indicated the need for an automatic sampler to take 24-hr composite samples for determinations of waste sludge solids content. An appropriate device has been developed which utilizes the existing flow to operate without an external power source. The inexpensive and relatively simple sampler is described and illustrated. (Brown-IPC)
W74-08442

TEST AND EVALUATION OF OIL POLLUTION ABATEMENT DEVICES FOR SHIPBOARD USE, PHASE 1,
Coast Guard, Washington, D.C. Naval Engineering Div.
For primary bibliographic entry see Field 5G.
W74-08450

ANALYSES OF TARS, CHARS, GASES, AND WATER FOUND IN EFFLUENTS FROM THE SYNTHANE PROCESS,
Bureau of Mines, Pittsburgh, Pa. Pittsburgh Energy Research Center.
A. J. Forney, W. P. Haynes, S. J. Gasior, G. E. Johnson, and J. P. Strakey, Jr.
Bureau of Mines Technical Progress Report 76, January 1974. 9 p, 2 fig, 7 tab, 4 ref.

Descriptors: *Industrial wastes, *Coals, *Waste water treatment, Water pollution sources, Fuels, Chemical wastes, Gases, *Pollutant identification.
Identifiers: *Coal gasification, *Synthane process.

Extensive studies were made of the various effluents found in the Synthane coal-to-gas process. Analyses were made of the waters, gases, and trace elements present in some of the streams. The major effluent problem is the contaminated condensate from the gasifier. The contaminated condensate from the shift converter would be similar to but more dilute than the gasifier condensate. A satisfactory means of solving the effluent problems of the Synthane plant is commercially available. (Knapp-USGS)
W74-08592

QUALITY OF SURFACE WATER IN THE VICINITY OF OIL EXPLORATION SITES, BIG CYPRESS AREA, SOUTH FLORIDA,
Geological Survey, Tallahassee, Fla.
E. T. Wimberly.
Geological Survey open-file report 74012, 1974. 26 p, 1 fig, 1 ref.

Descriptors: *Water pollution sources, *Oil fields, *Florida, *Brines, Salinity, Saline water, Chlorides, Oil pollution, Data collections, Hydrologic data, Sampling, Water quality, *Pollutant identification.
Identifiers: Big Cypress(Fla).

Exploration for oil in the Big Cypress area of south Florida caused concern that this activity might change the quality of surface water in the vicinity of the drilling sites. Samples of surface water were collected near the proposed exploration sites before oil drilling activities commenced in order to assemble background water-quality data. After the drilling sites were actually in use the surface water was again sampled to determine whether the exploration activities had caused any water-quality changes. At Site 4, concentration of June 1973 was about 445 times higher than that of August 1971; at site 5, concentration of June 1973 was about 15 times higher than that of August 1971 and July 1972; at site 8, concentration of June 1973 was about 8 times higher than that of August 1971. The October 1973 sampling showed that chloride concentrations at all sites were at background level. (Knapp-USGS)
W74-08596

RADIOLOGICAL SURVEY OF NEW LONDON HARBOR, THAMES RIVER, CONN., AND ENVIRONS,
Office of Radiation Programs, Washington, D.C.
For primary bibliographic entry see Field 5B.
W74-08645

ENVIRONMENTAL RADIOACTIVITY IN ILLINOIS, 1970,
Office of Radiation Programs, Washington, D.C. Field Operations Div.
For primary bibliographic entry see Field 5B.
W74-08646

STATE ENVIRONMENTAL RADIOACTIVITY SURVEILLANCE PROGRAMS, 1972,
Office of Radiation Programs, Washington, D.C.
For primary bibliographic entry see Field 5B.
W74-08647

SUMMARY OF ENVIRONMENTAL MONITORING AT PHILADELPHIA, 1958-1971,
Philadelphia Public Health Dept., Pa. Div. of Occupational and Radiological Health.
For primary bibliographic entry see Field 5B.
W74-08648

TRITIUM BURDENS IN TWO ARCTIC VILLAGES,
National Environmental Research Center, Las Vegas, Nev.
For primary bibliographic entry see Field 5B.
W74-08649

TRITIUM SURVEILLANCE SYSTEM, OCTOBER-DECEMBER 1972.
Office of Radiation Programs, Las Vegas, Nev.
For primary bibliographic entry see Field 5B.
W74-08650

WATER SURVEILLANCE PROGRAMS, NOVEMBER 1972.
National Environmental Research Center, Las Vegas, Nev.
For primary bibliographic entry see Field 5B.
W74-08651

WATER SURVEILLANCE PROGRAMS, FEBRUARY 1973 AND 1972, SPECIAL ANALYSES.
National Environmental Research Center, Las Vegas, Nev.
For primary bibliographic entry see Field 5B.
W74-08652

RADIOACTIVITY IN WASHINGTON SURFACE WATER JULY 1970-JUNE 1971.
Washington State Dept. of Social and Health Services, Olympia.
For primary bibliographic entry see Field 5B.
W74-08653

RADIOACTIVITY IN NEW YORK STATE SURFACE WATER, JULY-DECEMBER 1971.
New York State Dept. of Environmental Conservation, Albany. Bureau of Radiological Pollution Control.
For primary bibliographic entry see Field 5B.
W74-08654

WATER SURVEILLANCE PROGRAMS, APRIL-MAY 1973.
National Environmental Research Center, Las Vegas, Nev.
For primary bibliographic entry see Field 5B.
W74-08655

TRITIUM SURVEILLANCE SYSTEM, APRIL-JUNE 1973.
National Environmental Research Center, Las Vegas, Nev.
For primary bibliographic entry see Field 5B.
W74-08656

POTENTIOSTATIC COULOMETRIC DETERMINATION OF VANADIUM, VANADIUM-MANGANESE AND VANADIUM-IRON MIXTURES AND THE INFLUENCE OF CHROMIUM ON THE PROCESS,
Exeter Univ. (England) Dept. of Chemistry
E. Bishop, and P. H. Hitchcock.
Analyst, Vol 98, No 1169, p 572-579, August 1973. 3 fig, 2 tab, 14 ref.

Descriptors: *Pollutant identification, Manganese, Iron, Chromium, Chemical analysis, Electrodes, Electrolytes, *Analytical techniques.
Identifiers: *Vanadium, *Voltammetry, Chemical interference, Coulometry.

A simple coulometric cell was constricted and a commercial potentiostat was adapted for use in determining V, V-Mn, and V-Fe in various media. Since current integration by strip-chart recorder was inadequate, an RC integration system was constructed from polystyrene capacitors. Pretreatments of electrolytes and electrodes are described. Vanadium (V) was determined at minus 0.128 V in acetate buffer and at plus 0.247 V in 2.0 M sulphuric acid, in the latter with a relative standard deviation of 0.27 percent and a 95 percent confidence level result of 0.1008 to 0.1011 M compared with 0.1012 M for a standard solution. Chromium (VI) suppressed all reduction at pH 4.0, and reduced simultaneously with vanadium in sulphuric acid. Manganese (VII) reduced to manganese (III) in the first step at plus 0.7 at pH 3.5 and manganese (III) and vanadium (V) simultaneously reduced in second step at minus 0.12 V. The separation of iron (III) was possible at plus 0.9 V but inpracticable; simultaneous reduction at plus 0.25 V in 2.0 M sulphuric acid followed by re-oxidation of the iron (II) at plus 1.0 V is recommended. (Little-Battelle)
W74-08674

BIOLOGICAL METHODS FOR THE ASSESSMENT OF WATER QUALITY. A SYMPOSIUM PRESENTED AT THE SEVENTY-FIFTH ANNUAL MEETING, JUNE 26-29, 1972.
American Society for Testing and Materials, Philadelphia, Pa.
ASTM Special Technical Publication 528, 1972. p 1-3, 6, 31, 46, 61, 76, 96, 117, 127, 148, 164, 178, 194, 209, 221, 227, 242. $16.25.

Descriptors: *Bioassay, *Pollutant identification, *Bioindicators, *Methodology, Laboratory tests, *Water quality, *Assessments, On-site tests, Water pollution, Aquatic life, Data storage and retrieval, Biological communities, Reviews, Aquatic microorganisms, Benthic fauna, Toxicity, Water pollution effects, Environmental sanitation, Instrumentation, Benthic flora, Water management(Applied), Mixing, Mixolimnion, Monitoring.
Identifiers: Biological monitoring, Species diversity index, Continuous flow techniques, Macroinvertebrates, Sample preservation, Microbiological inhibition test.

This volume is intended to be a management tool to apprise the reader of the types of considerations involved in making biological assessments of

water quality, developing water pollution monitoring programs, and assessing the effects of potentially deleterious waste discharges in the aquatic environment. Also, it provides information which would enable a nonbiologist to get a state-of-the-art view of the existing techniques available, as well as some historic perspective. Papers by world authorities on the use of fish, algae, aquatic invertebrates, and bacteria in the assessment of pollution, in addition to bioassays for evaluating the toxicity of products or waste effluents, are included. Futuristic methods for continuous biological monitoring of industrial effluents are presented, as well as a possible alternative to the much belabored biochemical oxygen demand. (Holoman-Battelle)
W74-08675

THE BRACKISH WATER CLAM RANGIA CUNEATA AS INDICATOR OF ECOLOGICAL EFFECTS OF SALINITY CHANGES IN COASTAL WATERS,
Texas A and M Univ., College Station. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W74-08676

RESEARCH TO DETERMINE THE ENVIRONMENTAL RESPONSE TO THE DEPOSITION OF SPOIL ON SALT MARSHES USING DIKED AND UNDIKED TECHNIQUES.
Skidway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5C.
W74-08677

AIR-BORNE ACID,
Swedish Water and Air Pollution Research Lab., Goteborg.
C. Brosset.
Ambio. Vol 2, No 1/2, p 2-9, 1973. Illus.
Identifiers: Human health, Precipitation(Atmospheric), *Sulfur dioxide, *Sweden, *Air pollution, *Acids(Air borne).

Studies concerning acidification in Sweden led to the development of a method of determining strong acid in precipitation and a technique with which contributions to the acid deposition from local as well as from distant emission sources can be determined. The results of the studies presented a new aspect of the effects of SO2 and particle emissions. The effect on human health that is today tentatively ascribed to the combined impact of SO2 and particles is, instead, attributable to particle-borne acid. If this is the case, measurements of particle-borne acid should replace or complement the measurements of SO2.--Copyright 1973, Biological Abstracts, Inc.
W74-08689

RESIDENCE TIME OF SULFUROUS AIR POLLUTANTS FROM A LOCAL SOURCE DURING PRECIPITATION,
Uppsala Univ. (Sweden). Dept. of Meteorology.
U. Hogstrom.
Ambio. Vol 2, No 1/2, p 37-41, 1973.
Identifiers: *Air pollution, Pollutants, Precipitation(Atmospheric), *Rainfall, Snow, *Sulfurous air pollution, Fallout.

The wet fallout pattern of sulfate and strong acid around a locally restricted source area was studied on 5 different occasions, during well-defined rainfalls and snowfalls, in order to get an estimate of the residence time of sulfurous air pollution released during rainfall or snowfall. In each case samples were obtained from about 100 points situated on concentric 180 deg arcs with a maximum radius of 60 km. The 5 tests indicate that 2/3 of the S that is released during rainfall or snowfall is deposited within a distance of 50-100 km from the source.--Copyright 1973, Biological Abstracts, Inc.
W74-08690

DETECTION AND QUANTITATIVE DETERMINATION OF SALMONELLAE IN SURFACE WATERS AND IN THE WATER OF A MUNICIPAL WATER SUPPLY SYSTEM, (IN RUSSIAN),
G. P. Kalina.
Gig Sanit. Vol 37, No 6, p 77-80, 1972.
Identifiers: Epidemiology, Human infections, *Municipal water, *Salmonellae, Surface waters, *Water supply, Solid wastes, *Pollutant identification.

A survey was made of the literature to determine the possibility of Salmonella contamination occurring in water. The possibility of this occurring exists since human waste provides a breeding ground for these organisms. The role of water in the epidemiology of Salmonella infection is supported. Various methods of detection and quantitative determination of Salmonella in water are discussed.--Copyright 1973, Biological Abstracts, Inc.
W74-08693

DETERMINATION OF THE ACTIVITY OF NITRIFYING BACTERIA IN SURFACE WATERS BY A MODIFIED BOD-TEST, (IN GERMAN),
Hamburgisches Hygienisches Institut (West Germany).
For primary bibliographic entry see Field 5B.
W74-08694

THE SHARE TAKEN BY NITRIFICATION PROCESSES IN THE BIOCHEMICAL OXYGEN DEMAND (BOD) IN THE WATER OF THE RIVER ELBE, (IN GERMAN),
Hamburgisches Hygienisches Institut (West Germany).
K. Roch, and A. Kaffka.
Zentralbl Bakteriol Parasitenkd Infektionskr Hyg Erste Abt Orig Reihe B Hyg Praev Med. Vol 155, No 2, p 189-202, 1971. Illus. English summary.
Identifiers: Bacteria, *Biochemical oxygen demand, Effluents, *Nitrification, Rivers, Waste water, *West Germany(Elbe River).

In addition to the standard 5-day BOD (biochemical O2 demand) test a modified method was applied to eliminate nitrification. Complete suppression of nitrification was obtained by admixture of 0.1 mole/liter ammonia nitrogen (5.35 g/l NH4Cl) to the sample pH 7.0 or slightly below. Differences in the O2 demand between the 2 methods represented the demand due to nitrification. In 1969 studies of the Elbe stream indicated that the percentage part of nitrification in BOD can rise to 81.5%. The waste effluents discharged into the stream by the main sewage treatment plant of Hamburg, West Germany, raise the O2 demand of the nitrifying organisms downstream. The rate of nitrification depended on the seasonal temperature fluctuations in the stream, the content of ammonia and the number and activity of the nitrifying bacteria. Because of the differences in the conditions in the surface waters and during the laboratory tests (constant incubation temperature, darkness during and aeration before incubation) the BOD test did not indicate the real proceedings in the waters. A high carbonaceous BOD could be stimulated by active nitrification. The standard BOD could result in misinterpretation of the degree of self-purification of the water of a stream. For that reason using a modified method in addition to the standard BOD to eliminate nitrification during incubation time was recommended.--Copyright 1973, Biological Abstract, Inc.
W74-08695

5B. Sources Of Pollution

OPTIMIZATION OF THE ASSIMILATIVE WASTE CAPACITY OF THE UNSATURATED AND SATURATED ZONES OF AN UNCONFINED AQUIFER SYSTEM,
Univ., of California, Los Angeles. School of Engineering and Applied Science.
R. Willis.
Available from the National Technical Information Service as PB-232 428; $5.00 in paper copy, $1.45 in microfiche. Report UCLA-ENG-7394, December 1973. 153 p, 8 fig, 11 tab, 90 ref. OWRR B-150-CAL(11).

Descriptors: *Aquifer, *Waste assimilative capacity, *Mathematical models, *California, *Optimization, Zone of saturation, Dilution, Cost analysis, *Sewage treatment, Model studies, Treatment facilities.
Identifiers: Whittier Narrows(Calif), Santee Water Reclamation Project(Calif), Mass transport theory, Flow equations.

A mathematical model to optimize the assimilative waste capacity of unconfined aquifers is formulated. The aquifer is to be used conjunctively with surface sources as a source of water supply. Waste waters may be introduced into the ground water aquifer system by either well injection or by basin spreading of waste waters. In the model, three treatment processes are available to reduce constituent concentrations present in the waste waters: (1) dilution, (2) surface treatment of each constituent, and (3) the assimilative capacity of the unsaturated and saturated zones of the aquifer system. The total cost for supplying the dilution water and the cost for surface treatment of each constituent is minimized by the model. Constraints on water quality are maintained throughout the aquifer system. The model is a mixed integer programming problem which is decomposed into subproblems for each set of feasible unit processes. Each subproblem involves minimization of a concave function over a convex constraint set. The solution procedure examines the extreme points of the convex set to determine the minimum cost solution. The subproblem solutions are compared to yield the optimal solution for the overall problem. The results indicate the feasibility of using only primary treatment plants plus dilution water along with the assimilative capacity of the unconfined aquifer for waste water degradation. (Snyder-California)
W74-08152

ECOLOGICAL HISTORY OF WETLANDS,
Yale Univ., New Haven, Conn. Dept. of Biology.
For primary bibliographic entry see Field 2L.
W74-08165

PRELIMINARY SYSTEM DEVELOPMENT--CHEMICAL HAZARDS RESPONSE INFORMATION SYSTEM (CHRIS), APPENDIX VII--SUPPORTING INFORMATION.
Little (Arthur D.) Inc., Cambridge, Mass.
Available from NTIS, Springfield, Va. 22151, as AD-757 474, Price $3.00 printed copy; $1.45 microfiche. Final Contract Report to U.S. Coast Guard Office of Research and Development, Append VII, May 1972. 237 p, 17 fig, 17 tab, 222 ref. DOT-CG-03-223A.

Descriptors: *Water pollution sources, *Chemical wastes, *Hazards, *Warning systems, *Information retrieval, Documentation, Publications, Methodology, Path of pollutants, Bibliographies.
Identifiers: *Chemical spill response, Chemical hazards, System development, Accidental chemical spills.

This appendix to the Final Report on the Preliminary System Development of a Chemical Hazards Response Information System (CHRIS) contains the results of studies that led to the development of the CHRIS concept. The results of a survey of user needs and the formulation and analysis of potential information system concepts are presented. A concept for the design of five

reference guides (manuals) that will form the basic structure of CHRIS is developed. Other supporting information includes reviews of statistics on water pollution incidents, decision processes involved in spill response, other hazardous chemical information systems and successes and failures of information retrival systems. A bibliography is included. (Woodard-USGS)
W74-08181

A BIBLIOGRAPHY ON THE POLLUTION ASPECTS OF COKE OVENS,
British Steel Corp., (Sheffield) (England). Strip Mills Div.
D. G. Brinn.
Available from NTIS, Springfield, Va. 22151 as PB-219 072. Price $3.00 printed copy; $1.45 microfiche. Report SM/TN/1/25, February 1973. 10 p, 73 ref.

Descriptors: *Air pollution, *Water pollution, *Bibliographies, *Coal mine wastes, Water pollution sources, Industrial wastes.
Identifiers: *Coke ovens.

This bibliography on pollution from coke ovens consists of 73 briefly annotated references from the literature since 1968. For convenience the references are grouped under two headings--Air Pollution Aspects and Water Pollution Aspects. (Knapp-USGS)
W74-08183

GROUND WATER POLLUTION FROM SUBSURFACE EXCAVATIONS: PART III. MORE ON POLLUTION FROM WELLS.
Environmental Protection Agency, Washington, D.C.
Water Well Journal, Vol 28, No 5, p 100-102, May 1974.

Descriptors: *Water pollution control, *Waste disposal wells, *Injection wells, Water pollution sources, Earthquakes, Path of pollutants, Groundwater.
Identifiers: Subsurface waste disposal.

Tangible impacts of waste injection that can be predicted to occur in every case are modification of the groundwater system and introduction into the subsurface of fluids with a chemical composition different from that of the natural fluids. Tangible impacts that could occur in individual cases are degradation of groundwater quality, contamination of other subsurface resources, stimulation of earthquakes, chemical reaction between waste water and natural water, and chemical reaction between waste water and rocks in the injection interval. (Knapp-USGS)
W74-08184

THE CONTROL OF POLLUTION FROM HYDROGRAPHIC MODIFICATIONS.
Environmental Protection Agency, Washington, D.C. Office of Air and Water Programs.
For primary bibliographic entry see Field 5G.
W74-08186

AUTOMATED METHOD FOR ORTHO-, ORTHO-PLUS HYDROLYZABLE AND TOTAL PHOSPHATE IN SURFACE AND WASTEWATERS,
Proctor and Gamble Co., Cincinnati, Ohio. Ivorydale Technical Center.
For primary bibliographic entry see Field 5A.
W74-08208

PRIMARY SLUDGES PRODUCED BY THE ADDITION OF LIME TO RAW WASTE WATER,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W74-08224

ANIMAL WASTE UTILIZATION FOR POLLUTION ABATEMENT TECHNOLOGY AND ECONOMICS. PHASE II,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering
For primary bibliographic entry see Field 5D
W74-08231

RUNOFF OF OILS FROM RURAL ROADS TREATED TO SUPPRESS DUST,
Edison Water Quality Research Lab., Edison, N.J.
F. J. Freestone.
Environmental Protection Agency National Environmental Research Center Report EPA-R2-72-054, October 1972. 29 p, 6 fig, 7 tab, 3 ref.

Descriptors: *Roads, *Oily water, *Water pollution sources, Runoff, Leaching, Lead, Heavy metals.
Identifiers: *Road oil, *Oiled roads.

Oil runoff from two rural roads in Readington Township, Hunterdon County, New Jersey, which are treated with waste crankcase oils, was studied to determine whether or not the oil leaves the road. Roughly 1% of the total oil estimated to have been applied remains in the top inch of road surface material, oil penetration below the top inch of road was minimal, and lead was concentrated in the top inch of road material. Laboratory weathering experiments indicate that estimated maximum weathering loss of oil from a road would be approximately 18%. Runoff studies on simulated rural road surfaces indicated two mechanisms by which oil is transported from the road: leaching of the oil by flotation, and flotation of oil-wet soil particles. The greatest oil transport is during the first few rains after oil application with continuous, low-level leaching during each subsequent rain. Analysis of soil samples taken from a field subjected to runoff from an oiled road showed significantly higher lead content than soil taken from a field 150 feet from the road. (Knapp-USGS)
W74-08236

WATER TRANSPORT OF HEAVY METALS IN SOLUTION AND BY DIFFERENT SIZES OF PARTICULATE SOLIDS,
Tennessee Univ., Knoxville. Dept. of Geology.
R. M. Perhac.
Available from the National Technical Information Service as PB-232 427 $3.25 in paper copy, $1.45 in microfiche. Tennessee University Water Resources Research Center Research Report No 32, March 1974. 41 p, 3 fig, 22 tab, 23 ref. OWRR A-023-TENN(3).

Descriptors: *Path of pollutants, *Heavy metals, *Sediments, *Water pollution, *Streams, *Tennessee, Cadmium, Cobalt, Copper, Iron, Manganese, Nickel, Lead, Zinc, Colloids, Adsorption, Absorption.

Transport of heavy metals by water and bottom sediments was studied in three streams in east Tennessee. One stream is in an industrialized, urban area; a second flows over exposed carbonate rocks which contain zinc minerals; the third is in a rural, nonmineralized area. Dissolved solids, particulates, and bottom sediment were analyzed for a suite of heavy metals, principally, Cd, Co, Cu, Fe, Mn, Ni, Pb, and Zn. Most of the heavy metal is transported in solution. The concentration of metals in the particulates (especially colloids) is very high but the amount of particulate matter is exceedingly low. The amount of heavy metals in the bottom sediment differs considerably from sample to sample. These differences, however, are not reflected in the amount of metal dissolved in the aqueous phase. Within the bottom sediment, the metals seem to be mainly in carbonate lattice positions and, to a limited extent, with free iron oxides. Only very small quantities occur in exchange sites as sorbed cations. As a result, little of the bottom sediment trace metals are available to biota. Both the carbonates and iron oxides seem to be effective in minimizing the amount of metal which gets into solution. As a result, the natural input of metals into solution is difficult to distinguish from that resulting from man's activity. (Knapp-USGS)
W74-08238

SURFACE WATER POLLUTION CONTRACT STUDIES: ADSORPTION OF COMPLEX ORGANIC MOLECULES BY SUSPENDED CLAY,
R. D. Harter, and B. M. Kilcullen
Available from the National Technical Information Service as PB-232 415 $3.75 in paper copy, $1.45 in microfiche. Completion Report, January 1970, to June, 1973. New Hampshire University Water Resource Research Center, Durham, Publication, 1973. 66 p. OWRR A-020-NH(3).

Descriptors: *Adsorption, *Clay minerals, *Soil chemistry, *Proteins, *Phosphates, Sorption, Surfaces, Cations, Path of pollutants, Thermodynamics.
Identifiers: Adsorption isotherms, Microcalorimetry.

The Langmuir equation is frequently used in attempts to explain results of adsorption studies at solid-solution interfaces. Noncompliance to theory or compliance over a limited concentration range is frequently reported. Reasons for these problems are examined, and an experimental method is proposed whereby similar results can be obtained without using the Langmuir equation. Microcalorimetry is useful in studying the heat exchanged during clay-protein interactions. Net heats of reaction were measured in clay-smectite reactions; they are the combination of several reactions at the clay surface. The contribution of each reaction (ion exchange, protein denaturation, etc.) is unknown. (See W74-08240 thru W74-08243) (Knapp-USGS)
W74-08239

ADSORPTION STUDIES AT SOLID-SOLUTION INTERFACES,
New Hampshire Univ., Durham. Inst. of Natural and Environmental Resources.
R. D. Harter.
In: Completion Report, January, 1970, to June 1973: New Hampshire University Water Resources Research Center Publication, p 1-15, 1973. 2 fig, 10 ref. OWRR A-020-NH(3).

Descriptors: *Adsorption, *Clay minerals, *Soil chemistry, *Proteins, *Phosphates, Sorption, Surfaces, Cations, Path of pollutants, Thermodynamics.
Identifiers: Adsorption isotherms.

The Langmuir equation is frequently used in attempts to explain results of adsorption studies at solid-solution interfaces. Noncompliance to theory or compliance over a limited concentration range is frequently reported. Reasons for these problems are examined, and an experimental method is proposed whereby similar results can be obtained without using the Langmuir equation. To overcome the problems, incremental rather than batch adsorption can be used. An initial adsorbate concentration must be chosen that does not lead to excess concentration dependent adsorption. This solution can then be added to the adsorbent in increments of constant adsorbent-solution ratio, and the equilibrium concentration of each increment carefully measured. In sum, the increments have effectively varied the volume rather than concentration of adsorbate solution, while keeping the adsorbent-solution ratio constant. When lysozyme was adsorbed onto Na-smectite, it appeared that batch adsorption slightly overestimated the amount of protein which could be adsorbed by the clay surface, even when excess was removed by water washing. When adsorption was conducted by incremental additions, the isotherm broke sharply at a maximum adsorption of 61 mg protein per 50 mg clay. Batch adsorption tended to un-

derstimate the ability of soil to adsorb phosphorus. (See also W74-08239) (Knapp-USGS)
W74-08240

EFFECT OF EXCHANGE CATIONS ON ADSORPTION OF LYSOZYME AND OVALBUMIN BY SMECTITE,
New Hampshire Univ., Durham. Inst. of Natural and Environmental Resources.
R. D. Harter.
In: Completion Report, January, 1970, to June, 1973: New Hampshire University Water Resources Research Center Publication, p 17-25, 1973. 3 fig, 5 ref. OWRR A-020-NH(3).

Descriptors: *Adsorption, *Clay minerals, *Soil chemistry, *Proteins, *Phosphates, Sorption, Surfaces, Cations, Path of pollutants, Thermodynamics.
Identifiers: Adsorption isotherms.

Protein adsorption by clays homoionic to the first five elements of the alkali and alkali earth periods, as well as H, Al and La was studied. Adsorption of ovalbumin by smectite is differenct from that of lysozyme adsorbed by the same clay. In no case was an equilibrium condition reached, and in only two cases (adsorption to H- and Be-clay) did the isotherm approach the classical Langmuir form. Constant partition type isotherms are observed when the clay suspension pH is higher than the protein isoelectric point. Apparently, the environment near basic cation-saturated clay surfaces is hostile enough that few ovalbumin molecules were adsorbed. Na is released from Na-saturated clays upon adsorption of ovalbumin, and the surface is thereby modified sufficiently that another increment of ovalbumin can be adsorbed. That the adsorption of ovalbumin by clay is pH dependent is further shown by the fact that all except the H- and Be-saturated clays absorbed approximately the same smount of the protein. There was little variation either as a function of valence or size of the ion. (See also W74-08239) (Knapp-USGS)
W74-08241

EFFECT OF SALT CONTENT OF EQUILIBRIUM-SOLUTION ON FORMATION AND STABILITY OF SMECTITE-PROTEIN COMPLEXES,
New Hampshire Univ., Durham. Inst. of Natural and Environmental Resources.
R. D. Harter.
In: Completion Report, January, 1970, to June, 1973: New Hampshire University Water Resources Research Center Publication, p 27-34, 1973. 2 fig, 2 tab. OWRR A-020-NH(3).

Descriptors: *Adsorption, *Clay minerals, *Soil chemistry, *Proteins, *Phosphates, Sorption, Surfaces, Cations, Path of pollutants, Thermodynamics.
Identifiers: Adsorption isotherms.

Proteinaceous pollutants are found in water with salt content ranging from near zero to near saturation, and clay-protein complexes already formed are constantly being swept into environments of higher ionic strength. For this reason, the effect of salt concentration on adsorption and stability of complexes to increasing salt concentrations was studied. Sodium chloride solutions of up to 0.1N did not affect the amount of lysozyme that could be adsorbed by Na-saturated smectite. However, NaCl concentrations above 0.1N did interfere with adsorption of lysozyme. The amount of lysozyme that could be adsorbed was progressively reduced, with clay in the presence of 2N NaCl able to adsorb only half as much as was the clay in the presence of 0.1N or less NaCl. Adsorption of protein by clay will probably not be affected by the ionic strength of any freshwater. In brackish or saline water, however, adsorption will be decreased. Since adsorption of protein tends to flocculate suspended clay, with resultant settling out of solution, the decreased adsorption of protein under saline conditions is significant. Proteinaceous pollutants dumped into the ocean or saline lakes are more likely to remain in solution than if they are dumped into freshwater. Once lysozyme was adsorbed, it could not be desorbed by altering the salt concentration. (See also W74-08239) (Knapp-USGS)
W74-08242

THE MEASUREMENT OF THE HEAT OF REACTION BETWEEN PROTEINS AND MONTMORILLONITE BY MICROCALORIMETRY,
New Hampshire Univ., Durham. Water Resources Research Center.
B. M. Kilcullen, and R. D. Harter.
In: Completion Report, January, 1970, to June, 1973: New Hampshire University Water Resources Research Center Publication, p 36-54, 1973. 3 fig, 2 tab, 9 ref. OWRR A-020-NH(2).

Descriptors: *Adsorption, *Clay minerals, *Soil chemistry, *Proteins, *Phosphates, Sorption, Surfaces, Cations, Path of pollutants, Thermodynamics.
Identifiers: *Calorimetry, Adsorption isotherms.

Microcalorimetry is useful in studying the heat exchanged during clay-protein interactions. Net heats of reaction were measured in clay-smectite reactions; they are the combination of several reactions at the clay surface. The contribution of each reaction (ion exchange, protein denaturation, etc.) is unknown. (See also W74-08239) (Knapp-USGS)
W74-08243

BACTERIAL DEGRADATION OF CYCLOHEXANE PARTICIPATION OF A CO-OXIDATION REACTION,
Koninklijke/Shell-Laboratorium, Amsterdam (Netherlands).
H. de Klerk, and A. C. van der Linden.
Antoine von Leeuwenhoek (Journal of Microbiology and Serology), Vol 40, No 1, p 7-15, 1974. 2 fig, 1 tab, 6 ref.

Descriptors: *Biodegradation, *Organic compounds, *Pseudomonas, Investigations, Laboratory tests, Oxidation.
Identifiers: *Cyclohexane, *Cyclohexanol utilization.

Complete biodegradation of cyclohexane was demonstrated to occur in a system containing two strains of Pseudomonad bacteria, an n-alkane oxidizer and a microorganism utilizing cyclohexanol. n-Heptane also is present as a substrate for the former with neither bacterial strain being capable of utilizing cyclohexane individually. Cyclohexane biodegradation occurs in the following two steps: first, the conversion of cyclohexane into cyclohexanol by the n-alkane oxidizer, and second, through utilization of cyclohexanol by the second strain. Unsuccessful methods used to accumulate a bacterium which could grow on cyclohexane as its sole source of carbon are described. (Sandoski-FIRL)
W74-08244

ENVIRONMENTAL RESEARCH AND HIGHWAYS,
D. Solomon.
Public Roads (A Journal of Highway Research and Development), Vol 37, No 8, p 297-305, March, 1974. 6 fig.

Descriptors: *Environmental effects, *Research and development, *Highway effects, Water pollution sources, Water quality, Sewage treatment, Waste treatment, Pollution abatement, Air pollution ecology.
Identifiers: Noise, Esthetics.

Environmental research completed, underway, or planned under the Federally Coordinated Program of Research and Development in Highway Transportation is described. Three major research areas are involved in efforts to reduce significant water pollution from highway sources. One is to provide requirements for the quantity of water to be treated and criteria for treatment of wastes at roadside rest areas. Physical, chemical, and biological tests of the water and sewage will determine water quality and effectiveness of the sewage treatment process. A second area of research involves determination of the type and amount of pollutants, their impact on the environment, and methods for controlling pollutants contributed by the highway system. Included are such pollutants as rubber, lead, grease, and oil which collect on the pavement surface and wash into drainage facilities. A third task has as its objective the reduction of damage of water resources through accidental spills of chemicals and other materials. Research on air quality, noise, esthetics and visual quality, and ecological problems is also discussed. (Merritt-FIRL)
W74-08251

THE SURPRISE FACTOR IN MARINE POLLUTION STUDIES,
Scripps Institution of Oceanography, La Jolla, Calif.
E. D. Goldberg.
Marine Technology Society Journal, Vol 8, No 2, p 29-34, February, 1974. 40 ref.

Descriptors: *Oceans, *Water pollution effects, Marine biology, Environmental effects, Biochemistry, Geochemistry, *Biodegradation, *Metals, Organic compounds, *Path of pollutants.

The ways in which pollution studies have contributed to a deeper understanding of biochemistries and of geochemistries occurring within the ocean system are described. Out of a concern to understand man's impact upon his environment, knowledge about the following subjects bearing on marine processes has advanced: the atmospheric transport of large organic molecules from the continents to the oceans, the role of methyl groups in the mobilization of metals and non-metals in biologic systems, the oceans as a source of low molecular weight gases to the atmosphere, bioaccumulation of trace substances by marine organisms, and the biodegradability of organic matter. (Merritt-FIRL)
W74-08252

A COMPUTER MODEL FOR PREDICTING NITRATE AND OTHER SOLUTES OF AGRICULTURAL DRAIN WATER,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
G. R. Dutt, and M. J. Saffer.
Available from the National Technical Information Service as PB-211 214 $3.00 in paper copy, $1.45 in microfiche. Final report to Bureau of Reclamation, June, 1972. 29 p, 4 fig, 2 append. BR 14-06-D-7328.

Descriptors: *Drainage, *Soils, Reclamation, Water quality, Pollutants, Systems analysis, *Computer models, *Path of pollutants, *Nitrates, Nutrients.

A computer simulation model was developed for predicting the changes in solute composition due to chemical reactions in the saturated region below the water table for tile drain systems underlaid by an impermeable layer. The ionic species considered to be present in the water include Ca^{++}, Mg^{++}, Na^{+}, NH_4^{+}, $SO_4^{=}$, Cl^{-}, HCO_3^{-}, $CO_3^{=}$, and NO_3^{-}. Chemical reactions considered are base exchange, dissociation or precipitation of gypsum and lime ($CaCO_3$), and reactions between Ca and Mg of sulfate ion pairs in solution. Verification of the model is considered. A procedure for utilizing the above with other models previously developed by the authors and others is outlined. It is concluded that the procedure developed is suitable for

practical application to base saturated soils fitting the boundary conditions. The procedure can be expanded to consider other soils and interactions which may be found to be of importance at a later date. (Skogerboe-Colorado State)
W74-08280

EFFECT OF PHOSPHATE SALTS AS SATURATING SOLUTIONS IN CATION-EXCHANGE CAPACITY DETERMINATIONS,
Chile Univ., Santiago.
For primary bibliographic entry see Field 2G.
W74-08285

RESULTS OF EXAMINATIONS OF HOSPITAL WASTE WATER (ERGEBNISSE DER UNTERSUCHUNGEN VON KRANKENHAUSABWAESSERN),
Hygiene-Institut des Ruhrgebietz zu Gelsenkirchen (West Germany). Wasserhygiene Abteilung.
H. Althaus.
Oeffentliches Gesundheitswesen, Vol 35, No 2, p 96-105, November 1973. 4 fig, 3 ref.

Descriptors: *Hospitals, *Waste water treatment, *On-site investigations, *Pathogenic bacteria, *Salmonella, Treatment facilities, Disinfection.

Examination of receiving water bodies which receive hospital wastewater resulted in the following findings. Pathogenic germs, particularly salmonella, were found in abundance. However, their presence was at a lesser degree than from those waste water discharged by a residential area, this being attributed to disinfectants being used to treat hospital waste water prior to its release to the public sewer system. If the hospital is not located near a purification plant where waste water receives treatment, then disinfection is practiced at the hospital by heating or chlorination before it is discharged to the receiving streams. (Sandoski-FIRL)
W74-08286

GROUND WATER QUALITY EFFECTS ON DOMESTIC WATER UTILIZATION,
Univ. of Alaska College. Inst. of Water Resources.
D. W. Smith, and L. A. Casper.
Available from the National Technical Information Service as PB-232 535, $4.75 in paper copy; $1.45 in microfiche. Office of Water Resources Research, USDI Report IWR-48, March, 1974, 139 p, 63 fig, 10 tab, 48 ref. OWRR A-040-ALAS(1).

Descriptors: Groundwater, *Water costs, Water quality, *Water wells, Water supply, *Wells, Groundwater management, Water utilization, *Alaska, *Cold regions, *Subarctic, Domestic water.
Identifiers: Water hauling, *Groundwater quality.

The areal distribution of ground water quality characteristics were examined through the rural domestic water users appraisal of the water and a selected number of chemical analyses. Survey forms were distributed to 6015 rural residents with a 20.9 per cent return. The results are presented in data form and by maps indicating well depths, iron, color, taste and odor problems, and the locations where softeners and filter were reported in use. Chemical analysis for alkalinity, electrical conductivity, Ca, Mg, Fe, Mn, NO-2 + NO=3, and color were run on 83 ground water samples in a selected area. Information was collected on an additional 23 wells. The chemical information had a good correlation with the quality problems indicated by the users. A significant inverse correlation was noted between iron content and nitrate-nitrite concentration in the well waters. Cost considerations indicate that considerably more attention to ground water supplies is warranted in the interior of Alaska.
W74-08287

A PARAMETRIC STUDY OF WATER RESOURCE VARIABLES IN A DELTA REGION OF SOUTH LOUISIANA...BAYOU LAFOURCHE VOLUME I - TECHNICAL DISCUSSION, VOLUME II - APPENDICES,
Louisiana State Univ., Baton Rouge. Div. of Engineering Research
C. A. Whitehurst, R. A. Kinney, and A. J. McPhate
Available from the National Technical Information Service as PB-232 521, $7.25 in paper copy, $1.45 in microfiche. Final Report; Volume I, 180 p, 50 fig, 29 tab, 53 ref, Volume II, 132 p, 4 append. 1974.

Descriptors: *Louisiana, Marshes, Marsh management, *Land use, Water pollution effects, Industrial wastes, *Estuaries, Chemical wastes, Water pollution sources, Analytical techniques, Water resources development, Planning, Management, Runoff, Probability, Open channels, Water supply, Drainage, Sewage, Disposal, Flood control, *Water quality, *Model studies, Water utilization, *Bioindicators.
Identifiers: *Bayou Lafourche(La.) Mississippi Delta, River diversion.

Bayou Lafourche is the only fresh water source for the population (150,000) of several Parishes in South Louisiana. It is presently under stress due to increased navigation, flooding, and industrial use. The Bayou was modeled both hydrologically and from a water quality viewpoint. Tides and winds proved to be the most influential factors in the movement of the stream, and these factors, coupled with the complexity of the Canal-Bayou-estuary network, generated a unique modeling effort. Energy and momentum relations were used in steady and the 'slowly varying' analyses. Baseline biological indices were established for the Bayou. An attempt to correlate all measured parameters including chemical, biological and hydrological, was made. Land use and water use correlations were made, based primarily on demographic projections. Water needs through 1980 were predicted.
W74-08289

DETERMINATION OF OIL LOSS RATES FROM A HIGH SEAS OIL CONTAINMENT BARRIER,
California Univ., Santa Barbara.
For primary bibliographic entry see Field 5G.
W74-08290

IDENTIFICATION AND CONTROL OF POLLUTION FROM SALT WATER INTRUSION.
Environmental Protection Agency, Washington, D.C. Div. of Water Quality and Non-Point Source Control.
Available from Sup Doc, GPO, Washington, DC 20402, price $1.25. Environmental Protection Agency, Office of Air and Water Programs, Report EPA-430/9-73-013, 1973. 94 p, 11 fig, 16 ref.

Descriptors: *Water pollution control, *Saline water intrusion, Groundwater, Surface waters, *Withdrawal, *Land use, *Consumptive use.
Identifiers: Federal water pollution control act.

Saltwater intrusion whether into surface water or groundwater is a complex situation controlled by the geologic and hydrologic characteristics of the area. Natural water systems are dynamic. They respond in quality and quantity to natural phenomena and to man's activities such as changes in land use, stream channel linings, and consumptive withdrawal. Identification and evaluation of the nature and extent of saltwater intrusion begins with an understanding of the general mechanisms by which intrusion occurs. A basic framework is given for assessment of saltwater intrusion problems and their relationship to the total hydrologic system, to aid State authorities in developing areawide waste treatment management plans. (Knapp-USGS)
W74-08293

WATER POLLUTION AND ASSOCIATED EFFECTS FROM STREET SALTING,
Environmental Protection Agency, Edison, N J
R. Field, E. J. Struzeski, Jr., H. E. Masters, and A. N. Tafuri
Journal of the Environmental Engineering Division, American Society of Civil Engineers Vol 100, No EE2, Paper 10473, p 459-477, April 1974. 9 fig, 3 tab, 100 ref.

Descriptors: *Snow removal, *Deicers, *Water pollution sources, *Urban runoff, *Highways, Water pollution control, Chlorides, Salts.

Excessive application of deicing salts to streets leads to environmental problems. Besides chemical melting, various methods for deicing exist. Some of these are stationary and mobile thermal melting units, alternate deicing compounds, snow adhesion reduction, electromagnetic energy for ice shattering, and drainage systems designed to capture snowmelt for treatment or control. Salt storage facilities often become a major contributing source of local groundwater and surface water salt contamination. High chloride concentration levels have been found in roadway runoff. The special additives in deicing salts may create more severe pollutional problems than the chloride salts. (Knapp-USGS)
W74-08306

PREDICTING REAERATION COEFFICIENTS FOR POLLUTED ESTUARY,
New Mexico Univ., Albuquerque. Eric H. Wang Civil Engineering Research Facility.
G. R. Kramer.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 100, No EE1, Paper 10351, p 77-92, February 1974. 4 fig, 1 tab, 52 ref, append.

Descriptors: *Reaeration, *Estuaries, Water pollution, Oxygen demand, Mathematical models, *Texas.
Identifiers: *Houston Ship Channel.

Reaeration rate coefficients measured in polluted estuaries were compared to those predicted from equations that predict reaeration coefficients in natural streams. Many of the currently available equations relating K2 with the physical and hydrodynamic characteristics of the waterway are described along with some of the conditions under which they were derived or determined. The effects of wind, temperature, and surface active agents on reaeration are reviewed. A number of the given equations were applied to the Houston Ship Channel in an attempt to predict K2. The predicted K2 was usually less than 1/100 of the measured K2. It is concluded that none of these equations are applicable to the upper Houston Ship Channel area. (Knapp-USGS)
W74-08307

SIMULATION OF WATER QUALITY IN TARAWERA RIVER,
Auckland Univ. (New Zealand). School of Engineering.
J. C. Rutherford, and M. J. O'Sullivan.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 100, No EE2, Paper 10461, p 369-390, April 1974. 4 fig, 2 tab, 47 ref, append.

Descriptors: *Water quality, *Oxygen demand, *Bottom sediments, *Simulation analysis, *Mathematical models, Reaeration, Industrial wastes, Dissolved oxygen.
Identifiers: *New Zealand(Tarawera River).

The Tarawera River, New Zealand receives effluent from two paper and pulp mills and exhibits a very high rate of deoxygenation. Biomass accumulates in the river sediments and aerobic metabolism of these organisms on the organic matter in the overlying waters causes the high rate of deox-

genation. A stratified mathematical model uses the Monod equations to predict the rates of growth of bacteria and protozoa in the river sediments. A theoretical multisubstrate system predicts concentrations of dissolved oxygen successfully at varying rates of flow. (Knapp-USGS)
W74-08308

ABSORPTION OF MERCURIC CATION BY TANNINS IN AGRICULTURAL RESIDUES,
Agricultural Research Service, Berkeley, Calif. Western Regional Research Lab.
For primary bibliographic entry see Field 5G.
W74-08314

RECOVERY OF N15-LABELED FERTILIZERS IN FIELD EXPERIMENTS,
Illinois Univ., Urbana. Dept. of Agronomy.
R. L. Westerman, L. T. Kurtz, and R. D. Hauck.
Soil Science Society of America Proceedings, Vol 36, No 1, p 82-86, January-February, 1972. 2 fig, 3 tab, 14 ref.

Descriptors: *Nutrient removal, *Nitrogen, *Leaching, Crop production, Crop response, Crops, Radioisotopes, *Ureas, *Fertilizers.
Identifiers: *Oxamide.

Urea and oxamide, each labeled with N15, were compared as fertilizers in two field experiments in adjacent locations in successive years with 'Sudax SX11' Sorghum-sudan hybrid as the test crop. Patterns of uptake of fertilizer N were in accord with the characteristics of the two carriers. In the first harvest in both experiments the amounts of N taken up from urea were markedly greater than from oxamide; but by the third harvests, yield responses and N uptake from oxamide were greater then from urea. Of the N added in urea in the first experiment, 51% was recovered in the crops and 28% was still in the soil (0-25cm) at the end of the growing season. Corresponding figures for oxamide were 52% in the crops and 31% in the soil. In the second experiment, when fertilizer applications and planting operations were delayed until more favorable growing weather, 93% and 99% of the urea- and oxamide-N, respectively, were estimated as recovered in the crops. (Skogerboe-Colorado State)
W74-08315

MODLEING OF LAND RUNOFF EFFECTS ON DISSOLVED OXYGEN,
Kansas State Univ., Manhattan. Dept. of Engineering.
D. A. Wallace, and R. R. Dague.
Journal Water Pollution Control Federation, Vol 45, No 8, p 1795-1809, August, 1973. 17 fig, 7 tab, 10 ref.

Descriptors: *Computer models, *Runoff, *Water pollution sources, Mathematical models, *Agricultural runoff, Agricultural watersheds, Water quality, Erosion, *Dissolved oxygen, Farm wastes.

A computer mathematical model to estimate the effects of agricultural land runoff on river dissolved oxygen (DO) concentrations has been developed. The Iowa River basin above the Coralville Reservoir was chosen as the area on which to base the model. This area includes 237 miles of main-stem channel and 44 tributaries draining 2,953 square miles. About 90 percent of the area is used for farming operations. The model accounts for both surface and subsurface inflows. Principles of open channel flow are used to describe the flow conditions in the river. The model approximates actual river conditions and is useful in showing the relative effects of different sources of pollution. (Skogerboe-Colorado State)
W74-08316

NITRATE REMOVED AT WATER TREATMENT PLANT,
Bowne (Sidney B.) and Son, Mineola, N.Y.
For primary bibliographic entry see Field 5F.
W74-08317

CONCENTRATIONS OF NITROGEN, PHOSPHORUS, POTASSIUM, AND TOTAL SOLUBLE SALTS IN SOIL SOLUTION SAMPLES FROM FERTILIZED AND UNFERTILIZED HISTOSOLS,
Florida Univ., Gainesville. Dept. of Soil Science.
C. C. Hortenstine, and R. B. Forbes.
Journal of Environmental Quality, Vol 1, No 4, p 446-449, October-December, 1972. 5 fig, 9 ref.

Descriptors: *Water pollution sources, Runoff, Surface runoff, Subsurface runoff, *Agricultural runoff, *Nitrogen, *Phosphorus, *Potassium, Nutrient removal, *Peat, Salts, Eutrophication, *Florida, Fertilization, Soils.
Identifiers: *Lake Apopka(Fla), Histosols.

Lake Apopka ranked at one time among the most productive bass and panfish bodies of water in the United States. During recent years this lake became eutrophic and fishing declined drastically. Farming operations on the rich organic soil along the northern shore of the lake were implicated as one cause of this eutrophication. To measure agriculture's contributions to the nutrient concentration in the lake, soil solution samples were extracted from uncleared, swampy Everglades mucky peat; newly cleared, drained Everglades mucky peat; and Everglades mucky peat that had been under cultivation for approximately 15 years. Nitrate-N, orthophosphate P, and K concentrations were relatively low in soil solution samples from the swampy area. Concentrations of each nutrient in soil solution extracted at the 60-cm depth in the newly cleared area increased by as much as 8 to 12 times as compared to the 60-cm depth in the swampy area. Further increases were noted in the cultivated area. Indications were that the peat itself was heavy contributor of nutrients to the drainage water. (Skogerboe-Colorado State)
W74-08319

PROCESS KINETICS FOR DENITRIFICATION,
Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering.
For primary bibliographic entry see Field 5D.
W74-08320

FATE OF NITRATE FROM MANURE AND INORGANIC NITROGEN IN A CLAY SOIL CROPPED TO CONTINUOUS CORN,
Vermont Univ., Burlington. Dept. of Plant and Soil Science.
J. M. Kimble, R. J. Bartlett, J. L. McIntosh, and K. E. Varney.
Journal of Environmental Quality, Vol 1, No 4, p 413-415, October-December, 1972. 5 fig, 1 tab, 6 ref.

Descriptors: *Water pollution sources, *Nitrogen, *Nutrient removal, *Denitrification, Leaching, Nitrogen cycle, *Fertilizers, *Nitrates, Corn(Field), *Farm wastes, Clays, Soil profiles.

Effects of dairy manure and N fertilizer were studied on plots that had received in a factorial arrangement two levels of manure (0 and 66 metric tons/ha) and two levels of N (0 and 224 kg/ha) applied every spring for 6 years. Laboratory incubation studies using soil profile samples showed potential denitrification to be greater in soil from the manure treated plots than in plots receiving either inorganic N or no N. The amount decreased with depth to 96 cm, below which energy for anaerobic microbial activity appeared to be limiting. Laboratory analyses of profile samples indicated decreasing nitrate-N/chloride ratios at all depths from fall to spring, suggesting that denitrification rather than leaching was responsible for a significant portion of the nitrate loss during this period. Abrupt decreases in the nitrate-N/chloride ratios from the surface to the 45- to 71-cm depth indicated that denitrification had taken place and that a nitrate bulge at 96- to 122-cm probably was caused by denitrification above that depth. (Skogerboe-Colorado State)
W74-08321

INCREASED DENITRIFICATION IN SOILS BY ADDITIONS OF SULFUR AS AN ENERGY SOURCE,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
L. D. Mann, D. D. Focht, H. A. Joseph, and L. H. Stolzy.
Journal of Environmental Quality, Vol 1, No 3, p 329-332, July-September, 1972. 1 fig, 6 tab, 18 ref.

Descriptors: *Denitrification, *Soil amendments, *Leaching, Nutrient removal, *Water pollution sources, Reduction, Oxidation, *Sulfur, Clay loam, Sands, Anaerobic conditions, *Nitrates, Nitrites.

Denitrification rates were studied in four large soil columns using Hanford sandy loam and Moreno silty clay loam soils. One column of each soil was amended with sulfur to serve as an energy source for the bacterium Thiobacillus denitrificans. Limestone was also added as a pH buffer. The other column of each soil was left untreated to serve as a control. A solution of Ca(NO3)2 containing 425 ppm NO3-N was perfused continuously through the columns. The columns were monitored periodically at depths of 10, 30, 50, 70, and 90 cm for nitrate, nitrite, redox potential and microbial numbers. Highly anaerobic conditions developed in all columns. All of the nitrate was reduced in each column, and nitrates penetrated to lower depths in the untreated columns. Nitrite concentrations were found to be negligible. Sulfur additions to field soils which are low in microbial energy sources could be an effective method of reducing the nitrate level in waters percolating through the profile. (Skogerboe-Colorado State)
W74-08322

A SIMPLE DIGESTION PROCEDURE FOR ESTIMATION OF TOTAL NITROGEN IN SOILS AND SEDIMENTS,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
D. W. Nelson, and L. E. Sommers.
Journal of Environmental Quality, Vol 1, No 4, p 423-425, October-December, 1972. 5 tab, 12 ref.

Descriptors: *Digestion, *Nitrogen, Nutrients, Fertility, Soils, *Soil chemistry, Soil investigations, Sediments, Analytical techniques, Water pollution sources, Pollutant identification.
Identifiers: *Kjeldahl method, Steam distillation, Hydrofluoric acid.

A simple and convenient digestion procedure for total nitrogen analysis of soils and sediments is described. The digestion is carried out in pyrex Folin-Wu tubes heated in an aluminum block placed on a hot plate. Samples up to 1 g in size may be used and a digestion time of three hours after clearing is adequate. The proposed and conventional semimicro-Kjeldahl methods gave essentially the same values for total N in a wide variety of soils and sediments. The precision of the proposed method was almost as good as those reported for other seimicro-Kjeldahl methods. The tube digestion method allows simultaneous digestion of 60 samples in a relatively inexpensive and maintenance-free aluminum heating block, which occupies a minimum of laboratory space and appears applicable for routine determination of total N in soils having diverse properties. (Skogerboe-Colorado State)
W74-08324

AGRICULTURAL CHEMICALS IN RELATION TO ENVIRONMENTAL QUALITY: CHEMICAL FERTILIZERS, PRESENT AND FUTURE,
Tennessee Valley Authority, Muscle Shoals, Ala. Div. of Agricultural and Chemical Development.
L. B. Nelson.
Journal of Environmental Quality, Vol 1, No 1, p 2-6, January-March, 1972. 15 ref.

Descriptors: *Water pollution sources, *Fertilizers, *Leaching, Nutrient removal, Runoff, Erosion, *Agricultural chemicals, *Nitrogen, *Phosphorus, Potassium.

In the USA, fertilizers have accounted for over 50% of the increase in crop production since 1940, and farmers have substituted fertilizers for land and other inputs. However, considerable controversy has developed in recent years over the role of fertilizers in pollution of natural waters. Increased nitrate and phosphate levels in waters are cited by ecologists as proof of contamination by fertilizers, but this is contested by many agriculturists. Examination by competent reviewers of the limited data available so far indicates that losses of fertilizer nutrients into surface and groundwaters may be minimal under most situations. There are a number of ways to minimize losses without sacrificing the important benefits gained from fertilizers. These include carefully tailoring rates and times of nitrogen application to better fit the needs of the growing crop, greater care in irrigation, use of slow-release nitrogen fertilizers, and wider application of selected soil conservation practices to control surface losses of both nitrates and phosphates. (Skogerboe-Colorado State)
W74-08325

CHEMICAL AND BIOCHEMICAL CONSIDATIONS FOR MAXIMIZING THE EFFICIENCY OF FERTILIZER NITROGEN,
Agricultural Research Service, Baton Rouge, La.
J. F. Parr.
Journal of Environmental Quality, Vol 2, No 1, p 75-84, January-March, 1973. 6 fig, 2 tab, 56 ref.

Descriptors: *Water pollution sources, *Nitrogen, *Fertilizers, Nutrient removal, Leaching, Salinity, Nitrates, Nitrification, Groundwater, *Water pollution control, Crop production.

Fertilizer nitrogen is subject to loss from the soil-root zone, and immobilization by the soil and rhizosphere microfloras, which can result in low recovery and use efficiency of the applied nitrogen. With increasing rates of application, fertilizer nitrogen efficiency decreases progressively, while leaving an increasing amount of unused nitrogen as a potential pollution hazard. Since the point of greatest economic return from this nutrient is usually somewhere below the point of maximum yield, it should be possible to adjust fertilizer nitrogen rates for maximum return and minimum loss to the environment. This can be achieved through improved soil and crop management practices, including proper timing of application of conventional nitrogen fertilizers and use of deep-rooted crops for recovery of leached nitrate. Efficiency of fertilizer nitrogen might also be increased with controlled release fertilizers, including the use of coated granules, and compounds of limited water solubility blended with conventional nitrogen fertilizers. (Skogerboe-Colorado State)
W74-08326

RECYCLING AND RECOVERY OF NITROGEN, PHOSPHORUS, AND POTASSIUM BY COASTAL BERMUDAGRASS: I. EFFECT OF SOURCES AND RATES OF NITROGEN UNDER A CLIPPING SYSTEM,
Texas A and M Univ., Overton. Agricultural Research and Extension Center.
J. E. Matocha, F. M. Rouquett, Jr., and R. L. Duble.
Journal of Environmental Quality, Vol 2, No 1, p 125-129, January-March, 1973. 5 fig, 2 tab, 17 ref.

Descriptors: *Water pollution sources, *Fertilizers, *Nitrogen, Nitrates, Leaching, Nutrient removal, *Coastal bermudagrass, Forages, *Phosphorus, *Potassium, Groundwater, *Recycling

A field experiment was conducted to determine recovery efficiencies for applied N, P, and K under a system of total removal of forage over a 3-year period. Ammonium nitrate (NH2)2CO, and (NH4)2SO4 were each applied in split applications of 0, 280, 560, and 840 kg N/ha each season. Soil levels of total N, chemically extractable P, and K were monitored each season. Characteristic decreases in recoveries occurred with increasing N rates. Average P recovery percentages for NH4NO3 were 34, 46, and 52% for rates of 280, 560, and 840 kg N/ha, respectively. Plant recovery of applied K was greatest for (NH4)2SO4 and lowest for (NH2)2CO. Average values for (NH4)2SO4 were 108, 165, and 222% for the low, medium, and high rates of N, respectively. Ammonium sulfate gave greater accumulation of soil N with time than NH4NO3 or (NH2)2CO while chemically extractable soil P and K were highest for NH4NO3. (See also W74-08328) (Skogerboe-Colorado State)
W74-08327

RECYCLING AND RECOVERY OF NITROGEN, PHOSPHORUS, AND POTASSIUM BY COASTAL BERMUDAGRASS: II. UNDER GRAZING CONDITIONS WITH TWO STOCKING RATES,
Texas A and M Univ., Overton. Agricultural Research and Extension Center.
F. M. Rouquette, Jr., J. E. Matocha, and R. L. Duble.
Journal of Environmental Quality, Vol 2, No 1, p 129-132, January-March, 1973. 3 fig, 1 tab, 27 ref.

Descriptors: *Water pollution sources, *Fertilizers, *Nitrogen, *Phosphorus, *Potassium, Nutrient removal, Leaching, *Coastal bermudagrass, Pastures, Forages, Groundwater, Recycling.

The effect of two stocking rates on the recycling of N, P, and K was studied for 2 years on a Coastal bermudagrass. Samples for chemical analysis were taken at 14-day intervals. Available forage, forage yield, and forage consumption were estimated from samples taken at 2- to 4-week intervals. Soil samples were taken prior to, during, and at termination of the grazing trial. Plant nutrient recycling on the high stocked pastures were approximately twice as great during the dry, 1969 season and about 10% higher during the 1970 season compared to that on the low stocked pastures. Recoveries of applied plant nutrients averaged over stocking rates were 84, 50, and 155% for N, P, and K, respectively, during 1969, and 180, 73, and 172% for N, P, and K, respectively, during 1970. There was a substantial soil accumulation of plant nutrients under both stocking rates with a considerable advantage in favor of the high stocked pastures. (See also W74-08327) (Skogerboe-Colorado State)
W74-08328

MOVEMENT OF NITRATE NITROGEN IN SOME GRASSLAND SOILS OF SOUTHERN ALBERTA,
Department of Agricultural, Lethbridge (Alberta). Research Station.
T. G. Sommerfeldt, and A. D. Smith.
Journal of Environmental Quality, Vol 2, No 1, p 112-115, January-March, 1973. 5 fig, 3 tab, 14 ref.

Descriptors: *Water pollution sources, *Nitrogen, *Grasslands, Grasses, Leaching, Nutrient removal, Leaching, *Canada, Salinity, Groundwater, Fertilizers, Soils, Loam, Bromegrass, Alfalfa, Sands.

The downward movement of NO3-N in dryland soils under native grass 6 to 8 years after N was applied at rates up to 976 kg/ha reached a depth of 180 cm. Phosphorus fertilizer did not affect NO3-N movement. Under seeded grasses, there was no evidence of NO3-N accumulation 2 years after a single application of N at rates up to 944 kg/ha. After repeated annual applications of N that totaled up to 3776 kg/ha over a 4-year period, NO3-N accumulations were found to depths of 90 to 120 cm. The depth of NO3-N movement under bromegrass was similar to that under crested wheatgrass, but more NO3-N accumulated in the soil under the bromegrass. In irrigated soil underlaid by drains, NO3-N leaching was greater in a loam soil over till growing a mixture of bromegrass and alfalfa than in a loam soil over sandy loam to loamy sand growing an irrigated pasture-grass mixture. These studies indicate that, with good management, fertilizer N on grassland soils is not an important contributor to pollution in semiarid southern Alberta. (Skogerboe-Colorado State)
W74-08329

CHEMICAL DISTRIBUTION OF RESIDUAL FERTILIZER NITROGEN IN SOIL AS REVEALED BY NITROGEN-15 STUDIES.
Langston Univ., Okla. Dept. of Agriculture
A. L. Allen, F. J. Stevenson, and L. T. Kurtz.
Journal of Environmental Quality, Vol 2, No 1, p 120-124, January-March, 1973. 5 fig, 18 ref

Descriptors: Water pollution sources, *Nitrogen, *Fertilizers, Leaching, Nutrient removal, Nitrates, Radioisotopes, Salinity, Groundwater, *Soil analysis, *Distribution patterns, *Path of pollutants.

Chemical distribution patterns were obtained for the residual N in field plots previously amended with N15-labeled urea and oxamide. From 25 to 40% of the fertilizer N was present in the soil (0 to 25 cm) after the first growing season, about half of which still remained after 5 years. Essentially all of the fertilizer-derived N occurred in organic combination; only a small fraction was accounted for in inorganic forms, chiefly as fixed NH4. In comparison to the native humus N, higher percentages of the fertilizer N left after the first growing season occurred as amino acids and amino sugars; lower percentages occurred in acid-insoluble forms, as acid-hydrolyzable organic NH3, and as unidentified acid-soluble N. Considerable humification occurred during the subsequent 4 years with relocation of amino acids N to more resistant humus forms. The findings suggest that fertilizer N, once incorporated into soil organic matter, becomes increasingly stable with time and is not readily mineralized or subject to leaching. (Skogerboe-Colorado State)
W74-08332

RECIPIENT CAPACITY TO LIMIT DISCHARGE OF POLLUTANTS TO RECEIVING WATERS,
Bhabha Atomic Research Centre, Bombay (India). Health Physics Div.
P. R. Kamath.
Indian Journal of Environmental Health, Vol 15, No 3, p 200-207, July 1973. 2 fig, 2 tab.

Descriptors: *On-site investigations, *Evaluation, *Monitoring, Aquatic environment, *Water quality control, *Waste assimilative capacity, Discharge measurement.

Two field studies indicative of techniques which can be adopted to determine the assimilative maximum of pollutants into an aquatic environment are presented. Evaluation of recipient capacity of receiving waters is very important as a mode of surveillance to indicate if any unacceptable deterioration in water quality has occurred. A need for development programs to look into wastes generation aspects as a part of the total design is stressed. (Sandoski-FIRL)
W74-08351

IODEL STUDIES ON REACTIONS OCCUR-ING IN OXIDATIONS OF LIGNIN WITH IOLECULAR OXYGEN IN ALKALINE IEDIA,
ienna Univ. (Austria). Institut fuer Anorganische hemie.
. Kratzl, P. Claus, W. Lonsky, and J. S. Gratzl.
Vood Science and Technology, Vol 8, No 1, p 35-9, 1974. 12 fig, 47 ref.

Descriptors: *Lignins, *Oxidation, *Model studies, Measurement, Alkalis(Bases), Kinetics, Degradation(Decomposition), Decomposing organic matter.
Identifiers: Molecular oxygen, Critical Oxidation potentials.

The degradation of lignin in oxidation with molecular oxygen is discussed emphasizing the adical (homolytic) or one-electron transfer-oxidations in the initial phase of the basic reaction. The ritical oxidation potentials (COP) according to ieser represent a useful measure for the ease of lectron release from lignin-related phenolic nodels. At low alkalinity rough correlations were bserved between the measured COPs and the inial oxygenation rates. The results obtained from uantum mechanical calculations of critical oxidaon potentials are discussed briefly. The imortance of phenoxy radicals and the hypothetical yclohexadienone hydroperoxides as interediates is outlined in view of such degradation eactions as oxidative side-chain eliminations, emethoxylations, and splitting of aromatic rings. Sandoski-FIRL)
V74-08359

ESTIMATION AND EVALUATION OF RADIOACTIVE CONTAMINATION THROUGH A FOOD WEB IN AN AQUATIC ECOSYSTEM 1), AN APPLICATION OF THE COMPARTMENT MODEL TO TRANSFER OF RADIOACTIVE SUBSTANCES THROUGH A FOOD CHAIN,
Kyoto Univ. (Japan). Dept. of Sanitary Engineering.
. Aoyama, and Y. Inoue.
ournal of Radiation Research, Vol 14, No 4, p 375-381, December 1973. 11 ref.

Descriptors: *Food chains, *Radioactive wastes, Radioactive waste disposal, Aquatic environment, Fish, Predation, Prey fish, Investigations, *Food webs, Ecosystems, Model studies, Absorption, *Cesium, *Radioisotopes.
Identifiers: *Japan.

A transfer of radioactive substance through a food chain in an aquatic ecosystem was analyzed through application of modified three compartment model of Aten's. The modification consists of an excretion of radioactivity from Fish-1 (preys) to sea water and an direct uptake of radioactivity by Fish-2 (predator) from sea water. In the experimental system, pike cichlids and minnows were used as predators and preys, and the Cesium 137 isotope was used as a radionuclide in the system. The accumulation of 137 Cs in pike was explained by application of the modified model and various parameters in the model were determined. The transfer or a radionuclide through a food chain can be estimated by knowing the uptake rate and the turnover rate of the predator. In ecological terminology they are a daily average ration and an assimilation rate respectively. (Merritt-FIRL)
W74-08365

RECONNAISSANCE OF THE CHEMICAL QUALITY OF SURFACE WATERS OF THE RIO GRANDE BASIN, TEXAS,
Geological Survey, Austin, Tex.
H. B. Mendieta.
Texas Water Development Board Report 180, March 1974. 109 p, 10 fig, 11 tab, 48 ref.

Descriptors: *Water quality, *Rio Grande River, *Texas, Irrigation water, Return flow, Salinity, Water pollution sources, Geochemistry, Water chemistry, Leaching, Hydrologic data.

The kinds and quantities of minerals dissolved in surface waters of the Rio Grande basin are related principally to the geology of the area and return flow from irrigation. During periods when the flow consists principally of seepage from the Quaternary deposits and return flow from irrigation, water in the upper reach of the Rio Grande usually is slightly saline and very hard. Water in the01W74-08373
W74-08373

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r domestic supply and many industrial uses. The sodium hazard of water in the Rio Grande usually ranges from low to medium; that of the Pecos River usually is very high. The salinity hazard of water in the Rio Grande and Pecos River usually is high or very high. (Knapp-USGS)
For primary bibliographic entry see Field 5B.
solved solids and sulfate in the Rio Grande upstr

MEASUREMENT OF DYE CONCENTRATIONS BY PHOTOGRAPHY,
California Univ., Berkeley. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W74-08376

TRACER SIMULATION OF SOLUBLE WASTE CONCENTRATION,
Geological Survey, Washington, D.C. Water Resources Div.
N. Yotsukura, and F. A. Kilpatrick.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 99, No EE4, Paper 9947, p 499-515, August 1973. 8 fig, 1 tab, 14 ref, append.

Descriptors: *Tracers, *Dispersion, *Path of pollutants, Degradation(Decomposition), Mathematical models, *Simulation analysis, Estuaries.
Identifiers: Radioactive tracers.

The transport of solute in rivers and estuaries can be described by a linear convective diffusion equation. Therefore, the principle of linear superposition can be applied to the dispersion data obtained from a short-term prototype tracer test in order to simulate the concentration buildup of a soluble waste resulting from its long-term release. The assumptions are that both tracer and waste decay according to the first-order reaction rates and that the flow is repetitive with a certain period, which may range from a multiple of tidal cycle for an estuary to an infinitesimal time for a steady river flow. Equations are derived to relate observed tracer concentrations to simulated waste concentrations. Examples of field application are presented. This simulation method is quite feasible for a quick and direct pollution assessment under proper conditions. (Knapp-USGS)
W74-08377

TRANSVERSE DISPERSION IN OCILLATORY CHANNEL FLOW,
British Columbis Univ., Vancouver. Dept. of Civil Engineering.
P. R. B. Ward.
Journal of the Hydraulics Division, Vol 100, American Society of Civil Engineers, No HY6, Paper 10589, p 755-772, June 1974. 9 fig, 2 tab, 17 ref, append.

Descriptor: *Dispersion, *Estuaries, *Turbulence, Meanders, Dye releases, Hydraulic models, Tides, *Path of Pollutants, Tracers, Open channel flow.
Identifiers: *Secondary flow.

In homogeneous estuaries, the dimensionless transverse dispersion coefficient is large compared with results in steady flow in straight channels. Transverse currents of three kinds are responsible for the large coefficients. The results of laboratory tests with oscillatory flow in meandering channels are described. Point injections of dye and subsequent measurements of the dye cloud were made. These results support the hypothesis that the transverse currents cause the large transverse dispersion coefficients. The results suggest that the spiral secondary currents associated with the channel meanders are the principal reason for the large coefficients. (Knapp-USGS)
W74-08389

ENHANCED DISPERSION IN DRAG REDUCING OPEN CHANNEL FLOW,
Clemson Univ., S.C. Dept. of Chemical Engineering.
J. P. Peterson, W. E. Castro, P. B. Zielinski, and W. F. Beckwith.
Journal of the Hydraulics Division, Vol 100, American Society of Civil Engineers, No HY6, Paper 10622, p 773-785, June 1974. 8 fig, 2 tab, 10 ref.

Descriptors: *Dispersion, *Open channel flow, *Path of pollutants, Turbulence, Hydraulics, Diffusion.
Identifiers: *Dray reduction, Polymers, Drag-reducing additives.

Effects of high polymer drag reducing additives on turbulent dispersion was studied in open channel flow. Theoretical analysis shows that the dispersion coefficient should be greatly enhanced in a drag reducing flow. The data obtained for the longitudinal turbulent dispersion coefficient increases with increasing polymer concentration for dilute polymer solutions at a given Reynolds number. In water and dilute polymer solutions the dispersion coefficient varies linearly with the Reynolds number for each concentration. Above a Reynolds number of 10,000 the dispersion coefficient could be predicted from theretical equations with a single empirical constant. (Knapp-USGS)
W74-08390

THE TOXICITY OF SULPHATE PULP BLEACHING EFFLUENTS,
Finnish Pulp and Paper Research Inst., Helsinki.
For primary bibliographic entry see Field 5C.
W74-08403

A NEW ASPECT OF POLLUTION: INCREASE IN THE SALINITY OF WATER DURING ITS USE IN MILLS (UN NOUVEL ASPECT DE LA POLLUTION: LA SALINITE AJOUTEE A L'EAU AU COURS DE SON UTILISATION DANS LES USINES),
G. Djiniadhis.
La Papeterie, Vol 95, No 6, p 458, 461, June 1973. 2 tab.

Descriptors: *Salinity, *Water quality, *Waste water(Pollution), *Pulp wastes, *Industrial wastes, Discharge(Water), Rivers, Europe, Pulp and paper industry, Water pollution sources, Water pollution effects, Impaired water quality.
Identifiers: *France(Seine River).

Surface water salinity caused by pulp and paper mill effluent discharges is discussed as another form of water pollution, exemplified by the increased salinity of the Seine River in France. The kinds and amounts of salts discharged by various mills are indicated, and the costs of this pollution to industrial users of polluted river water are described. (Speckhard-IPC)
W74-08404

WASTE WATER PROBLEMS OF THE TEXTILE INDUSTRY. PART I. OXYGEN DEMAND OF PRINTING PASTE THICKENERS. (PROBLEMI INERENTI LE ACQUE DI SCARICO NELL'INDUSTRIA TESSILE. IO. LA DOMANDA DI OSSIGENO DI ADDENSANTI DA STAMPA),
Stazione Sperimentale per la Cellulosa, Carta e Fibre Tessili Vegetali ed Artificiali, Milan (Italy). Laboratorio Analisi delle Acque.
L. d'Angiura, and L. Vicini.
Tinctoria, Vol 69, No 12, p 442-445, 1972. 6 tab, 9 ref.

Descriptors: *Water pollution sources, *Biodegradation, *Textiles, *Industrial wastes, *Carbohydrates, *Cellulose, *Resins, Biochemical oxygen demand, Chemical oxygen demand, Oxygen demand, Effluents, Pollutants, Polymers.
Identifiers: Starch, Cellulose ethers, Cellulose derivatives, Carboxymethylcellulose, Thickening agents(Chemicals), Printing inks, Alginates, Polyacrylic acid.

Thickeners in the form of chemical solutions or emulsions are usually added to textile printing pastes and are later washed out of the printed fabrics, thus adding to the BOD of discharged effluents. Experimental solutions (0.25 g/liter) of various common thickeners were prepared and tested for COD and BOD. The results showed that carboxymethylcellulose, polyacrylic acid, and alginate were difficult to oxidize, whereas alkyl celluloses and converted (degraded) starches are fairly sensitive to permanganate oxidation at both high and low temperatures. The 7-day BOD of degraded starch was 430, that of a branched-chain alkyl cellulose was only 50 mg of oxygen per gram. (Stapinski-IPC)
W74-08421

CELLULOSIC DEPOSITS IN BENTHAL ENVIRONMENTS: OCCURRENCE, EVOLUTION, AND DECOMPOSITION,
Institute of Paper Chemistry, Appleton, Wis.
A. M. Springer, and R. H. Atalla.
Tappi, Vol 57, No 1, p 120-124, Jan 1974. 2 fig, 1 tab, 17 ref.

Descriptors: *Pulp wastes, *Biodegradation, *Cellulose, *Benthos, Rivers, Self-purification, *Wisconsin, *Sludge, *Anaerobic conditions, Fibers(Plant), Microorganisms, Benthic flora, Aquatic microbiology, Radioisotopes, Carbon radioisotopes, Tracers, Water pollution sources, Water pollution effects, Waste assimilative capacity, Streamflow, Scour, Sediments, Surveys.
Identifiers: *Fox River(Wis), Groundwood, Mechanical pulps, Chemical pulps.

The occurrence and evolution of fibrous sludge beds in the Lower Fox River (Wisconsin) were explored over a period of ca. 2 years. Simultaneously, anaerobic decomposition of fibers in the sludges was investigated under controlled laboratory conditions. Sludge beds were found to cover ca. 50% of the river bottom under average conditions. A linear flow rate of 1 ft/sec was found to be a suitable criterion for prediction of fiber deposition. Monitoring of one selected bed for 20 months led to the conclusion that anaerobic decomposition of fibers proceeds at rates comparable to those of deposition. The variation of organic content with temperature indicated a lower microbiological activity during the colder fall and winter, and a significant activity rise in warmer periods. Most of the fibers in sludge beds derived from mechanical pulp (groundwood), suggesting that the lifetime of chemically pulped fibers in benthal strata of the Lower Fox is quite short. Rates of anaerobic decomposition were measured by incubating sludge samples in a Warburg apparatus and monitoring the evolution of methane and carbon dioxide. Effects of environmental variables were established by perturbing particular variables and comparing the resulting responses to those of control systems. Radiotracer studies with C14-labeled cellulosic material confirmed the anaerobic decomposition mechanism and established that the degradation rates are higher for chemical than for mechanical pulps. An upper limit of ca. 2 years was established for the lifetime of fibers in the benthal sludge bed monitored. (Brown-IPC)
W74-08423

POLLUTION OF THE DRAMMENS RIVER BY THE WOOD-PROCESSING INDUSTRY (TREFOREDLINGSINDUSTRIENS UTSLIPP TIL DRAMMENSVASSDRAGET),
D. Rusten
Norsk Skogindustri, Vol 27, No 11, p 324-327, Nov 1973

Descriptors: *Pulp wastes, Europe, *Water pollution sources, *Water pollution control, Pulp and paper industry, *Water conservation, Treatment facilities, *Waste water treatment, Industrial wastes, Pollutants, Waste water(Pollution), Organic loading, Fibers(Plant), Carbohydrates, Lignins, Suspended solids, Dissolved solids, Filtration, Sedimentation, Flotation
Identifiers: *Norway(Drammens River), White water, Paper mills, Paper machines, Savealls, Fiber recovery, Fines(Fine fibers).

Pollutants in the Drammens River in Norway include suspended organic matter (fiber debris), inorganic fillers, and dissolved organic compounds, notably carbohydrates and lignin. Among methods proposed for reducing any further pollution by pulp and paper mill discharges are: recirculation of paper-machine white waters so as to reduce freshwater intake; filtration; sedimentation; and flotation savealls for fines (fine fiber) recovery. The economics of appropriate effluent treatment installations are also mentioned. (Brown-IPC)
W74-08428

APPRAISAL OF THE WATER RESOURCES OF EASTERN PALM BEACH COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 4B.
W74-08445

MODEL STUDY OF THE DILUTION OF SOLUBLE LIQUIDS DISCHARGE FROM TANKERS,
Stevens Inst. of Tech., Hoboken, N.J. Davidson Lab.
J. A. Mercier, R. I. Hires, and M. Wu.
Available from NTIS, Springfield, Va. 22151 as AD-768 681; Price $4.25 printed copy; $1.45 microfiche. Final Contract Report No CG-D-12-74, to Department of Transportation, United States Coast Guard, September 1973. 115 p, 68 fig, 3 photo, 9 tab, 10 ref.

Descriptors: *Path of pollutants, *Dispersion, *Solutes, *Ships, Water pollution sources, Water pollution control, Mixing, Model studies, Hydraulic models.

Dispersion of effluent discharged from chemical tankers was studied in scale models. The effects of location, volume rate, and velocity of discharge were investigated as well as ship speed and propeller action. Discharge should be through the ship's hull at low rates of flow, through large diameter pipes or sea chests. The discharge should be located so that the effluent flows into the central region of the wake and is not affected by bow or bilge vortices. Locations in the region just forward of the engine room and from just below the turn of the bilge or outboard to about the height of the shaft centerline are suggested. For low velocity discharges into the central region of the ship's wake, the concentration of contaminant is approximately proportional to the discharge rate. The dilution is expected to be relatively insensitive to ship displacement and trim if the effluent flows into the central part of the ship's wake and is not affected by bow or bilge vortices. (Knapp-USGS)
W74-08451

USE OF HYDROCHEMISTRY FOR INTERPRETING GROUND-WATER FLOW SYSTEMS IN CENTRAL NEVADA,
Nevada Univ., Las Vegas. Desert Research Inst.
For primary bibliographic entry see Field 2F.
W74-08453

POLLUTION CONTROL OF DISCHARGES INTO RIVERS, STREAMS AND SEA,
BP Refinery Singapore Pty. Ltd.
For primary bibliographic entry see Field 5G.
W74-08469

THE SLOP OIL PROBLEM IN SINGAPORE,
Ministry of Science and Technology, Singapore. Industrial Liaison Unit.
For primary bibliographic entry see Field 5G.
W74-08471

THE CONTROL OF WASTEWATER AND OIL DISCHARGES TO THE SEA WITH PARTICULAR REGARD TO STUDIES RECENTLY CARRIED OUT IN SINGAPORE'S SOUTHERN COASTAL WATERS,
Watson (J. D. and D. M.), London (England)
For primary bibliographic entry see Field 5G.
W74-08472

THE HANDLING OF OIL SPILLS,
Esso Research and Engineering Co., Linden, N.J.
For primary bibliographic entry see Field 5G.
W74-08474

SEA POLLUTION IN SINGAPORE,
Port of Singapore Authority.
K. Chitharanjan.
In: Water Resources, Environment and National Development--Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 238-241, 1972.

Descriptors: *Oil spills, *Water pollution sources, *Ships, Oily water, Water pollution control, Navigation.
Identifiers: *Oil tankers, *Singapore.

The sea pollution problem in Singapore involves pollution that emanates directly from a variety of sources within the territory of Singapore and the constant threat posed by international shipping, particularly tankers. Ocean-going ships and tankers could cause disastrous pollution as a result of collision and grounding. Such a threat is greater now than ever before owing to the general increase in the world shipping tonnage and the continuing increase in the size and draft of tankers. The other factor which has a detrimental influence on the general situation is the configuration of the waterway around the Republic where bottlenecks exist on the west, south and east. (See also W74-08454) (Knapp-USGS)
W74-08475

WATER POLLUTION AND ENVIRONMENTAL HEALTH,
Ministry of Health, Kuala Lumpur (Malaysia).
For primary bibliographic entry see Field 5G.
W74-08479

WATER POLLUTION IN THAILAND,
Applied Scientific Research Corp., of Thailand, Bangkok. Environmental and Ecological Research Inst.
For primary bibliographic entry see Field 5G.
W74-08483

SEA POLLUTION--SOME ASPECTS AND THE NEED TO FIGHT IT,
Indonesian Petroleum Inst., Djakarta.
W. Wisaksono.
In: Water Resources, Environment and National Development--Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 321-329, 1972. 1 tab, 23 ref.

Descriptors: *Oil spills, *Oily water, Oil wastes, Oil industry, Water pollution control, Water pollution effects.
Identifiers: *Indonesia.

Indonesian waters generally are relatively clean. Areas with a relatively higher degree of hydrocarbon or oil pollution are the southern areas of the Billiton Island Group, the Bay of Djakarta, the northern coasts of Java, North Sulawesi, waters in the northern part of Lombok Island, and Birdhead Bay of West Irian. (See also W74-08454) (Knapp-USGS)
W74-08485

PROGRESS EVALUATION MEETING IN THE MATTER OF POLLUTION OF THE INTERSTATE WATERS OF THE MISSOURI RIVER, OMAHA, NEBRASKA AREA (NEBRASKA-IOWA-MISSOURI-KANSAS).
Federal Water Pollution Control Administration, Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-08529

REPORT ON THE SECOND SESSION OF THE CONFERENCE IN THE MATTER OF POLLUTION OF THE SOUTH PLATTE RIVER BASIN.
Federal Water Pollution Control Administration, Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-08530

DISTRIBUTION OF FLUORIDE IN WATERS OF TOKYO BAY,
Nagoya Univ. (Japan). Water Research Lab.
Y. Kitano, and T. Furukawa.
J Oceanogr Soc Jap. Vol 28, No 3, p 121-125, 1972, Illus.
Identifiers: Bays, *Chorinity, Distribution patterns, *Fluoride distribution, *Japan(Tokoyo Bay), *Path of pollutants, Water pollution sources.

Fluoride concentrations in the waters of Tokyo Bay, Japan, are 0.63-1.27 mg/kg and the fluoride to chlorinity ratios are 6.71-8.76x10-5. Fluoride concentrations in river mouth waters flowing to the western part of Tokyo Bay are 0.15-1.07 mg/1, and the fluoride to chlorinity ratios are 1.4x10-4 to 3.6x10-2. The influence of industrial activities on the fluoride to chlorinity ratios is negligible.--Copyright 1973, Biological Abstracts, Inc.
W74-08549

SOLUBILITY OF 1,1,2,2-TETRABROMOETHANE IN WATER AS A FUNCTION OF TEMPERATURE,
Bureau of Mines, Tuscaloosa, Ala. Tuscaloosa Metallurgy Research Lab.
J. P. Gooch, E. K. Landis, and J. S. Browning.
Bureau of Mines Report of Investigations 7656, 1972. 18 p, 3 fig, 11 tab, 20 ref.

Descriptors: *Water pollution sources, *Halogens, *Heavy media separation, *Flotation, *Separation techniques, Bromine, Solubility.
Identifiers: *Tetrabromoethane.

The solubility of 1,1,2,2-tetrabromoethane (TBE) in water was determined from 1.0 deg to 97.0 deg C. The data are also necessary in an examination of potential water quality problems associated with the discharge of effluent streams from an aqueous recovery process, even though, in view of the low threshold vapor phase toxicity of TBE, acceptable levels in discharge streams will be extremely low. A thermodynamic analysis conducted on a system consisting of a TBE phase and a water phase in equilibrium with a vapor phase led to the calculation of the activity coefficient, vapor-liquid equilibrium distribution coefficient, relative volatility, and heat of mixing for saturated solutions of TBE in water. (Knapp-USGS)
W74-08589

WASTE DISPOSAL SYSTEMS FROM A GROUNDWATER HYDROLOGY AND POLLUTION POINT OF VIEW,
Ministry of the Environment, Ottawa (Ontario). Water Quality Branch.
For primary bibliographic entry see Field 5E.
W74-08594

QUALITY OF SURFACE WATER IN THE VICINITY OF OIL EXPLORATION SITES, BIG CYPRESS AREA, SOUTH FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5A.
W74-08596

RICHARDSON BAY EFFLUENT DILUTION STUDY--A WORKING PAPER.
Environmental Protection Agency, San Francisco, Calif. Region IX.
Final Report, January 1971. 14 p, 6 fig, 2 tab.

Descriptors: *Path of pollutants, *Bays, *California, Water pollution effects, Algae, Sewage disposal, Water circulation, *Path of pollutants.
Identifiers: *San Francisco Bay.

Dilution of effluent from the Richardson Bay Sanitation District sewage treatment plant in San Francisco Bay was measured with fluorescent dye. Rhodamine WT dye was added to the effluent at a continuous rate and its concentration in the receiving water monitored daily until a steady state was achieved. Dilution contours were drawn for both high and low slack waters, and flushing time was measured after cessation of dye injection. Algal growth potentials were measured for various effluent concentrations. Most of the volume of water in the portion of the bay studied was replaced every tidal cycle. During the release period, a steady-state condition was reached when a narrow band of high concentration developed along the shoreline in the vicinity of the outfall. Beyond the outer boundary of the band a steep concentration gradient indicated a limited area of mixing, and beyond this point the water at high tide could only consist of replacement from the outer bay. After termination of the release, the visible band of red disappeared within one day, and within a week only background levels could be detected with the fluorometer. In general, increasing or addition of effluent to the bay water gave higher algal growth, with 100% effluent response more than 100 times that of the controls. (Knapp-USGS)
W74-08604

AN APPRAISAL OF THE GROUNDWATER RESOURCES OF THE UPPER CAPE FEAR RIVER BASIN, NORTH CAROLINA,
Geological Survey, Raleigh, N.C.
For primary bibliographic entry see Field 4B.
W74-08605

WATEQ, A COMPUTER PROGRAM FOR CALCULATING CHEMICAL EQUILIBRIA OF NATURAL WATERS,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2K.
W74-08606

RATES OF SALT SOLUTION IN THE PERMIAN BASIN,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 2K.
W74-08608

THE MICROBIAL DEGRADATION OF OIL POLLUTANTS,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
D. G. Ahearn, and S. P. Meyers.
Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication No LSU-SG-73-01, 1973. 322p. Report LSU-SG-73-01, SG-04-3-158-19, ONR-N00014-73-C-0066.

Descriptors: *Oil spills, *Oil pollution, *Biodegradation, *Microbial degradation, Water quality control, *Pollution abatement, *Water pollution control, *Pesticides, Environmental effects, Aquatic environment, Aquatic animals, Aquatic plants, Estuarine environment.
Identifiers: Seeding oil spills, Bacterial seeding, Crude oils, Pollutant effects, Marine environment, Freshwater environment.

Thirty-two papers constitute the proceedings of the workshop which was held to determine the present status of knowledge concerning the use of microorganisms in facilitating oil biodegradation, to assess future areas of investigation, to promote cooperative research projects, and to promote exchange of information. Papers are separately abstracted. (See W74-08610 thru W74-08641) (Sinha-OEIS)
W74-08609

MICROBIAL-FACILITATED DEGRADATION OF OIL: A PROSPECTUS,
Georgia State Univ., Atlanta. Dept. of Biology.
D. G. Ahearn.
Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publicatin No., LSU-SG-73-01, p 1-2, 1973.

Descriptors: *Oil pollution, *Oil spills, *Biodegradation, *Microbial degradation, *Environmental effects, *Water quality control, *Water pollution control, *Pollution abatement, Food chains.
Identifiers: Crude oil.

The increasing dependency of industrialized nations on fossil hydrocarbons will not be appreciably altered in the near future. The current 'energy crisis,' with shortages of oil, will increase requirements for shipping and piping vast amounts of hydrocarbons. Thus, the likelihood of future catastrophic oil pollution will be heightened and chronic oil pollution will continue to be a problem. Practical applications for controlled biodegradation of oil may be developed for transformation of bilge wastes and spent lubricating oils to products not harmful to the environment. Following oil spills, various microbial treatments may be necessary to reduce toxicity and to remove residual oils after mechanical clean-up procedures have been instituted. Presently, defined microbial systems which give a proven increase of oil biodegradation in nature have not been developed. Moreover, neither the immediate or long-term effects of seeding hydrocarbonoclastic microorganisms into the environment have been established. (See also W74-08609) (Sinha-OEIS)
W74-08610

MICROBIAL DEGRADATION OF OIL: PRESENT STATUS, PROBLEMS, AND PERSPECTIVES,
Scripps Institution of Oceanography, La Jolla, Calif.
C. E. ZoBell.

Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication No. LSU-SG-73-01, p 3-16, 1973. 46 ref.

Descriptors: *Oil spills, *Oil pollution, *Microbial degradation, *Biodegradation, Bacteria, Yeasts, Fungi, Microorganisms, Food chains, Bottom sediments, Water quality control, Pollution abatement.
Identifiers: *Hydrocarbon oxidizers, *Biosynthesis, Seeding oil spills, Tar balls.

Virtually all kinds of hydrocarbons are susceptible to microbial degradation under favorable conditions. More than 200 species of bacteria, yeasts, and filmentous fungi have been shown to metabolize one or more kinds of hydrocarbons ranging from CH4 to compounds containing more than 40 carbon atoms. Although there is a wealth of information on the occurrence and kinds of oil-degrading microorganisms in oil-polluted environments, not much is known about their reaction rates or their intermediate degradation products. A summary is given on: the occurrence of hydrocarbon oxidizers in nature; kinds of hydrocarbon oxidizers; kinds of hydrocarbons oxidized; factors affecting the microbial degradation of oil; criteria for the microbial degradation of oil; biodegradation products; rate of oil degradation; the problem of oil in food chains; artificial seeding of oil spills; and the fate of oil in bottom deposits. (See also W74-08609) (Sinha-OEIS)
W74-08611

A THRENODY CONCERNING THE BIODEGRADATION OF OIL IN NATURAL WATERS,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
G. D. Floodgate.
Proceedings of a Workshop held at Georgia State University, December 4-6 1972. Published by Louisiana State University, Sea Grant Publication No. LSU-SG-73-01, p 17-24, 1973. 25 ref.

Descriptors: *Oil spills, *Biodegradation, *Oil pollution, *Microbial degradation, *Ecology, Microorganisms, Evaporation, Chemical analysis.
Identifiers: Marine chemistry, Crude oils, Petroleum degradation, Oil degradation, Heterotrophic activity, Marine environment, Solubilization, Photo-oxidation, Mineralization.

A plea for a more ecological approach to the problem of oil degradation--an insistence that when oil is spilled into water, the physics, chemistry and biology of the water must be taken into account. New ideas and new apparatus are required such as Gibbs has used in his semi-open system as a first approach to the problem, and its later developments. Other possible ways of measuring heterotrophic activity as yet unexplored in oil degradation, were suggested by Strickland. Also implied in the present paper is that research on this topic requires the cooperation of microbiologists, oil chemists and marine chemists. It is also a plea for recognition of our ignorance, and of the complexity of the problem. Broad generalizations, whether optimistic or pessimistic, are out of place. Our knowledge of what part microorganisms play in the ecology of estuaries, coastal waters and the deep oceans is at best sketchy. (See also W74-08609) (Sinha-OEIS)
W74-08612

HYDROCARBON UTILIZATION BY CLADOSPORIUM RESINAE,
Dayton Univ., Ohio. Dept. of Biology.
J. J. Cooney, and J. D. Walker.
Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication No. LSU-SG-73-01, p 25-32, 1973. 4 tab, 27 ref.

Descriptors: *Biodegradation, *Oil spills, *Oil pollution, *Fungi, *Microbial degradation, Ecosystems, Food chains
Identifiers: *Biosynthesis, Amorphotheca, *Cladosporium resinae, Seeding oil spills, Substrates, Soil microflora, Creosote fungus, Kerosene fungus, Deuteromycetes

Cladosporium resinae resembles a number of hydrocarbon-using bacteria and yeasts in that it grows slowly on hydrocarbons. Moreover, limited growth is obtained on cyclic and aromatic compounds. However, the two strains examined do grow on a variety of substrates. Combinations of hydrocarbons and other nitrogen sources may enhance activity and are under examination. Moreover, somatic growth alone may not be an adequate criterion. C. resinae accumulates hydrocarbons, assimilating and oxidizing them by mechanisms that have been demonstrated for a number of bacteria and yeasts. Results summarized here may provide a beginning for evaluation of the role of C. resinae in aquatic and terrestrial environs, and for determining its potential as a seeding organism for oil slicks. Of equal importance with surface slicks, however, is the need to deal with accumulations of hydrocarbons in sediments. The most refractory hydrocarbons are deposited where they can be toxic to benthic organisms and thus provide a reservoir from which they may enter the food chain. Such bottom accumulations are particularly important in shallow water systems such as lakes, streams, marshes and estuaries. (See also W74-08609) (Sinha-OEIS)
W74-08613

MICROBIAL DEGRADATION OF AROMATIC HYDROCARBONS,
Texas Univ., Austin. Dept. of Microbiology.
D. T. Gibson, and W. K. Yeh.
Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication No. LSU-SG-73-01, p 33-38, 1973. 2 fig, 3 tab, 13 ref. NIH-ES000537.

Descriptors: *Oil pollution, *Oil spills, *Microbial degradation, *Biodegradation, Bacteria, Mammals, Aromatic compounds.
Identifiers: *Aromatic hydrocarbons, Microbial oxidation, Cis-hydroxylation, Mutagenesis, Schizomycetes, Pseudomonas putida.

Bacteria capable of growth on benzene, toluene, ethylbenzene, naphthalene and biphenyl were isolated from soil. Mutagenesis led to the isolation of different bacterial strains that will accumulate the initial products of hydrocarbon oxidation. The results obtained suggest that cis-hydroxylation is a common reaction in the microbial oxidation of aromatic hydrocarbons. Differences in mechanisms utilized by bacteria and mammals to oxidize aromatic hydrocarbons are illustrated. Mammals incorporate one atom of molecular oxygen into aromatic hydrocarbons with the formation of arene oxides. Subsequent enzymatic addition of water leads to the formation of trans-dihydrodiols. The latter compounds can undergo NADP+-dependent oxidation to catechols. Bacteria utilize both atoms of molecular oxygen to form cis-dihydrodoils. The cyclic peroxide (dioxetane) intermediate is hypothetical. Oxidation of cis-dihydrodoils is NAD+-dependent and, as with the mammalian system, also leads to formation of catechols. The mechanisms of enzymatic oxygen fixation remain unsolved, and probably will not be resolved until purified enzyme systems are available. (See also W74-08609) (Sinha-OEIS)
W74-08614

MICROBIAL DEGRADATION OF OIL AND HYDROCARBONS IN CONTINUOUS CULTURE,
State Univ. Coll., Brockport, N.Y. Dept. of Biological Sciences.
P. H. Pritchard, and T. J. Starr.
Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication No. LSU-SG-73-01, p 39-45, 1973. 1 fig, 4 tab, 9 ref. ONR N0014-73-C-0074

Descriptors: *Oil pollution, *Biodegradation, *Microbial degradation, *Bacteria, *Environmental effects, *Ecosystems, *Oil spills.
Identifiers: *Petroleum hydrocarbons, Substrates, Water insolubility, Continuous culture system, Oil degradation

Preliminary results are presented which support the proposed use of continuous culture techniques to study oil degradation. Experiments with both pure and mixed bacterial populations have shown that slow but significant degradation rates can be obtained with an undisturbed, two-phase (water-hydrocarbon) system. The study of the degradation of petroleum hydrocarbons in a continuous culture system presents a number of complicated problems, the most obvious of which is the water insolubility of the substrate. The purpose is to describe a continuous culture system, developed in our laboratory, which eliminates many of these problems and allows examination of oil degradation in an open versus a closed system. Using isolate J-10 in pure culture (obtained from batch culture enrichments on octane), degradation rates of 16.2 micro gram of octane consumed per hour were obtained. This rate was determined by following the decrease in percent transmittance of the Sudan III dye in the octane layer. The removal of octane was not due to solubilization or evaporation. The observed rate appears to be a function of the ability of the bacterium to degrade the octane at the hydrocarbon-water interface without the aid of emulsification or physical dispersion. It therefore represented a minimal rate. (See also W74-08609) (Sinha-OEIS)
W74-08615

UTILIZATION OF CRUDE OIL HYDROCARBONS BY MIXED CULTURES OF MARINE BACTERIA,
Texas Univ., Port Aransas. Marine Science Inst.
H. Kator.
Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication No. LSU-SG-73-01, p 47-65, 1973. 18 fig, 11 tab, 7 ref.

Descriptors: *Oil pollution, *Bacteria, *Oil spills, *Cultures.
Identifiers: *Oil degradation, Crude oils, Paraffins.

Marine bacteria degraded hydrocarbons in crude oils in an enriched seawater medium. Normal and branched paraffins were preferentially utilized. Utilization rates were inversely related to chain length. Rapidly growing oil-degrading cultures consistently dispersed and metabolized thin layers of Louisiana, Kuwait and Venezuelan crude oils in ESW within 24 hours. In summary, n-paraffin degradation patterns were similar for different major crude oils. However, the rates of total n-paraffin utilization were significantly larger with the Louisiana crude oil. This oil contains roughly twice the amount of normal paraffins found in Kuwait and Venezuelan crude oils. It is evident that mixed populations of marine bacteria isolated on selected crude oils have a clear preference for normal and then branched paraffins. Inasmuch as hydrocarbon degradation in crude oils is sequential, further research utilizing steady-state conditions (without loss of oil) is required to evaluate the range and rates of hydrocarbons utilized or oxidized in crude oils. (See also W74-08609) (Sinha-OEIS)
W74-08616

MICROBIAL DECOMPOSITION PATTERNS USING CRUDE OIL,
University of Southern California, Los Angeles. Environmental Geology Program.
B. J. Mechalas, T. J. Meyers, and R. L. Kolpack.
Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication No. LSU-SG-73-01, p 67-79, 1973. 5 fig, 2 tab, 24 ref. NOAA SG 2-35227.

Descriptors: *Oil pollution, *Oil spills, *Biodegradation, *Microbial degradation, *Bacteria.
Identifiers: *Petroleum hydrocarbons, *Oil degradation, Crude oils, Paraffins.

A mixed culture of microorganisms, acclimated to decomposition of crude oil, was used in a series of incubation experiments to determine the sequence of microbial degradation in a Santa Barbara, California, crude oil. Microbial degradation of the crude oil is initially characterized by a rapid disappearance of the n-paraffin envelope. This degradation starts with the low molecular weight components and progresses toward the higher molecular weight compounds. The isoprenoids are also progressively reduced simultaneously with the reduction of the paraffins. In addition, the base envelope and fine fingerprint region subsequently undergo degradation and the base envelope becomes progressively skewed toward the higher molecular weight end of the chromatogram. Biodegradation of the Santa Barbara crude oil by a mixed microbial population was initiated simultaneously on all components, but the sequential patterns of decomposition were affected by rate differences. Chromatograms of naturally weathered oils collected from southern California beaches are remarkably similar to chromatograms of oil samples which have undergone extensive microbial decomposition in the laboratory. (See also W74-08609) (Sinha-OEIS)
W74-08617

CONSIDERATIONS IN APPLICATION OF MICROORGANISMS TO THE ENVIRONMENT FOR DEGRADATION OF PETROLEUM PRODUCTS,
California Univ., Berkeley. Naval Biomedical Research Lab.
A. B. Cobet, H. E. Guard, and M. A. Chatigny.
Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication No. LSU-SG-73-01, p 81-87, 1973. 1 fig, 24 ref. ONR N00014-69-A-0200-1001.

Descriptors: *Oil pollution, *Bacteria, *Biodegradation, *Nutrients, *Aerosols, *Toxicity, Environmental effects, Invertebrates, Microorganisms, Pathogens, Aquatic plants, Aquatic animals.
Identifiers: *Oil degradation, Aerosolization, Oil slicks, Emulsification, Pollution-nutrient.

Considerations in the use of microbial preparations for the degradation of oil pollutants are presented. Besides obvious effects of nutrients on the environment, factors associated with emulsification of the oil pollutant, i.e., increased solubility and toxicity of the residue, and factors in application of the preparation (aerosolization) are discussed. The presence of potential human or animal pathogens in the microbial preparations used for seeding oil spills can create hazards either during the initial aerosolization or from the secondary aerosolization of spume of spray from the water surface. Biodegradation of an oil slick results in the formation of extracellular metabolic products, the effects of which should be considered. Aerobic biodegradation of the hydrocarbon molecule commences with the incorporation of molecular oxygen into the hydrocarbon. The resulting metabolic products may be more toxic and often have a greater solubility than the precursor compound. Biodegradation of an oil slick, emulsified oil, and the soluble fraction could conceivably result in a greatly increased toxic organic load in the water colume due to increased solubility differences of the metabolic products. (See also W74-08609) (Sinha-OEIS)
W74-08618

STUDIES ON THE DEGRADATION OF PETROLEUM BY FILAMENTOUS FUNGI,
North Carolina State Univ., Raleigh. Dept. of Microbiology.
J. J. Perry, and C. E. Cerniglia.
Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication No. LSU-SG-73-01, p 89-94, 1973. 1 tab, 25 ref.

Descriptors: *Oil pollution, *Microbial degradation, *Biodegradation, *Microorganisms, *Fungi, Nitrogen, Phosphorous.
Identifiers: *Petroleum degradation, Crude oils, Hydrocarbon substrates, Filamentous fungi, Mycobacteria, Cunninghamella elegans, Ascomycetes Penicillium zonatum, Ascomycetes Penicillium ochro-chlorens, Ascomycetes Aspergillus versicolor, Cephalosporium acremonium.

Studies were initiated on the degradation of petroleum by microorganisms maintained in stock culture and originally selected for their ability to grow on hydrocarbon substrates. The results suggested that many of the constituent parts of complex petroleum could be utilized by these organisms but none could mineralize a significant part of the oil. It was evident, however, that the fungi available were superior to bacteria in the amount of growth attained on various crude oils. Tests with microbes isolated by enrichment with crude oil as substrate confirmed that fungi were more efficient in our system in mineralizing petroleum hydrocarbons. This report is concerned with several aspects of these hydrocarbon degradation studies. Our results suggest that filamentous fungi might have greater potential than bacteria in cleansing the environment of spilled petroleum. The fungi degrade greater quantities of oil during growth, in part perhaps due to their development as a mat on the surface of the oil. Bacteria and yeasts grow in oil droplets where oxygen and mineral nutrients might be limiting. Another advantage is the ability of fungi to form spores that retain viability over extended periods of time without refrigeration. Spores could be accumulated for use as 'seed' inocula when and where they might be needed. (See also W74-08609) (Sinha-OEIS)
W74-08619

MICROBIAL DEGRADATION OF CRUDE OIL AND THE VARIOUS HYDROCARBON DERIVATIVES,
Canada Centre for Inland Waters, Burlington (Ontario).
D. L. S. Liu.
Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication No. LSU-SG-73-01, p 95-104, 1973. 11 fig, 7 ref.

Descriptors: *Oil spills, *Oil pollution, *Biodegradation, Microbial degradation, Microorganisms, *Organic compounds.
Identifiers: n-alkane, *Crude oil, Hydrocarbon alcohols, Methyl ester, Fatty acids, Alkylbenzenes, Hydrocarbon bacteria.

The utilization of various petroleum products by a crude oil-grown bacterial culture has been studied using manometric and gas chromatographic techniques. A comparison of the gas chromatogram before and after growth showed that the n-alkane fraction had been preferentially utilized. Manometric techniques demonstrated that the crude oil-grown cells could also rapidly degrade n-alkanes, hydrocarbon alcohols, methyl ester of fatty acids and alkylbenzenes. (See also W74-08609) (Sinha-OEIS)
W74-08620

MICROBES AND PETROLEUM: PERSPECTIVES AND IMPLICATIONS,
Georgia Univ., Athens. Dept. of Microbiology.
W. R. Finnerty, R. S. Kennedy, P. Lockwood, B. O. Spurlock, and R. A. Young.
Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication No. LSU-SG-73-01, p 105-125, 1973. 20 fig, 4 tab, 30 ref. NSF GB-8208, GB-34120.

Descriptors: *Oil spills, *Oil pollution, *Biodegradation, *Microbial degradation, Metabolism, Food chains, Microorganisms.
Identifiers: Hydrocarbon microbiology, Hydrocarbon oxidation, Lipid synthesis, Membrane synthesis, Hydrocarbon metabolism, Schizomycetes, Acinetobacter sp., Tar balls, Oil degradation, Carcinogens, Petroleum degradation, Sequestering hydrocarbons, Microbial flora, Cytoplasmic sequestering.

An ultra-structure study of Acinetobacter sp grown on paraffinic and olefinic hydrocarbons demonstrated cytoplasmic sequestering of hydrocarbons. Induced membrane synthesis was additionally demonstrated as a result of hydrocarbon metabolism. Increased cellular and extracellular lipid synthesis was qualitatively and quantitatively documented during hydrocarbon metabolism. These studies serve to emphasize our lack of detailed knowledge concerning the consequences which may arise from this relationship. A serious problem facing hydrocarbon microbiology today is not so much microbial utilization of volatile petroleum fractions, but rather the biodegradation of resinous tars. These highly complex constituents of petroleum appear to be highly refractory to biological degradation so that further and immediate studies are needed to understand the apparent recalcitrant nature of these petroleum constituents. (See also W74-08609) (Sinha-OEIS)
W74-08621

DISTRIBUTION AND ABUNDANCE OF OIL-OXIDIZING BACTERIA IN THE NORTH SEA,
Biologische Anstalt Helgoland, (West Germany).
W. Gunkel.
Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication No. LSU-SG-73-01, p 127-139, 1973. 4 fig, 2 tab, 20 ref.

Descriptors: *Oil pollution, *Oil slicks, *Biodegradation, *Microbial degradation, Water pollution control, *Pollution abatement, Water quality control, Yeasts, Air-water interfaces, Bacteria, Sediments.
Identifiers: Oil-oxidizing bacteria, Marine heterotrophic bacteria, *North Sea, Elbe River Estuary, Surface films, Beach sands.

Investigations include distribution of oil-oxidizing (and total heterotrophic bacteria) in the waters, surface films, sediments and beach sands of the North Sea in the vicinity of Helgoland and in the River Elbe estuary. Microbial concentrations in unpolluted samples, as great as 10,000,000,000 per liter of sediment, are reported. The results on the abundance of marine oil-oxidizing bacteria at the cable-buoy showed that all 57 samples contained oil-oxidizing bacteria. The average was 53,860 bacteria per liter with the percentage 0.52 to 16.8% of the total number of marine heterotrophic bacteria. Because it is highly unlikely that these large concentrations of bacteria belong to a single species, we can assume that bacteria with different potencies to break down various oil compounds are present throughout the year around Helgoland. The sediment samples collected around Helgoland give very different results. Bacterial numbers fluctuate about five orders of magnitude. The data indicate the presence of a large bacterial population

which is able to decompose different types of hydrocarbons. For two years the lowering of the surface tension due to organic substances in collected surface films was measured. In all cases, a considerably lower value was obtained for dyn/cm compared with the water at 1 m depth. Because oil pollution occurs in the former environment further investigations will be concentrated in the surface film. (See also W74-08609) (Sinha-OEIS)
W74-08622

MARINE HYDROCARBONOCLASTIC BACTERIA: TYPES AND RANGE OF OIL DEGRADATION,
Naval Weapons Center, China Lake, Calif. Research Dept.
G. Soli.
Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication No. LSU-SG-73-01, p 141-146, 1973. 3 tab, 7 ref.

Descriptors: *Bacteria, *Oil spills, *Oil pollution, *Biodegradation, *Microbial degradation, *Pollution abatement, Water quality control, Water pollution control, Nitrogen.
Identifiers: Oil slicks, Oil degradation, Marine bacteria, Hydrocarbon degradation, Hydrocarbonoclastic bacteria, Hydrocarbon oxidation.

Marine bacterial isolates were characterized on the basis of their ability to attack hydrocarbons in a complex synthetic mixture. It is possible to outline the oil degradation range of the organisms by properly balancing the various components. The degree of specialization and adaptation to hydrocarbon oxidation was determined indirectly with different nitrogen sources. (See also W74-08609) (Sinha-OEIS)
W74-08623

BIODEGRADATION OF OIL IN SEAWATER: LIMITING FACTORS AND ARTIFICIAL STIMULATION,
Rutgers-The State Univ., New Brunswick, N.J. Dept. of Biochemistry and Microbiology.
R. Bartha, and R. M. Atlas.
Proceedings of a Workshop held at Georgia State University, December 4-6,1972. Published by Louisiana State University, Sea Grant Publication No LSU-SG-73-01, p 147-152, 1973. 2 fig, 1 tab, 9 ref. ONR N00014-67-A-0115-0005.

Descriptors: *Biodegradation, *Oil pollution, *Pollution abatement, *Water quality control, *Water pollution control, *Bacteria, Oil spills, Sea water, Nitrogen, Phosphorus, Nutrients, Water temperature.
Identifiers: *Oleophilic fertilizer, Crude oil, Oil slicks, Flavobacterium sp, Brevibacterium sp., Schizomycetes.

The limiting factors of petroleum biodegradation in seawater were systematically evaluated. In the surveyed coastal waters, hydrocarbon oxidizers were found to be abundant, but their substrate ranges relatively restricted. Besides lowering the biodegradation rates, low water temperatures caused long lag periods due to retention of volatile inhibitors in crude oil. Nitrogen and phosphorus were found to be severely limiting. Addition of these nutrients dramatically increased oil biodegradation both in laboratory and in field experiments. An oleophilic fertilizer formula for use on floating oil slicks is described. Summarizing some identified or postulated causes that inhibit biodegradation of polluting oil in the sea, ZoBell listed the low numbers of marine hydrocarbon degraders, their limited substrate range, toxic substances in crudge oil, lack of sufficient aeration, lack of adequate dispersion, sub-optimal temperatures, and insufficiency of essential mineral nutrients such as nitrogen and phosphorus. We have evaluated some of these limiting parameters in a quantitative manner in order to define practical approaches toward the stimulated biodegradation of oil as a pollution abatement technique. (See also W74-08609) (Sinha-OEIS)
W74-08624

BACTERIAL DEGRADATION OF MINERAL OILS AT LOW TEMPERATURES,
Scripps Institution of Oceanography, La Jolla, Calif.
C. E. ZoBell.
Proceedings of a Workshop held at Georgia State University, December 4-6, 1972 Published by Louisiana State University, Sea Grant Publication No LSU-SG-73-01, p 153-161, 1973. 2 fig, 3 tab, 17 ref.

Descriptors: *Tundra, *Biodegradation, *Bacteria, *Yeasts, *Fungi, *Water pollution, *Oil pollution, Pollution abatement, Soils, Water temperature, Oil spills.
Identifiers: Bacterial degradation, Mineral oil, Microbial degradation, North Alaska Slope, North Sea, Siberia.

Psychrophilic oil-oxidizing bacteria were demonstrated in 13 samples of oil-polluted water, soil, and tundra muck collected from the North Alaska Slope. Within a week or two there was visual evidence that clear mineral oil was being degraded by bacteria at 8 and 4 C. Such activity became apparent after two to three weeks' incubation at -1.1C, the freezing point of the medium. From oxygen uptake data it was calculated that bacteria oxidized mineral oil at rates ranging from 0.13 to 0.9 mg/liter/day at -1.1 C. Assuming an average generation time of 24 hours, it is calculated that a bacterial population of 1,000,000,000 reproducing cells per ml of mineral oil medium would consume oil for building biomass at a rate of 1.2 mg/liter/day at -1.1 C. Nine different crude oils were found to be slowly attacked by bacteria growing at -1.1 C. (See also W74-08609) (Sinha-OEIS)
W74-08625

BACTERIAL DEGRADATION OF PETROLEUM MATERIALS IN LOW TEMPERATURE MARINE ENVIRONMENTS,
Rhode Island Univ., Kingston. Dept. of Plant Pathology-Entomology.
R. W. Traxler.
Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication No LSU-SG-73-01, p 163-170, 1973. 3 fig, 3 tab, 4 ref.

Descriptors: *Oil pollution, *Oil spills, *Biodegradation, *Microbial degradation, Environmental effects, *Pollution abatement, Water quality control, Water pollution control, Sediments, Microbiology, *Rhode Island, Bacteria.
Identifiers: Obligate marine psychrophiles, *Chedabucto Bay(R.I.), *Narragansett Bay(R.I.), Oil degradation, Psychrophilic temperature range, Aliphatic hydrocarbons, Cyclic hydrocarbons, Aromatic hydrocarbons.

It was found that sediments were a better source of organisms than water column samples. Not only were bacteria present in larger numbers in the sediments but a wider spectrum of genera were obtained from sediment samples. This seems particularly true for Chedabucto Bay which has a faster flushing rate than Narragansett Bay. To day, 49 hydrocarbon-utilizing bacteria were isolated from Chedabucto Bay and 72 organisms from Narragnasett Bay. The capacity of all of these isolates to grow on hydrocarbons was confirmed by development on No 1 Fuel Oil prior to screening studies. The Chedabucto Bay samples were obtained from a 16 to 17 C environment, whereas the Narragansett Bay samples were taken at temperatures of 2.5 to 5 C. (See also W74-08609) (Sinha-OEIS)
W74-08626

HYDROCARBON BIODEGRADATION IN ALASKAN WATERS,
Alaska Univ., College Inst of Marine Sciences
B Robertson, S Arhelger, P J Kinney, and D K Button
Proceedings of a Workshop held at Georgia State University, December 4-6, 1972 Published by Louisiana State University, Sea Grant Publication No LSU-SG-73-01, p 171-184, 1973. 4 fig, 5 tab, 14 ref.

Descriptors *Oil pollution, *Oil spills, *Biodegradation, *Microbial degradation, *Estuaries, Sea water, Salinity, Bacteria, Yeast, Microorganisms, Algae, Mixing, Silts, *Alaska
Identifiers Cook Inlet(Alas), Port Valdez(Alas), Marine microorganisms, Crude oils, Oil slicks, Inoculation, Chemotaxis, Hydrocarbon oxidation, Microbial oxidation, Oil toxicity, Selenastrum capricornutum, Flushing, Solubilization, Incubation temperature, Inoculation frequency, Kerosene.

Populations of hydrocarbon-oxidizing organisms were of the order of 1/cc in Alaska's Cook Inlet and Port Valdez, less in the Artic Ocean. Distribution decreased with salinity in Cook Inlet and with depth in Port Valdez. In situ oxidation of 14-C-dodecane (91 microgram C/liter) started within hours and proceeded at a rate of 1 microgram/liter-day. Storage of Cook Inlet crude oil for four years in sea water at 10 C effected removal of most visible components. Mixing had a major effect on oil slick stability. The solubilization process was little affected by added silt, a major component of many Alaskan estuaries. Isolated organisms had unique preferences for various components of kerosene, emulsified crude oil and responded in a normal way to incubation temperature, E sub a 14.5 to 16 Kcal/mole. Some effects of crude oil inhibition are discussed. Calculations show that motility, particularly in combination with chemotaxis, is necessary for rapid slick inoculation. In this communication we report observations on the distribution of hydrocarbon-oxidizing organisms, some characteristics of several organisms isolated, rates of hydrocarbons oxidation observed and some estimates of inoculation frequency. (See also W74-08609) (Sinha-OEIS)
W74-08627

MICROBIAL ECOLOGY AND THE PROBLEM OF PETROLEUM DEGRADATION IN CHESAPEAKE BAY,
Maryland Univ., College Park. Dept. of Microbiology.
R. R. Colwell, J. D. Walker, and J. D. Nelson, Jr.
Proceedings of a Workshop held at Georgia State University, December 4-6, 1973. Published by Louisiana State University, Sea Grant Publication No LSU-SG-73-01, p 185-197, 1973. 3 fig, 6 tab, 36 ref.

Descriptors: *Estuaries, *Bacteria, *Oil pollution, *Microbial degradation, *Pollution abatement, *Chesapeake Bay, Inlets(Waterways), Bays, Microorganisms, Ecology, Sediments, Fungi, Actinomycetes, Microbiology, *Maryland.
Identifiers: Microbial ecology, Petroleum degradation, Species distribution, Seasonal variations, Baltimore Harbor, Eastern Bay, Substrates, Cladosporium resinae, Microbial flora, Microflora, Deuteromycetes.

Information obtained on the ecology of mercury-metabolizing bacteria in Chesapeake Bay has provided interesting comparisons with the petroleum-degrading microbial populations. Petroleum degradation studies are being done to obtain a seasonal incidence, as well as species distribution of petroleum-degrading microorganisms. It was found that the concentration of petroleum in an oil polluted site in Baltimore Harbor was ca five times greater than in Eastern Bay. The numbers of petroleum-degrading microorganisms, measured by direct and replica plating, in the water and sediment samples were related to the concentration of

il in each sample. Total yields of petroleum-egrading microorganisms grown on an oil sub-rate were greater for those organisms exposed to il in the natural environment. Microorganisms olated from water and sediment samples grew on ubstrates representative of the aliphatic, aromatic nd refractory hydrocarbons. From analysis of pecies distributions, it was observed that a ydrocarbon-utilizing fungus, Cladosporium sinae, and actinomycetes were predominant mong the hydrocarbon-utilizing isolates. Microbi- degradation of petroleum in Chesapeake Bay ppears to be mediated by the autochthonous icrobial flora. (See also W74-08609) (Sinha-EIS)
/74-08628

LKANE DEGRADATION IN BEACH SANDS,
lorida State Univ., Tallahassee. Dept. of ceanography.
. E. Ahlfeld, and P. A. LaRock.
roceedings of a Workshop held at Georgia State niversity, December 4-6, 1972. Published by ouisiana State University, Sea Grant Publication o LSU-SG-73-01, p 199-203, 1973. 2 tab, 6 ref.

escriptors: *Oil pollution, *Seepage, *Beaches, Microbial degradation, *Pollution abatement, vaporation, Bacteria, *California.
dentifiers: Beach sands, Oil seeps, Coal Oil oint(Calif.), Alkane, Bacterial degradation, Au-oxidation, Seeding experiments, Crude oil, Tar.

n estimation of the rate of n-alkane degradation as made in beach sands from Coal Oil Point, alifornia. Bulk sand samples from a beach hronically polluted with oil from natural seeps ere extracted and analyzed gas chromatographi-ally and gravimetrically for hydrocarbon content. alculations indicate that a maximum degradation f 0.32 g of n-alkane occurs per day for 100 sq m of each. The oil input on the day of sampling was stimated to be 5 g/100 sq m/day. From these gures it is seen that the daily maximum oxida-on, including bacterial degradation, evaporation nd autoxidation accounts for only 6% removal of he alkane content of the sand. (See also W74-8609) (Sinha-OEIS)
V74-08629

IYDROCARBONS OF SUSPECTED POLLU-'ANT ORIGIN IN AQUATIC ORGANISMS OF 'AN FRANCISCO BAY: METHODS AND 'RELIMINARY RESULTS,
Calif ornia Univ., Berkeley. Naval Biomedical Research Lab.
. H. DiSalvo, H. E. Guard, L. Hunter, and A. B. Cobet.
Proceedings of a Workshop held at Georgia State Jniversity, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication No LSU-SG-73-01, p 205-220, 1973. 9 fig, 2 tab, 20 ef.

Descriptors: *Organic compounds, Estuaries, Pol-utants, Food chains, Aquatic animals, Ecosystems, Embayments, Deltas, Invertebrates, Sharks, *Oil pollution, Bioindicators, *California, Bays.
dentifiers: *San Francisco Bay(Calif), Hydrocarbon pollution.

Large amounts of petroleum-derived hydrocar-ons enter the waters of San Fransisco Bay each ear, yet little is known concerning the fate and ef-ects of pollutant hydrocarbons on estuarine or-ganisms and, indirectly, on the human environ-nent of the Bay area. Investigation into fate and effects of petroleum-derived hydrocarbons was in-tiated by analyzing the hydrocarbon content of elected Bay animals to determine if this served as n indicator of chronic hydrocarbon pollution in Bay food chains. Initial results have been obtained sing solvent extracts of sponge, mussel, and crab issues. Closely related animals were obtained rom relatively clean waters along the northern California coast to provide 'unpolluted' control extracts for comparison. To date, it has been shown that Bay organisms have a significantly higher content of hydrocarbons than the clean water organisms. Methods tested included gas chromatography (GC), thin layer chromatography (TLC), fluorescence spectrometry, and high pressure liquid chromatography (HPLC). Comparative results between the different methods suggest thin layer chromatography to be the method of choice. (See also W74-08609) (Sinha-OEIS)
W74-08630

THE IMPACT OF OIL ON MARSHLAND MICROBIAL ECOSYSTEMS,
Louisana State Univ., Baton Rouge. Dept. of Food Science.
For primary bibliographic entry see Field 5C.
W74-08631

PRODUCTION AND CHARACTERIZATION OF EMULSIFYING FACTORS FROM HYDROCARBONOCLASTIC YEAST AND BACTERIA,
Oklahoma State Univ., Stillwater. Dept. of Biochemistry.
P. E. Guire, J. D. Friede, and R. K. Gholson.
Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication No. LSU-SG-73-01, p 229-231, 1973. 1 fig, 1 tab. ONR N00014-71-A-0004-0001.

Descriptors: *Oil spills, *Oil pollution, *Bacteria, *Yeast, *Pollution abatement, Water pollution control, Water quality control, Microorganisms.
Identifiers: *Hydrocarbonoclastic microorganisms, Oil degradation, Mineralization, Candida petrophilum, Ascomycetes, Schizomycetes, Pseudomonas aeruginosa, Emulsification.

The chemical conversion of oil polutants to carbon dioxide (mineralization) and water-soluble, non-toxic organic oxidation products is an esthetically pleasing decontamination process which is being performed continuously by microorganisms in natural environments chronically polluted with oil. We are therefore interested in gaining an appreciably greater level of control over the location, rate, and perhaps end products of this biological wet combustion process. A common characteristic of the growth of hydrocarbonoclastic microorganisms in liquid media containing hydrocarbons is the production of hydrocarbon-water emulsion early in the growth phase. Because of the potential value of biodegradable, non-toxic emulsifying factors for accelerating the growth and metabolic processes of microorganisms on oil pollutants, we have examined the production and some pertient characteristics of emulsifying factors from a yeast (Candida petrophilum, ATCC 20226) and a bacterium (Pseudomonas aeruginosa, NCIB 9904) grown on hexadecane. (See also W74-08609) (Sinha-OEIS)
W74-08632

THE RELATIVE CHANGES IN N-ALKANE COMPOSITION IN SURFACE WATER SLICKS,
Florida State Univ., Tallahassee. Dept. of Oceanography.
P. A. LaRock, and T. E. Ahlfeld.

Descriptors: *Biodegradation, *Microbial degradation, *Oil spills, *Oil pollution, Pollution abatement, Water pollution control, Water quality control, *Louisiana, Bacteria, Evaporation, Dispersion.
Identifiers: *Oil slicks, *Alkanes, Hydrocarbon oxidation, Marine environment, *Barataria Bay(La).

Preliminary findings are reported here on the changes of n-alkane composition in surface slicks in Barataria Bay, Louisiana. At the locations studied, the net movement of water is to the south away from the gas wells in the north, and through Barataria Pass. By sampling away from the producing areas and toward the Pass, qualitative changes in the n-alkanes in surface slicks was followed. The general trend at stations 3, 4, and 6 shows alkanes with a chain length between C-17 and C-20 to be relatively unchanged, whereas C-14, C-16 and C-21 to C-32 show net decreases moving toward the south. This decrease amounted to 50 to 80% for alkanes over C-21. If dispersion were the principal factor in reducing the hydrocarbon density, little change in the alkane composition would be expected. Evaporation would affect the lower molecular weight material, and thus the changes in concentration of the long chain alkanes must presumably be the result of bacterial degradation. (See also W74-08609) (Sinha-OEIS)
W74-08633

ESTUARINE MICROBES AND ORGANOCHLORINE PESTICIDES (A BRIEF REVIEW),
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Environmental Research Lab.
A. W. Bourquin.
Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication No LSU-SG-73-01, p 237-243, 1973. 1 tab, 35 ref. Gulf Breeze Contrib 165.

Descriptors: *Reviews, *Estuaries, *Microbial degradation, Pesticides, Estuarine environment, Ecosystems, *Chlorinated hydrocarbon pesticides, Pollution abatement, Water pollution control, Water quality control, Microorganisms, Metabolism, Bacteria, Yeast, Fungi.
Identifiers: *Pesticide degradation, Organochlorine pesticides, Synergism, Microbial synergism.

Following a review of the literature, the author points out that pathways of microbial attack upon chlorinated hydrocarbons in the estuarine environment need to be investigated since breakdown by microorganisms is probably the main natural process of pesticide degradation. Although microbiological processes might reduce environmental pollution attributed to use of persistent pesticides, detailed studies of degradative pathways are required to assess the degree of hazard caused by breakdown products. (See also W74-08609) (Sinha-OEIS)
W74-08634

MEASUREMENT OF BASELINE LEVELS OF ENTERIC BACTERIAL ACTIVITY IN RIVER WATER,
Georgia Univ., Athens. Dept. of Microbiology.
C. W. Hendricks.
Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication No LSU-SG-73-01, p 245-258, 1973. 2 fig, 6 tab, 30 ref. EPA Project 16050 EQS.

Descriptors: Enteric bacteria, Rivers, Freshwater, *Bottom sediments, *Oil pollution, Water pollution control, Water quality control, *Pollution abatement, Nutrients, River beds, Dispersion, Oil spills, *Georgia.
Identifiers: Pathogens, Substrates, *Oconee River (Geo), Escherichia coli, Enterobacter aerogenes, Proteus rettgeri, Schizomycetes.

This investigation indicates that natural populations and selected laboratory strains of enteric bacteria, including pathogens, have the capacity to metabolize substrates present in the Oconee River, including autoclaved river water. These organisms, however, lacked the ability to increase in numbers in continuous culture with river water and suspended detritus recovered above a secondary sewage treatment facility, but demonstrated positive growth rates with substrates recovered below the plant. Data also showed that the sands and clays forming the stream bottom had the

capacity to sorb substrates from the overlayering water, and that sediment eluates stimullated the respiration rate of bacteria. This suggests that the stream bottom can provide a suitable environment for the growth of bacteria and perhaps controls basal nutrient concentration in the water itself. (See also W74-08609) (Sinha-OEIS)
W74-08635

SUBLETHAL EFFECTS OF THE WATER SOLUBLE COMPONENT OF OIL: CHEMICAL COMMUNICATION IN THE MARINE ENVIRONMENT,
Oregon State Univ., Corvallis. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W74-08636

SOME ACUTE EFFECTS OF LOW-BOILING PETROLEUM FRACTIONS ON THE CELLULAR STRUCTURE OF FISH GILLS UNDER FIELD CONDITIONS,
Texas Wesleyan Coll., Fort Worth. Div. of Science.
For primary bibliographic entry see Field 5C.
W74-08637

INHIBITION OF BACTERIAL CHEMORECEPTION BY HYDROCARBONS,
Harvard Univ., Cambridge, Mass. Lab. of Applied Microbiology.
For primary bibliographic entry see Field 5C.
W74-08638

DEGRADATION OF CRUDE OIL BY YEASTS AND ITS EFFECTS ON LESBISTES RETICULATUS,
Georgia State Univ., Atlanta. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W74-08639

EFFECTS OF SOME COMMERCIAL OIL HERDERS, DISPERSANTS AND BACTERIAL INOCULA ON BIODEGRADATION OF OIL IN SEAWATER,
Rutgers-The State Univ., New Brunswick, N.J. Dept. of Biochemistry and Microbiology.
For primary bibliographic entry see Field 5C.
W74-08640

BACTERIAL SEEDING TO ENHANCE BIODEGRADATION OF OIL SLICKS,
Texas Univ., Port Aransas. Marine Science Inst.
R. Miget.
Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication LSU-SG-73-01, p 291-309, 1973. 1 fig, 8 tab, 30 ref, 1 append.

Descriptors: *Oil spills, *Oil pollution, *Biodegradation, *Microbial degradation, Nutrients, Biochemical oxygen demand, Metabolism, *Water pollution control, Pollution abatement.
Identifiers: Seeding oil spills, Oil slicks, Bacterial seeding, Microbial seeding, Crude oils, Organic carbon, Microbial oxidation.

Evaluations have been made to determine the feasibility of adding selected hydrocarbon-oxidizing bacteria and required nutrient salts to an oil slick to enhance biodegradation of the polluting hydrocarbon. Fifty active mixed cultures were isolated. Culture characteristics including cell morphology, temperature tolerance, and resistance to chemical dispersants were determined. Biodegradation of adsorbed vs. nonadsorbed oil was compared, and media for mass cultivation of organisms was developed. Simulated field, or tank, experiments showed the effectiveness of microbial seeding varied more with the type and quantity of crude oil used than with such factors as inoculum density or nutrient salt concentration Initial 24-hr oil losses were generally twice as large in bacterial seeded tanks relative to uninoculated controls. Biological Oxygen Demand and Total Organic Carbon analyses of tank water indicated little metabolic product pollution of the water. (See also W74-08609) (OEIS)
W74-08641

VERTICAL DISTRIBUTION OF FALLOUT CESIUM-137 IN CULTIVATED SOILS,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
J. C. Ritchie, and J. R. McHenry.
Available from Supt. of Documents, Washington, D.C., $1.20 per copy. Radiation Data and Reports, Vol. 14, No. 12, p 727-728, December 1973. 1 tab, 10 ref.

Descriptors: *Fallout, *Cesium, *Distribution, *Vertical migration, *Soil contamination, Water pollution, Watershed management, Cultivation.

Fallout cesium-137 was found to be evenly distributed in the upper 15-20 cm of cultivated soils of five watersheds in the mid-United States. This distribution pattern is markedly different from the vertical distribution of cesium-137 in noncultivated soils. (Houser-ORNL)
W74-08644

RADIOLOGICAL SURVEY OF NEW LONDON HARBOR, THAMES RIVER, CONN., AND ENVIRONS,
Office of Radiation Programs, Washington, D.C.
S. T. Windham, and C. R. Phillips.
Available from Supt. of Doc., U.S. Gov. Print. Off., Wash., D.C. $1.00 per copy. Radiation Data and Reports, Vol. 14, No. 11, p 659-666, Nov. 1973. 8 fig, 7 tab, 2 ref.

Descriptors: *Surveys, *Harbors, *Ports, *Rivers, *Environment, *Radioactivity measurement, Assay, Water pollution, Water pollution sources, Nuclear powerplants, Ships, Connecticut, Population, Public health, Safety, Evaluation, Path of pollutants, Cobalt radioisotopes.
Identifiers: *New London Harbor, *Thames River.

In July 1972, the Eastern Environmental Radiation Facility, in cooperation with the U.S. Naval Ship Systems Command, conducted a radiological survey of the New London Harbor, Thames River and environs to determine if nuclear ship activity in that area has contributed radioactivity which could result in detectable radiation exposure to the public. Comparison with a similar survey conducted in 1966 shows that cobalt-60 activity levels in sediment have decreased by an average factor of 33 due to a reduction in the amount of radioactivity discharged, radioactive decay and natural sedimentation. Analysis of samples indicative of direct pathways for human exposure lead to the conclusion that no significant radiation exposure to the public has resulted from nuclear ship operations in this area. It is concluded that the environmental surveillance routinely conducted by the Navy should be adequate to assure protection of the public from the routine nuclear ship operations. (Houser-ORNL)
W74-08645

ENVIRONMENTAL RADIOACTIVITY IN ILLINOIS, 1970,
Office of Radiation Programs, Washington, D.C. Field Operations Div.
M. J. Shmuklarsky.
Report available from Supt. of Documents, U.S. Govt. Printing Office, Wash. D.C. 20402. $0.50 per copy. Radiation Data and Reports, Vol 13, No 11, p 589-618, Nov 1972. 3 fig, 30 tab, 46 ref.

Descriptors: *Nuclear powerplants, *Illinois, *Effluents, *Air pollution, *Water pollution, *Water pollution sources, Soil contamination, Fallout, Monitoring, Measurement, Data collections, Assay, Surveys, Background radiation, Radioactivity effects, Public health
Identifiers: Surveillance program

The contribution of radioactivity to the Illinois environment during 1970 resulting from the operation of nuclear power plants and from other major natural and manmade sources is presented. The environmental surveillance programs of the Dresden, Quad-Cities and Zion nuclear power stations are described. Dresden Unit 1 radioactive gaseous and liquid releases for the past 11 years, and Dresden Unit 2 discharges for 1970 are summarized. On the basis of data gathered during 1970, it is concluded that the effect of nuclear power plant operations on the radioactivity level of most environmental media was hardly distinguishable from the natural and fallout radioactivity. The only measured environmental radiation effect of nuclear power generation within the State was an apparent increase of a few millirem per year in the external background exposure in the vicinity of Dresden-1. Planned power facilities in Illinois are listed. (Houser-ORNL)
W74-08646

STATE ENVIRONMENTAL RADIOACTIVITY SURVEILLANCE PROGRAMS, 1972,
Office of Radiation Programs, Washington, D.C.
M. A. Culliton.
Available from Supt. of Documents, U.S. Govt. Printing Office, Washington, D.C., $0.50 per copy. Radiation Data and Reports, Vol 14, No 3, p 145-173, March 1973. 1 tab.

Descriptors: *Radioactivity, *Survey, *State government, *Regulation, *Public health, Monitoring, Assay, Data collections, Air pollution, Water pollution, Water pollution sources, Soil contamination, Sampling, Analytical techniques, Radioisotopes, Fallout, Food chains.
Identifiers: *Surveillance program.

A summary is presented of state environmental radioactivity surveillance programs for 1972. Information is given in table form on sample media, sites, collection and analysis frequency, and types of analysis performed. Data from this program made available to the Office of Radiation Programs, Environmental Protection Agency will be included in the National Environmental Radiation Data System now being designed and developed. This system will serve as a central source of environmental radiation data. (Houser-ORNL)
W74-08647

SUMMARY OF ENVIRONMENTAL MONITORING AT PHILADELPHIA, 1958-1971,
Philadelphia Public Health Dept., Pa. Div. of Occupational and Radiological Health.
J. E. Lieberman, R. D. Ice, M. Green, and R. McGrattan.
Available from U.S. Supt. of Documents, Washington, D.C., $1.00 per copy. Radiation Data and Reports, Vol 14, No 6, p 333-350, June 1973. 2 fig, 4 tab, 9 ref.

Descriptors: *Monitoring, *Assay, *Radioactivity, *Fallout, *Pennsylvania, Data collections, Environment, Measurement, Evaluation, Toxicity, Public health, Regulation, Governments, Analytical techniques, Ships, Water pollution, Water pollution sources, Submarines, Military aspects, Nuclear powerplants, Nuclear explosions.
Identifiers: *Philadelphia, *Delaware Valley.

The City of Philadelphia maintains an environmental radiation surveillance program for evaluating the environment of the Delaware Valley. The program has evolved from the initial goals of setting operational guides for the collection and analyses of data at sites of nuclear ship operations, through preoperational radiological data collection associated with the construction of the N.S. Savan-

through a nuclear weapons fallout evaluation, ie present objective of providing environmen- surveillance of nuclear facilities. A 13-year pilation of environmental data from the City is ented. Included are gross alpha and gross beta lts of raw and finished surface waters, gross results of air samples, and strontium-90 and ie-131 quantities in pasteurized milk. (Houser- NL)
-08648

TIUM BURDENS IN TWO ARCTIC VIL- ES,
onal Environmental Research Center, Las as, Nev.
Eckert, and R. B. Evans.
nal available from Supt. of Documents, U.S. t. Printing Office, Washington, D.C., $1.00 per . Radiation Data and Reports, Vol 14, No 5, p 275, May 1973. 3 fig, 2 tab, 6 ref.

criptors: *Environment, *Monitoring, dioactivity, *Cesium, *Tritium, *Alaska, Arc- Domestic water, Public health, Water pollu- , Urine, Analytical techniques, Data collec- s.
tifiers: Body burden.

ng a routine visit to measure cesium-137 body lens in residents of two Alaskan villages, king water and urine samples were collected analyzed for tritium. The mean concentrations foatak, Alaska, were 1200 pCi/liter and 1500 liter for tritium in drinking water and urine, ectively. At Kiana, the mean tritium concen- on in drinking water was less than 400 liter, and the mean tritium concentration in e was 1000 pCi/liter. (Houser-ORNL)
-08649

TIUM SURVEILLANCE SYSTEM, OC- BER-DECEMBER 1972.
ce of Radiation Programs, Las Vegas, Nev.
iation Data and Reports, Vol 14, No 5, p 294- May 1973. 4 p, 2 fig, 3 tab, 6 ref.

criptors: *Pollutant identification, Pollutants, er pollution, *Water pollution sources, Water ity, Domestic water, *Potable water, tium, *United States.

Tritium Surveillance System is an expansion revious tritium surveillance activities initiated he Public Health Service and transferred in) to the Office of Radiation Programs of the ironmental Protection Agency. Most of the ac- y in the past involved levels in surface water. present network includes drinking water and cipitation sampling as well. This article in- les the locations of the samplings, tables of including locations, collection dates, and con- trations. (Wadley-Florida)
-08650

TER SURVEILLANCE PROGRAMS, VEMBER 1972.
ional Environmental Research Center, Las as, Nev.
iation Data and Reports, Vol 14, No 5, p 290- May 1973. 4 p, 2 fig, 1 tab.

criptors: *Pollutant identification, *Water pol- on sources, Surface waters, Potable water, vada.
ntifiers: *Water surveillance network, ionuclide concentrations.

Water Surveillance Network is operated by National Environmental Research Center-Las as and consists of 90 sampling locations situ- d in the area surrounding the Nevada test site is operated in support of the nuclear testing grams sponsored by the U.S. Atomic Energy nmission and the Space Nuclear Systems, Of- of the National Aeronautical and Space Administration. The sampling is conducted to determine radionuclide concentrations and to take protective action if required. For surface water samples, the analyses include strontium-89, strontium-90, plutonium-238, plutonium-239, uranium, and radium-226. For drinking water, the analyses include strontium-89, strontium-90, uranium, and radium-226. The results of all tests are listed. No gamma-emitting fission products were identified in any of the samples. (Wadley-Florida)
W74-08651

WATER SURVEILLANCE PROGRAMS, FEBRUARY 1973 AND 1972, SPECIAL ANALYSES.
National Environmental Research Center, Las Vegas, Nev.
Radiation Data and Reports, Vol 14, No 8, p 482-490, August 1973. 9 p, 2 map, 2 tab.

Descriptors: Water resources, *Surface water, *Radiochemical analysis, *Radioactivity, *Fallout, Water supply, Technology, Chemical properties, Nuclear powerplants, Test procedures, Radioisotopes, Analytical techniques, Gamma-rays, Laboratory tests, *Nevada.

The Water Surveillance Network is operated by the National Environmental Research Center-Las Vegas, in support of the nuclear testing programs sponsored by the Atomic Energy Commission (AEC) at the Nevada Test Site (NTS). In the event of a release of radioactivity, special sampling within the affected areas is conducted to determine radionuclide concentrations. Selected samples from each of 61 sampling locations are given special analyses at least once a year for the purpose of identifying the source of the gross radioactivity in all network samples and comparing them with both the AEC concentration guides and the PHS Drinking Water Standards. These special analyses include strontium-89 and -90, plutonium-238 and -239, uranium and radium-226. Analytical results of all water samples collected during 1972 are set forth. (Sutton-Florida)
W74-08652

RADIOACTIVITY IN WASHINGTON SURFACE WATER JULY 1970-JUNE 1971.
Washington State Dept. of Social and Health Services, Olympia.
Radiation Data and Reports, Vol 14, No 8, p 494-497, August 1973. 4 p, 5 fig, 3 tab, 1 map, 4 ref.

Descriptors: *Water supply, *Radiochemical analysis, *Water sources, *Radioactivity, *Surface water, *Washington, Technology, Air pollution effects, Fallout, Water resources, Gamma rays, Radioisotopes, Laboratory tests, Test procedures, Analytical techniques.

Testing surface water samples to determine radioactive content is a prime function of the Washington State Department of Ecology as part of a continuing radiation surveillance program. Samples are collected at different intervals from various rivers in the State in 2-liter polyethylene bottles by grab sampling and are mailed to the State radiation laboratory and special analyses are performed by the National Environmental Research Center in Las Vegas. The article describes the analytical procedures used in detecting gamma-ray emitters and samples from the Columbia River are also analyzed for phosphorus-32, a pure-beta particle emitter not detectable in the gamma-ray scan. Each method is detailed, outlining the materials used and the holding periods after collection. Monthly averages of monitoring data are plotted and reasons are set forth concerning the dropping of radioactivity concentrations in the Columbia River. The various tables, figures, and maps made understanding of the study relatively simple. (Sutton-Florida)
W74-08653

RADIOACTIVITY IN NEW YORK STATE SURFACE WATER, JULY-DECEMBER 1971.
New York State Dept. of Environmental Conservation, Albany. Bureau of Radiological Pollution Control.
Radiation Data and Reports, Vol 14, No 8, p 491-493, August 1973. 3 p, 1 map, 3 tab, 2 ref.

Descriptors: *Public health, *Radiochemical analysis, *Water supply, *Surface water, *Water resources, *New York, Radioactivity, Fallout, Nuclear powerplants, Water sources, Laboratory tests, Analytical techniques, Gamma rays, Technology, Chemical properties, Water quality, Nuclear wastes.

In 1955, the New York State Department of Health began a program to determine the amount of radioactivity in water used for public consumption. The analytical procedures employed by the State Radiological Sciences Laboratory are described in a simple, fairly untechnical manner, although many chemical names are used. A gross beta determination is the first method, followed by other tests for various compounds including strontium, alkaline, and iron earths. Tritium in water is determined by liquid scintillation counting and minimum sensitivities are 1,000 pCi/liter for the Tri-Carb and 500 pCi/liter for the Beckman. Discussion is then presented on the frequency of sampling and the results are shown in the various tables and figures, which can prove very informative. (Sutton-Florida)
W74-08654

WATER SURVEILLANCE PROGRAMS, APRIL-MAY 1973.
National Environmental Research Center, Las Vegas, Nev.
Radiation Data and Reports, Vol 14, No 9, p 605-609, October 1973. 5 p, 2 map, 2 tab.

Descriptors: *Radiochemical analysis, *Water supply, *Surface water, *Water resources, *Radioactivity, *Nevada, Technology, Gamma-rays, Chemical properties, Fallout, Laboratory tests, Analytical techniques, Nuclear powerplants, Radioisotopes, Test procedures.

Consisting of 61 sampling locations, the Water Surveillance Network, in the off-site area surrounding the Nevada Test Site(NTS) is operated in support of the nuclear testing programs conducted by the Atomic Energy Commission (AEC). In the event of a release from the NTS, specific sampling within the affected area is conducted to determine radionuclide concentrations. Other sampling stations are set up when requested in other areas. For a complete description of sampling and routine analytical procedures used, a cross-reference is given to the July 1973 issue of Radiation Data and Reports. The routine analytical results of all water samples collected between April and May 1973 are listed in two tables and it should be noted that no gamma-emitting fission products were identified by gamma spectrometry in any of the April and May samples. The calendar year analytical results will be fully reported at a later date. (Sutton-Florida)
W74-08655

TRITIUM SURVEILLANCE SYSTEM, APRIL-JUNE 1973.
National Environmental Research Center, Las Vegas, Nev.
Radiation Data and Reports, Vol 14, No 10, p 601-604, October 1973. 4 p, 2 map, 3 tab.

Descriptors: *United States, *Tritium, *On-site data collections, *Rivers, *Nuclear wastes, Nuclear power plants, Water pollution sources, Water quality control, Data collections, Data processing, Instrumentation, Maps, Statistics, Water law, Water policy, Water pollution, Networks, Regional analysis.

The Tritium Surveillance System network was established to measure and monitor tritium concentrations in major river systems in the United States. It also provides surveillance at surface water stations downstream from selected nuclear facilities. Other sampling services were established but all have since been incorporated into one overall system. Drinking water and precipitation samples have been collected and analyzed. Maps are included citing the sampling locations chosen by the system. From these locations, samples were taken and analyzed. Tables have been compiled to present tritium concentrations in drinking water, in surface water samples, and in precipitation samples for a specific period of time. (Procter-Florida)
W74-08656

SALT-WATER INTRUSION AND ITS CONTROL,
California Univ., Berkeley. Dept. of Civil Engineering.
D. K. Todd.
Journal of the American Water Works Association, Vol 66, No 3, p 180-187, March 1974. 16 fig, 13 ref.

Descriptors: *Saline water intrusion, *Water pollution control, Saline water barriers, Artificial recharge, Water spreading, Withdrawal, Injection wells.

Saltwater intrusion is a natural and troublesome phenomenon that renders groundwater unpotable. It must therefore be controlled or eliminated where possible. Various means of preventing saltwater from contaminating groundwater sources of drinking water are discussed. The states of California, Texas, Florida, New York(Long Island), and Hawaii have been affected to the largest extent. At least six methods have been proposed to control intrusion: Controlling pumping patterns--requires that the pumping draft be altered sufficiently by reduction in extractions or by rearrangement of areal pattern of pumping so that groundwater levels will rise. Direct artificial surface recharge--requires that groundwater levels be raised and maintained by artificial recharge, using surface spreading for unconfined aquifers and recharge wells for confined aquifers. Maintenance of a freshwater ridge--requires maintenance of a freshwater ridge in the aquifer along the coast by surface spreading for unconfined aquifers or by recharge wells for confined aquifers. Development of an extraction barrier--requires maintaining a continuous pumping trough by a line of wells adjacent to the ocean. Seawater would move inland from the ocean to the trough, and freshwater in the basin would move seaward toward the trough. A combination injection ridge and pumping trough can be formed. Both extraction and recharge rates would be somewhat reduced over those required using only a single method; however, the number of wells required would be basically doubled. Impermeable subsurface barriers--involve establishment of a subsurface barrier to reduce the permeability of the aquifer sufficiently to prevent the inflow of seawater into the basin. Construction of a barrier could be achieved using sheet piling, puddled clay, emulsified asphalt, cement grout, bentonite, silica gel, calcium acrylate, or plastics. (Knapp-USGS)
W74-08662

AIR-BORNE ACID,
Swedish Water and Air Pollution Research Lab., Goteborg.
For primary bibliographic entry see Field 5A.
W74-08689

RESIDENCE TIME OF SULFUROUS AIR POLLUTANTS FROM A LOCAL SOURCE DURING PRECIPITATION,
Uppsala Univ. (Sweden). Dept. of Meteorology.
For primary bibliographic entry see Field 5A.
W74-08690

DETERMINATION OF THE ACTIVITY OF NITRIFYING BACTERIA IN SURFACE WATERS BY A MODIFIED BOD-TEST, (IN GERMAN),
Hamburgisches Hygienisches Institut (West Germany).
K. Roch, and A. Kaffka.
Zentralbl Bakteriol Parasitenkd Infektionskr Hyg Erste Abt Orig Reihe B Hyg Praev Med. Vol 156, No 4/5, p 414-421, 1972. Illus. English summary.
Identifiers: Bacteria, Biological studies, Estuary, *Nitrifying bacteria, Oxygen, Rivers, Seasonal, *West Germany(Elbe River), *Biochemical oxygen demand test.

A modified method of the BOD (biochemical O2 demand) test was applied in order to find out the seasonal alterations of Nitrifying bacteria in surface waters. In studies of the Elbe River (W. Germany), the samples collected at Teufelsbrueck (km 630.1) were diluted 1:10 with aerated tap water and mixed with 5.2 mg/l NH4 plus or minus nitrogen (0.37 x 10 minus 3 M/1). As the result of this admixture a seasonal increase of BOD was found. This increase was caused by the activity and number of the NH4 plus or minus oxidizing bacteria and depended on temperature. The low NH4 plus or minus content functioning in summer as a limiting factor does not allow a higher influence of nitrification on the BOD and O2 balance in the receiving water. With regard to water hygiene the nitrifying flora can affect the O2 balance significantly, particularly in rivers of long retention time or in estuaries loaded by nitrogenous waste waters during the summer time or if the river water is artificially heated by cooling water discharge.--Copyright 1973, Biological Abstracts, Inc.
W74-08694

THE SHARE TAKEN BY NITRIFICATION PROCESSES IN THE BIOCHEMICAL OXYGEN DEMAND (BOD) IN THE WATER OF THE RIVER ELBE, (IN GERMAN),
Hamburgisches Hygienisches Institut (West Germany).
For primary bibliographic entry see Field 5A.
W74-08695

NATURAL NIDI OF CUTANEOUS LEISHMANIASIS IN THE ZONE OF THE KARA KUM CANAL (4TH STAGE) AND THEIR EPIDEMIC SIGNIFICANCE, (IN RUSSIAN),
Akademiya Nauk Turkmenskoi SSR, Ashkhabad. Institut Zoologii i Parazitologii.
T. N. Remy Annikova.
Zdravookhr Turkm. Vol 15, No 11, p 30-33, 1971.
Identifiers: Canals, *Cutaneous leishmania, Epidemic studies, Human diseases, Phlebotomus-Spp, *USSR(Turkman).

The territory through which passes the route of the fourth stage of the Kara Kum canal and its Kizyl-Atrek branch (USSR) is dissimilar with respect to the character of the natural nidi of cutaneous leishmaniasis and presents a different hazard from the viewpoint of the possibility of epidemic outbreaks of the disease. The following species were discovered: Phlebotmus paptasi, Ph. caucasicus, Ph. andrejivi, Ph. mongolensis, Ph. sergenti, Ph. chininsis, Sergentomylia grecovi, S. arpaklensis and S. pawlowshyi.--Copyright 1973, Biological Abstracts, Inc.
W74-08696

CERTAIN PROBLEMS OF THE SANITARY STATE OF UPPER REACHES OF THE SARATOV WATER RESERVOIR, (IN RUSSIAN),
Kuybyshev Res. Hyg. Inst. (USSR).
S. N. Bukovskaya, and I. F. Sukhacheva.
Gig Sanit. Vol 36, No 11, p 106-107, 1971.
Identifiers: Reservoirs, *Sanitary conditions, *USSR(Saratov reservoir), Water pollution, Flow.

The problem of water pollution of the Saratov water reservoir is that there is a sharp difference in flow on workdays and holidays. Water flow on Sundays and holidays drops to 1000 m3/sec. Since the calculations of water pollution preventive methods were based on a minimal flow of 3000 m3/sec, guaranteed sanitary discharge from the factory biological purification station of V.I. Lenina is necessary.--Copyright 1973, Biological Abstract, Inc.
W74-08698

5C. Effects Of Pollution

APPLICATIONS OF GROWTH AND SORPTION ALGAL ASSAYS,
Wisconsin Univ., Madison.
G. P. Fitzgerald, and P. D. Uttormark.
Copy Available from GPO Sup Doc as EP1.23:660/3-73-023, $2.10; microfiche from NTIS as PB-232 446, $1.45. Environmental Protection Agency Ecological Research Series Report EPA-660/3-73-023, February 1974. 186 p, 64 fig, 43 tab, 48 ref. EPA Program Element 1BA031, R-801361.

Descriptors: *Analytical techniques, *Algae, *Aquatic plants, *Sorption, Phosphorus compounds, Rooted aquatic plants, Bioassay, Competition, Eutrophication, Muds, Anaerobic conditions, Nitrogen, Iron, Chemical analysis, Nutrients, Limiting factors, *Wisconsin.
Identifiers: *Madison lakes(Wis).

The availability and utilization of nutrients by algae and rooted aquatic plants was measured in laboratory studies using both sorption and algal growth assays. The tests were conducted to evaluate contributions of phosphorus to the Madison (Wisconsin) lakes from septic tanks, agricultural runoff, and urban drainage and to measure changes in the nutritional status of six lakes which were manipulated for water quality improvement by nutrient inactivation or hypolimnetic aeration. The assay techniques are described and results are compared with chemical determinations of plant nutrients. Comparative rates of phosphorus sorption by different types of aquatic plants were determined by three methods in order to understand how the plants compete for limited phosphorus sources. In situ and laboratory experiments indicated that naturally layered lake muds in three lakes release soluble phosphate-phosphorus when disturbed and will be competitively sorbed by both muds and plants in aerobic conditions. Studies with duckweed, Lemna minor, showed that it cannot utilize the phosphorus of aerobic lake muds but can absorb phosphorus from lake muds when its roots are able to penetrate presumably anaerobic areas. Comparisons have demonstrated that ground waters and some storm sewer discharges contain phosphorus compounds that are not available to algae. (Uttormark-Wisconsin)
W74-08154

PROCEEDINGS: FIRST WETLANDS CONFERENCE, JUNE 20, 1973,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 2L.
W74-08157

NEUROLOGICAL CHANGES IN CATS FOLLOWING LONG-TERM DIET OF MERCURY CONTAMINATED TUNA,
Wisconsin Univ., Madison, Dept. of Pathology.
L. W. Chang, S. Yamaguchi, and A. W. Dudley, Jr.
Acta Neuropathologica (Berlin), Vol 27, No 2, p 171-176, 1974. 4 fig, 30 ref.

Descriptors: *Mercury, *Toxicity, *Public health, *Animal pathology, *Tuna, Human diseases, Investigations, Reviews.
Identifiers: *Neurological disturbances(Cats), Fish contamination.

ittens of both sexes were fed daily with mercury ontaminated tuna containing about 0.5 ppm mer-ury. Neurological disturbances similar to those in linamata disease or in experimental mercury in-oxication were observed after 7-11 months. licroscopic examination revealed degenerations f the granular layer and some Purkinje neurons in he cerebellum. Neuronal necrosis was also ob-erved in the cerebral cortex. This investigation uggests that fish containing 0.5 ppm mercury may ill be potentially hazardous to health when con-umed in excessive amounts for prolonged periods f time. (Sandoski-FIRL)
W74-08200

BIOASSAY OF TOXICITY USING ROTOZOA IN THE STUDY OF AQUATIC EN-IRONMENT POLLUTION AND ITS PREVEN-ION,
nstitutul de Medicina si Farmacia, Iasi (Rumania).
atedra de Igiena.
or primary bibliographic entry see Field 5A.
W74-08221

HE SURPRISE FACTOR IN MARINE POLLU-ION STUDIES,
cripps Institution of Oceanography, La Jolla, alif.
or primary bibliographic entry see Field 5B.
W74-08252

NVIRONMENTAL EFFECT OF A COMPLEX UCLEAR FACILITY,
)uPont de Nemours (E.I.) and Co., Aiken, S.C.
or primary bibliographic entry see Field 5D.
W74-08254

ALINITY-OZONE INTERACTIONS ON PINTO EAN: INTEGRATED RESPONSE TO OZONE ONCENTRATION AND DURATION,
gricultural Research Service, Riverside, Calif. alinity Lab.
or primary bibliographic entry see Field 3C.
W74-08330

HE ACCUMULATION OF ORGANIC AND IN-RGANIC MERCURY COMPOUNDS BY THE ASTERN OYSTER (CRASSOSTREA VIR-INICA),
nvironmental Protection Agency, Dauphin sland, Ala. Gulf Coast Water Supply Research, ab.
. C. Kopfler.
ulletin of Environmental Contamination and oxicology, Vol 11, No 3, p 275-280, March, 1974. fig, 3 tab, 10 ref.

escriptors: *Mercury, *Oysters, *Laboratory ests, United States, Coasts, Pollutants, Fish hysiology, *Absorption, Water pollution effects. dentifiers: Mercury uptake.

he presence of mercury contamination in some oastal waters of the United States prompted an nvestigation into the extent of concentration of arious mercury compounds by shellfish in those oastal waters. This study was designed to in-estigate the differences in mercury uptake when ysters were exposed to specific environmental evels of inorganic, phenyl- and methyl-mercury ompounds. Experimental results indicate that ysters, following continuous exposure to even ne microgram/liter mercury in any of the three ompounds studied, rapidly concentrated mercury n their tissues far in excess of the 0.5 ppm uideline established by the Food and Drug Ad-inistration. (Sandoski-FIRL)
W74-08346

RESIDUES OF MIREX AND OTHER CHLORINATED PESTICIDES IN COMMER-CIALLY RAISED CATFISH,
. C. Hawthorne, J. H. Ford, and G. P. Markin.
Bulletin of Environmental Contamination and Toxicology, Vol 11, No 3, p 258-264, March, 1974. 1 fig, 3 tab, 5 ref.

Descriptors: *Catfishes, *Mississippi, *Arkansas, *Insecticides, Food chains, Fish physiology, *Clorinated hydrocarbon pesticides, *Pesticide residues.
Identifiers: *Mirex.

Commercially raised catfish from parts of Mississippi and southern Arkansas in which the insecticide mirex was used extensively for the control of the fire ant have been sampled and analyzed. Mirex was found in none of the 50 samples at the detection level, 0.01 ppm; however, all samples contained extensive residues of other pesticides. The lack of detectable mirex residues indicates that there is no widespread contamination of the catfish and that mirex is probably one of the least of the chlorinated pesticides to reach humans by consumption of catfish. (Sandoski-FIRL)
W74-08347

CADMIUM UPTAKE AND TIME DEPENDENT ALTERATIONS IN TISSUE LEVELS IN THE WHITE CATFISH ICTALURUS CATUS (PISCES: ICTALURIDAE),
State Univ. of New York, Buffalo. Dept. of Biochemistry.
D. W. Rowe, and E. J. Massaro.
Bulletin of Environmental Contamination and Toxicology, Vol 11, No 3, p 244-249, March, 1974. 1 tab, 18 ref.

Descriptors: *Cadmium, *Catfishes, *Laboratory tests, Fish physiology, Water pollution effects, Toxicity, *Absorption.
Identifiers: Time dependent distribution.

Anatomical differences, compared to centrarchid and salmonid fishes, coupled with the commercial and sport-fishing importance of catfish prompted this investigation of the time dependent distribution of cadmium in white catfish. Fish were found to regurgitate from 39 to 56 percent of the dose solution within the first hour. After one hour, 75.1 percent of the Cd body load was contained within the gastrointestinal tract; maximum relative concentrations were attained by the stomach, esophagus, and skin within one hour. The intestinal portions attained maximum levels at widely divergent times. Outside the GI tract, the liver and kidney contained the highest percentages of the body load at 21 days (termination of experiment); these organs may not have reached their relative maximum concentrations at this time. (Sandoski-FIRL)
W74-08348

THE USE OF THE DILUTION WATER EFFECT AS A WATER QUALITY CRITERION,
Southeastern Massachusetts Univ., North Dartmouth. Dept. of Biology.
For primary bibliographic entry see Field 5A.
W74-08356

THE TOXICITY OF SULPHATE PULP BLEACHING EFFLUENTS,
Finnish Pulp and Paper Research Inst., Helsinki.
O. Seppovaara.
Paperi ja Puu (Papper och Tra), Vol 55, No 10, p 713-715, 717-720, Oct. 1973. 5 fig, 2 tab, 8 ref.

Descriptors: *Pulp wastes, *Waste dilution, *Bleaching wastes, *Toxicity, Fish, *Aquatic organisms, Aquatic life, Water pollution sources, *Water pollution effects, *Trout, *Carp, Rainbow trout, Oxygen, Chlorine, Industrial wastes, Effluents, Pulp and paper industry, Lethal limit, Fish physiology, Fish behavior, Waste water(Pollution).
Identifiers: Crucian carp, Bleach plants, Kraft mills, Chlorine dioxide, Hypochlorites, Sublethal effects.

The long-term consequences of water pollution by kraft pulp bleaching effluents for aquatic organisms were investigated. Rainbow trout (Salmo gairdneri) and crucian carp (Carassius carassius) were exposed to waste waters from oxygen-alkali bleaching, four-stage CEHH pine pulp bleaching, and six-stage CEHDED birch pulp bleaching. (C = chlorine, E = alkaline extraction, H = hypochlorite, D = chlorine dioxide). As measured by the standard toxicity test of the American Public Health Association, the fish survived all effluents in 1:10 to 1:25 dilutions, except for chlorination-stage effluents which killed trout even at 1:150 dilution when the active chlorine content was 0.5 mg/liter. Mixing with other effluents considerably reduced the toxicity of chlorination wastes. Long-term exposure caused health disturbances, such as abnormal behavior, deterioration of blood characteristics, and minor injuries to internal organs. In view of the presence of harmful effluents from other than papermaking sources, and because of the low tolerance of natural waterways to poisons and acids, a 500-fold dilution may be necessary to avoid toxic effects from bleached kraft mill outfalls in fish populations. (Brown-IPC)
W74-08403

CELLULOSIC DEPOSITS IN BENTHAL ENVIRONMENTS: OCCURRENCE, EVOLUTION, AND DECOMPOSITION,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 5B.
W74-08423

CHANGES IN THE HETEROTROPHIC BACTERIA OF VOLTA LAKE, 1968-1971,
Ghana Univ., Legon. Volta Basin Research Project.
E. R. I. Biswas.
Ghana J Sci. Vol 12, No 1, p 72-85, 1972. Illus.
Identifiers: *Bacteria(Heterotrophic), *Coliforms, *Ghana(Volta Lake), Lakes, Seasons, Temperature, Water pollution effects.

A previous study of the heterotrophic bacteria of Volta Lake was continued over the final stages of its formation. A regular sampling program was maintained at Ajena and supplemented by occasional samples from stations up-lake. Temperature and Secchi disk transparency increased and seasonal differences decreased. Bacteria appeared unaffected by changes in temperature while there was evidence of an inverse relationship with transparency in the surface layers. Throughout the period highest counts came from below 20 m. Two or 3 peaks occurred each year, the main one coinciding with the early rains. The difference in counts from near the shore and from the mid-lake was greatest during the early rains and also during the subsequent floods. Gram-negative rods continued to predominate. Gram-positive spore forming rods were mainly found on the bottom and their general distribution was very variable. Chromogens accounted for about 1/5 of the population. Presumptive coliform organisms decreased steadily until 1970 and then rose abruptly but without evidence of fecal pollution.--Copyright 1973, Biological Abstracts, Inc.
W74-08434

INDICATIONS OF THE RELATIONSHIP BETWEEN PHYTO-PLANKTON DISTRIBUTION AND PHOSPHATE LEVELS,
Singapore Primary Production Dept.
Foo Yen Chen, and A. Shirota.
In: Water Resources, Environment and National Development--Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 242-250, 1972. 1 fig, 4 tab, 7 ref.

Descriptors: *Phosphates, *Eutrophication, *Reservoirs, Algae, *Phytoplankton, Water pollution effects, Nutrients, Water quality, Fertilizers.
Identifiers: *Singapore.

Preliminary findings on phosphate values and phytoplankton distribution in streams and reservoirs in Singapore are discussed. Water samples were collected at various depths from Seletar Reservoir (280 ha), Peirce Reservoir (110 ha) and MacRitchie Reservoir (102 ha). A total of 11 stations were sampled in Seletar Reservoir and 4 each in Peirce and MacRitchie Reservoirs. The phosphate values (expressed as elemental P) at various depths in MacRitchie Reservoir range from 0.26 microgram-atom/liter to 0.78 microgram-atom/liter; those of Peirce Reservoir from 0.05 to 0.50 microgram-atom/liter and those of Seletar Reservoir from 0.31 to 1.46 microgram-atom/liter. The phosphate levels of Seletar Reservoir have given rise to an algal population commonly found in highly eutrophic waters, consisting predominantly of Dictyosphaerium, Scenedesmus, Coelastrum (Chlorophyta), Microcystis, Oscillatoria, Phormidium, Aphanocapsa and Merismopedia (Cyanophyta). (See also W74-08454) (Knapp-USGS)
W74-08476

DEVELOPMENT OF BLUE-GREEN ALGAL BLOOMS IN NON-ALKALINE WATERS,
Singapore Univ. Dept. of Zoology.
D. S. Johnson.
In: Water Resources, Environment and National Development--Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 256-267, 1972. 4 fig, 49 ref.

Descriptors: *Eutrophication, *Tropical regions, *Alkalinity, Phosphates, Carbonates, Fertilizers, Algae, Nutrients, Primary productivity, Water pollution effects, *Cyanoplita.
Identifiers: *Singapore.

Blue-green algal blooms in reservoirs in Malaysia and incipient blooms in Singapore reservoirs are unexpected since the majority of these habitats are calcium-poor, low alkalinity, low pH habitats which are generally low in dissolved minerals. The development of blue-green blooms was studied in an acid water pond. The pond is extremely calcium-poor (3.0 - 4.5 parts per million). At the start of the survey, the midday pH varied from 6.3 to 7.0 with still lower levels at night; the alkalinity ranged from 0.14 to 0.29 meq/liter and the phytoplankton were a diversified soft-water assemblage dominated by green algae and with an abundance of desmids. Slight fertilization was sufficient to initiate a spectacular blue-green bloom which finally rose to over 51,000 organisms per liter. Blue-green blooms develop much more readily in equatorial climates than in temperate climates. They are likely to develop in waters in which they would not occur in temperate areas, at relatively low levels of fertilization, and at any period of the year, where there is no long-continued dull weather. Thus more stringent control is necessary to avoid eutrophication than would be required in temperate areas. (See also W74-08454) (Knapp-USGS)
W74-08478

TOXICITY CONTROL OF INDUSTRIAL WASTEWATERS AND PESTICIDE-POLLUTED WATERS IN VIETNAM,
Institut Pasteur du Vietnam, Saigon. Dept. of Water Sanitation and Toxicology.
The Tran Phan, and Thi Thuan Bich Do.
In: Water Resources, Environment and National Development--Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 272-276, 1972. 9 tab, 5 ref.

Descriptors: *Toxicity, *Bioassay, *Water pollution control, *Monitoring, Fish, Carp, Fishkill.
Identifiers: *Vietnam, Goldfish.

A bioassay evaluating the acute toxicity to Carassius auratus (goldfish) is used to test the toxicity of industrial wastewaters and pesticide-polluted waters in Vietnam. The wastewaters coming from hydrochloric acid and alkali manufacturing plants (no 24 hr TLm) are found usually less toxic than those coming from galvanized sheet-metal manufacturing plants (24 hr TLm = 50%) or from textile dyeing plants (24 hr TLm = 36%). These results fit quite well with BOD values determined for these same waters. The toxicity of waters from Xuan Huong Lake is greater in July (48 hr TLm = 30%) than in December (48 hr TLm = 70.5%). The height of the rainy season comes in July (rainfall: 205mm), while December (rainfall: 28 mm) is a dry month. Precipitation washes away the pesticides sprayed on the vegetable crops grown on the slopes surrounding Xuan Huong Lake and makes these waters more toxic in the rainy season. (See also W74-08454) (Knapp-USGS)
W74-08480

CHEMICAL COMPOSITION AND MOLECULAR WEIGHT DISTRIBUTION OF DISSOLVED ORGANIC MATTER PRODUCED BY BACTERIAL DEGRADATION OF GREEN ALGAE,
Dep. Chem., Tokyo Metrop. Univ., Setagaya, Tokyo Jap. Tokyo Metropolitan Univ. (Japan). Dept. of Chemistry.
T. Akiyama.
Geochem J. Vol 6, No 2, p 93-104. 1972. Illus.
Identifiers: Algae, Carbohydrates, Chemical composition, *Chlorella, Chlorophyll, *Degradation(Bacterial), Dissolved solids, Distribution patterns, *Japan(Lake Haruma), *Molecular weight, Organic matter, Pigment, Produced, Protein, *Chlorophyta.

Chemical composition and molecular weight of dissolved organic matter were determined by employing chemical analysis and Sephadex Gel filtration method with respect to bacterial (from water of Lake Haruna, Japan) degradation products of green algae (Chlorella). The chemical composition is as follows: pigment materials 15%, lipid and organic acid materials 30%, proteinous materials 26% and carbohydrate materials 8%. The molecular weight of the dissolved organic matter is distributed in wide ranges. Organic matter with high molecular weight (>50,000) consists mainly or proteinous and carbohydrate materials; intermediate one (1500-50,000) consists of pigment and lipid materials. The composition of lower molecular weight matter is not yet known. The dissolved organic matter produced by bacterial degradation of green algal cells is characterized by yellow coloring, which orginates in pigments (in main chlorophyll pigments), and high molecular weight organic substances, which consist almost of proteinous substances with lesser amounts of carbohydrate substances. Although there is a considerable difference between the dissolved organic matter of bacterial degradation products and that in natural water, the former is suggested to be an important source of the latter.--Copyright 1973, Biological Abstracts, Inc.
W74-08494

CHANGES OF THE NUMBER OF BACTERIAL CELLS OF DIFFERENT MORPHOLOGICAL GROUPS IN THE WATER AND BOTTOM DEPOSITS OF THE KHAKON RESERVOIR AS A FUNCTION OF THE INTENSITY OF DEVELOPMENT OF BLUE-GREEN ALGAE, (IN UKRAINIAN),
N. I. Sakharova, and L. H. Brantsevych.
Visnik Kyyiv Univ Ser Biol 14 p 88-89, 1972. English summary.
Identifiers: Algae, *Bacterial cells, *Bottom deposits, Reservoirs, *USSR(Kharkov reservoir), Water pollution effects, *Cyanophyta, Morphology, Distribution patterns.

The vertical, horizontal and season distributio bacteria of different morphological groups in water and bottom deposits of the Khakov re voir (USSR) was studied. Bacilli, mainly sporeforming, predominated. Along with o factors, the number of blue-green algae and e cially their physiological condition had a subs tial effect on the content of bacteria in the w and deposits of the reservoir.--Copyright 1 Biological Abstracts, Inc.
W74-08505

ADVERSE EFFECTS OF COAL MINING FEDERAL RESERVOIR PROJECTS.
For primary bibliographic entry see Field 5G.
W74-08528

OUR GREAT LAKES.
Wisconsin Univ., Madison. Sea Grant College gram.
For primary bibliographic entry see Field 2H.
W74-08531

ENVIRONMENTAL HAZARDS OF LAR SCALE DEVELOPMENTS.
Geological Survey, Raleigh, N.C.
For primary bibliographic entry see Field 6G.
W74-08601

RICHARDSON BAY EFFLUENT DILUT STUDY--A WORKING PAPER.
Environmental Protection Agency, San Franci Calif. Region IX.
For primary bibliographic entry see Field 5B.
W74-08604

THE MICROBIAL DEGRADATION OF POLLUTANTS,
Louisiana State Univ., Baton Rouge. Center Wetland Resources.
For primary bibliographic entry see Field 5B.
W74-08609

HYDROCARBON UTILIZATION CLADOSPORIUM RESINAE,
Dayton Univ., Ohio. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W74-08613

MICROBIAL DEGRADATION OF AROMA HYDROCARBONS,
Texas Univ., Austin. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W74-08614

MICROBIAL DEGRADATION OF OIL HYDROCARBONS IN CONTINUOUS C TURE,
State Univ. Coll., Brockport, N.Y. Dept. Biological Sciences.
For primary bibliographic entry see Field 5B.
W74-08615

UTILIZATION OF CRUDE OIL HYDROC BONS BY MIXED CULTURES OF MAR BACTERIA,
Texas Univ., Port Aransas. Marine Science Ins
For primary bibliographic entry see Field 5B.
W74-08616

CONSIDERATIONS IN APPLICATION MICROORGANISMS TO THE ENVIRONME FOR DEGRADATION OF PETROLE PRODUCTS,
California Univ., Berkeley. Naval Biomed Research Lab.
For primary bibliographic entry see Field 5B.
W74-08618

ICROBES AND PETROLEUM: PERSPEC-IVES AND IMPLICATIONS,
eorgia Univ., Athens. Dept. of Microbiology.
or primary bibliographic entry see Field 5B.
74-08621

ISTRIBUTION AND ABUNDANCE OF OIL-XIDIZING BACTERIA IN THE NORTH SEA,
ologische Anstalt Helgoland, (West Germany).
or primary bibliographic entry see Field 5B.
74-08622

ARINE HYDROCARBONOCLASTIC BAC-ERIA: TYPES AND RANGE OF OIL EGRADATION,
aval Weapons Center, China Lake, Calif. esearch Dept.
or primary bibliographic entry see Field 5B.
74-08623

YDROCARBON BIODEGRADATION IN LASKAN WATERS,
laska Univ., College. Inst. of Marine Sciences.
or primary bibliographic entry see Field 5B.
74-08627

ICROBIAL ECOLOGY AND THE PROBLEM F PETROLEUM DEGRADATION IN CHES-PEAKE BAY,
aryland Univ., College Park. Dept. of icrobiology.
or primary bibliographic entry see Field 5B.
74-08628

HE IMPACT OF OIL ON MARSHLAND ICROBIAL ECOSYSTEMS,
ouisana State Univ., Baton Rouge. Dept. of Food cience.
P. Meyers, D. G. Ahearn, S. Crow, and N. erner.
roceedings of a Workshop held at Georgia State niversity, December 4-6, 1972. Published by ouisiana State University, Sea Grant Publication o. LSU-SG-73-01, p 221-228, 1973. 1 fig, 1 tab, 22 f. EPA Project 800993.

escriptors: *Oil spills, *Oil pollution, *Marshes, Environmental effects, *Wetlands, *Pollution atement, Ecosystems, Ecology, Food chains, oxicity, Grasses, 8louisiana.
entifiers: Spermatophyta, Spartina alterniflora, icrobial ecosystems, Salt-marsh estuary.

he vast productivity of wetland regions along the ouisana coast, and their proximity to oil-produc-g sites, necessitates a more comprehensive un-erstanding of the significance of alterations in the icrobial community concurrent with oil intrusion d massive depositions of petroleum effluents. vestigations are concerned with examination of ch effects on the microbial ecology and the basic od web of the Spartina marshland ecosystem. ee also W74-08609) (Sinha-OEIS)
74-08631

RODUCTION AND CHARACTERIZATION OF MULSIFYING FACTORS FROM HYDROCAR-ONOCLASTIC YEAST AND BACTERIA,
klahoma State Univ., Stillwater. Dept. of iochemistry.
or primary bibliographic entry see Field 5B.
74-08632

UBLETHAL EFFECTS OF THE WATER OLUBLE COMPONENT OF OIL: CHEMICAL OMMUNICATION IN THE MARINE EN-IRONMENT,
regon State Univ., Corvallis. Dept. of Zoology.
T. Takahashi, and J. S. Kittredge.
roceedings of a Workshop held at Georgia State niversity, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication LSU-SG-73-01, p259,264, 1973. 1 tab, 5 ref. SG-2-35187, NSF-GB-27703, ONR-N00014-71-C-0103.

Descriptors: *Oil pollution, *Oil spills, Survival, *Reproduction, *Toxicity, *Feeding behavior, Crustacea, Crabs, Pollution, Environmental effects.
Identifiers: Chemoreceptors, Petroleum pollution, Chemoreception, Crude oils, Aromatic hydrocarbons.

Crude oil and petroleum products contain water soluble components that are potent inhibitors of chemoreceptors in marine organisms. Since many species rely on chemoreception for location of food and sexual partners, disruption of chemoreception in the marine environment by oil spills can have profound effects on survival and reproduction. These effects on species survival will not be revealed in the usual toxicity (LD) studies of pollutants. (See also W74-08609) (Sinha-OEIS)
W74-08636

SOME ACUTE EFFECTS OF LOW-BOILING PETROLEUM FRACTIONS ON THE CELLULAR STRUCTURE OF FISH GILLS UNDER FIELD CONDITIONS,
Texas Wesleyan Coll., Fort Worth. Div. of Science.
W. G. Blanton, and M. C. Robinson.
Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication LSU-SG-73-01, p 265-272, 1973. 10 fig, 1 tab, 5 ref. EPA Contract 68-01-0051.

Descriptors: *Oil spills, *Oil pollution, Fishes, Environmental effects, *Water pollution effects, Enzymes, *Texas, *Louisiana, Arthropods, Path of pollutants.
Identifiers: *Cellular structure(Fish gills), Crude oils, *Fish gill damage, Hydrocarbons, Gill damage, Cell loss, Branchial filaments, Pollutant effects, East Timbalier Island(Louisiana), Aransas Bay(Texas).

Fish taken from the area of the oil slick showed gill damage in the form of cell loss. The alterations of branchial filaments may produce certain physiological malfunctions. The loss of sufficient acidophiles would reduce the production of carbonic anhydrase-like enzyme. This enzyme deficiency could lead to pH changes in the blood and tissue fluids (acidosis or alkalosis) through a reduction in the rate of dissociation of carbonic acid into CO2 and hence malfunction of the blood-buffer system. Loss of mucous cells may result in the clogging of the filaments with detritus. Resultant irritation of the filament may produce epithelial sloughing as that seen in test specimens. These data are not conclusive with regard to the impact of petroleum fractions in pelagic megafauna because of the migratory nature of these animals; however, the observed damage raises certain critical questions which deserve further investigations under controlled laboratory conditions. There appears to be an inverse relationship between the amount of gill damage and the speed with which the fish in question usually swims, suggesting a direct relationship between damage and time of exposure (escape time). (See also W74-08609) (Sinha-OEIS)
W74-08637

INHIBITION OF BACTERIAL CHEMORECEPTION BY HYDROCARBONS,
Harvard Univ., Cambridge, Mass. Lab. of Applied Microbiology.
F. Walsh, and R. Mitchel.
Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication LSU-SG-73-01, p 275-278, 1973. 2 tab, 6 ref. ONR N00014-67-A-0298-0026.

Descriptors: Water quality control, *Microbial degradation, *Biodegradation, *Chemotaxis, Pollution effects, *Water pollution effects, Oil spills, *Oil pollution, Pollutants.
Identifiers: Organic substrates, Microbial chemotaxis, *Chemoreception, Schizomycetes, Pseudomonas sp., Escherichia coli.

A wide variety of chemical and physical water pollutants is shown to inhibit microbial chemotaxis. Such chemotaxis inhibition may have direct effects on microbial predator-prey relationships or on the rate of degradation of organic substrates in the sea. The effect of a broad spectrum of hydrocarbons on bacterial chemotaxis is described. Those hydrocarbons which affect chemotaxis at concentrations found in the environment may be ecologically significant in that they may alter predator-prey interactions or the rate of biodegradation of organic substrates without affecting gross bacterial physiology. One marine bacterium, studied in detail, showed a wide variation in chemotactic response in the presence of the hydrocarbons. The effect of pollutants on chemotaxis has important short- and long-term implications. In the vicinity of a pollutant release, the latter can seriously affect the microbial community. (See also W74-08609) (Sinha-OEIS)
W74-08638

DEGRADATION OF CRUDE OIL BY YEASTS AND ITS EFFECTS ON LESBISTES RETICULATUS,
Georgia State Univ., Atlanta. Dept. of Biology.
W. L. Cook, J. K. Massey, and D. G. Ahearn.
Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication LSU-SG-73-01, p 279-282, 1973. 2 tab, 6 ref. ONR N00014-77-C-0145.

Descriptors: *Oil spills, *Oil pollution, *Biodegradation, *Yeasts, Fishes, Toxicity, Invertebrates, Water pollution effects.
Identifiers: Guppies, *Lesbistes reticulatus, Candida tropicalis, Endomycopsis lipolytica, Asphalt crudes, Crude oils, Emulsification, Pathogenicity.

Two hydrocarbonoclastic yeasts, Candida tropicalis and Endomycopsis lipolytica selected for the study of hydrocarbon-utilization activities, have been examined in combination with crude oils for their effects on the mortality of the common guppy, Lesbistes reticulatus. Water samples from tanks with yeast and crude oil were examined microscopically. In nearly every field examined, numerous amoebae, flagellates, ciliates, Daphnia and other micro-invertebrates were observed feeding on the yeasts as well as ingesting small oil globules. In aquaria with oil, but lacking yeasts, approximately one microscopic field in 50 contained invertebrates. The concentration of invertebrate predators in the natural environment in areas enriched with yeasts has been noted. The closed system laboratory experiments suggest that metabolites or by-products produced during yeast decomposition and emulsification of certain high asphalt crudes may be harmful to fish. In contrast, a readily emulsified and generally less recalcitrant oil may have its toxicity reduced by the addition of yeasts. The extrapolation of these closed system studies to events in the open environment have not been undertaken yet. (See also W74-08609) (Sinha-OEIS)
W74-08639

EFFECTS OF SOME COMMERCIAL OIL HERDERS, DISPERSANTS AND BACTERIAL INOCULA ON BIODEGRADATION OF OIL IN SEAWATER,
Rutgers-The State Univ., New Brunswick, N.J. Dept. of Biochemistry and Microbiology.
R. M. Atlas, and R. Bartha.
Proceedings of a Workshop held at Georgia State University, December 4-6, 1972. Published by Louisiana State University, Sea Grant Publication

LSU SC 73 01, p 283-289, 1973. 2 fig, 2 tab, 8 ref. ONR N00014r67-A-0115-0005.

Descriptors: *Oil spills, *Oil pollution, *Biodegradation, *Microbial degradation, Water pollution effects.
Identifiers: *Oil spills, *Bacterial seeding, Oil herders, Dispersants, Mineralization.

The effects on petroleum biodegradation of several oil herders, dispersants and commercial bacterial inocula were tested. The oil herders and dispersants significantly increased the rate of mineralization but not the extend of petroleum biodegradation. The beneficial effect is apparently due to the increased surface of oil droplets and an absence of toxicity to oil degrading microorganisms at the recommended concentrations. The two commercial bacterial inocula tested failed to improve either the rate or the extent of oil biodegradation when tested in natural seawater. In sterile seawater, these inocula showed inferior performance compared to the natural microflora of seawater, and were judged to be ineffective for marine applications. Data on the safety and effectiveness of available oil pollution control products are basic to their correct use. While numerous studies have been conducted on the toxicity of such products to vertebrates and invertebrates, little is known about their effects on the indigenous microflora of the sea. Since microbial degradation is the major natural process for the ultimate destruction of polluting oil, it is essential that this process not be interfered with. The recommended concentrations of two oil herders, six dispersants and two bacterial inocula were tested for their effects on the biodegradation of Sweden crude oil in freshly collected seawater samples. (See also W74-08609) (Sinha-OEIS)
W74-08640

MICROBIOLOGICAL COMPARISON BETWEEN A FEW AQUATIC MEDIUMS, (IN FRENCH),
Poiters Univ. (France). Unite d'Enseignment et de Recherche de Medicine et Pharmacie.
F. Denis, J. Brisou, D. Courtois, and P. Niaussat.
Rev Epidemiol Med Soc Sante Publique, Vol 20, No 2, p 195-203, 1972. English summary.
Identifiers: *Aquatic plants, Atlantic Ocean, Citrobacter, Empedobacter-trapanicum, Enterobacter, Euryhaline, *France, Lakes, Mediterranean Sea, Microbiological studies, Pacific Ocean, Phytobacterium, Pseudomonadaceae, Rivers, Salinity, *Bacteria.

Microbial flora samples taken from the following bodies of water were compared: the Atlantic Ocean, the Mediterranean Sea, Clipperton Atoll (Pacific Ocean), a hypersaline lake around Djibouti and from French rivers. The idea of a universal permanent microbial flora was outlined as well as the idea of a relatively specific microbiocenosis of a given medium. Most bacterial populations come under the large group of the euryhalines, which are not affected by salinity. The marine medium selects halophilic bacteria strictly called weak, but their proportion does not exceed 10% of the microbiocenosis. In the hypersaline lake, only 1 type, Empedobacter (Halobacterium) trapanicum was isolated. This lake had a particularly high content of bacilli unaffected by salinity. There are many ubiquitous types, namely the Citrobacter, Enterobacter, Pseudomonadaceae (Phytobacterium), the chromogenic bacteria and some bacilli which represent a type of background for all biotopes.--Copyright 1973, Biological Abstracts, Inc.
W74-08669

PRELIMINARY PAPERS FOR UNESCO-IBP SYMPOSIUM ON PRODUCTIVITY PROBLEMS OF FRESHWATERS.
Polish Academy of Sciences, Warsaw.
Polish Committee for IBP, PF Section, UNESCO-IBP Symposium Organizing Committee, Vol I, p 1-250, Vol II, p 251-577, 1970.

Descriptors: *Primary productivity, *Rivers, *Streams, *Lakes, *Productivity, Aquatic plants, Aquatic animals, Phytoplankton, Zooplankton, Turnovers, Biomass, Bacteria, Benthos, Fish, Predation, Diptera, Trophic level, Littoral, Fish management, Algae, Reservoirs, Photosynthesis, Ponds, Food chains, Heated water, Arctic, Tropic, Eutrophication, Michigan, Massachusetts
Identifiers: *Chalk streams(England), *Salt lakes, USSR, Tyrol, Malaysia, Bulgaria, Poland, United Kingdom, Africa, Pyrenees, Netherlands, Kashmir, Hungary, Czechslovakia, India, Italy, Nigeria, France, Japan, Moldavia, Malawi, Tchad.

Fresh water bodies ranging from the African tropics, Pyrenees, Netherlands, and northern Siberia were investigated. Usually, the climate and surrounding topography are discussed. The contributions differ greatly in scope. In general, seasonal variations and water chemistry are described; changes in silicate, phosphate, and nitrogen compounds were recorded at Lake Tjeukemeer, Netherlands. Specific names of flora and fauna are listed, and in some cases, the higher plants. Some detailed studies of fauna behavior and relation to habitats were made. Production in a Polish lake was examined with detailed analysis of particular groups and dominating species and by estimating input and output of the ecosystem. Macrophytes afforded measurements of standing crops in Indian lakes. In one case, studies of species distribution in relation to sediment types were computed. Canadian Precambrian Shield Lakes afforded about 20 seasonal phytoplankton production studies with observations on zooplankton and methodology. Biological productivity efficiency at all trophic levels are recorded based on a four years' study of a Volga River reservoir. Diatom sedimentation and Daphnid populations were studied near London. Fish production and management are included in several papers. (Jones-Wisconsin)
W74-08673

BIOLOGICAL METHODS FOR THE ASSESSMENT OF WATER QUALITY. A SYMPOSIUM PRESENTED AT THE SEVENTY-FIFTH ANNUAL MEETING, JUNE 26-29, 1972.
American Society for Testing and Materials, Philadelphia, Pa.
For primary bibliographic entry see Field 5A.
W74-08675

THE BRACKISH WATER CLAM RANGIA CUNEATA AS INDICATOR OF ECOLOGICAL EFFECTS OF SALINITY CHANGES IN COASTAL WATERS,
Texas A and M Univ., College Station. Dept. of Biology.
S. H. Hopkins, J. W. Anderson, and K. Horvath.
Available from the National Technical Information Service as AD-763 176; $6.75 in paper copy, $1.45 in microfiche. Contract Report No H-73-1, June 1973. 262 p, 53 fig, 24 tab, 273 ref. Contract No. DACW39-71-C-0007.

Descriptors: *Salinity, *Physiological ecology, *Bioindicators, *Animal physiology, *Environmental effects, *Variability, Reproduction, Laboratory tests, On-site tests, Water temperature, Food habits, Respiration, Salt tolerance, Water properties, Mollusks, Water quality, Clams, Animal behavior, Animal growth, Biomass, Saline water intrusion, Carbohydrates, Spawning, Growth rates, Animal metabolism, Ecosystems, Estuarine environment, Ecology, Brackish water, Invertebrates.
Identifiers: *Rangia cuneata, Coastal waters, Seasonal variation, Osmoregulation, Enzyme activity, Survival, Trinity Bay, Lake Anahuac, Neches River, Trinity River Delta, Glycine, Gills, Glycogen, Macroinvertebrates.

Salinities in the range from 0 to 38 were tested on adult Rangia clams for: effects on survival; regulation of internal salinity; intake, use and release of amino acids, respiration, glycogen use under aerobic and anaerobic conditions, feeding rate, ciliary activity, uptake of glucose, glycogen storage and 'index of condition' in natural environments through a seasonal cycle, carbohydrate-digesting enzymes, and reproduction. Rangia cuneata has a system of compensating reactions that allows it to adjust to changes in salinity over the range from 0 to 38 ppt and over the temperature range from 10 to 35 C without harm. The key to the welfare of a Rangia population is not the physiology of the adult individuals, but reproduction and recruitment. The keys to the use of Rangia cuneata as an indicator were: a change on salinity, either up from near 0 or down from 15 ppt and above, is necessary to induce spawning; and the embryos and early larvae can survive only in salinities between 2 and 10 (or 15) ppt. On the basis of laboratory and field studies, the model proposed for Rangia in estuaries has the population consisting of: a central subpopulation in the most favorable breeding zone where the salinities between 2 and 10 ppt and the changes in salinity necessary for reproduction occur in most years; and a low-salinity population upstream that is made up of one, two, or three year-classes resulting from larvae that were carried up the estuary, set, and survived in infrequent favorable (high-salinity) years; and (3) a similar subpopulation of one or a few year-classes downbay that set in years of freshets. Since a change in salinity, not just a favorable level, is required for reproduction, perfect stabilization of salinity at any level will result in dying out of the population in 15-20 years when old clams reach the limits of their life span. (Holoman-Battelle)
W74-08676

RESEARCH TO DETERMINE THE ENVIRONMENTAL RESPONSE TO THE DEPOSITION OF SPOIL ON SALT MARSHES USING DIKED AND UNDIKED TECHNIQUES.
Skidway Inst. of Oceanography, Savannah, Ga.
Available from the National Technical Information Service as AD-763 920; $3.00 in paper copy, $1.45 in microfiche. Annual Progress Report No 2, March 1973. 196 p, 25 fig, 46 tab, 9 ref. Contract No DACW-21-71-C-0020.

Descriptors: *Water pollution effects, Water quality, Fish, *Dredging, *Marsh plants, *Sediments, Heavy metals, Dissolved oxygen, Nitrates, Phosphates, Ammonia, Waste disposal, Spoil banks, North Carolina, South Carolina, Georgia, Marshes, Sampling, Hydrogen ion concentration, Biochemical oxygen demand, Water temperature, Salinity, Biomass, Iron, Population, Benthic fauna, Germination, Seeds, Vegetation establishment, Cadmium.
Identifiers: *Macroinvertebrates, *Dredge spoils, Species diversity, Recovery, Recolonization, Separation alterniflora, Grease, Chlorophylla a.

Included were studies of water quality changes in polluted areas during dredging, effects of spoil impoundment on water quality, processes responsible for water quality changes during dredging and after spoil disposal, sediment parameters which might provide a basis for predicting water quality changes during dredging, effects of dredging on fish, macroinvertebrates, and benthic infaunal populations, and regeneration of marshes. Major conclusions were: Water quality changes during dredging operations cannot be predicted on the basis of simple bulk chemical analyses of the sediments to be dredged. Significant variations in the quality of water leaving spoil areas can be expected depending on its retention time in the spoil area. Since ammonia is the constituent released to the greatest extent during the dredging of sediments in general, one consideration that must be made in determining the optimum retention time of spoil material is the microphyte succession within spoil areas. Dynamic analytical techniques appear to provide a possibility of predicting the water quality changes that might occur during a dredging operation. Sampling for fish macroinvertebrates,

and benthos led to the following conclusions: (1) There apparently was no effect of dredging on standing crops or species composition in areas having undiked spoil banks. (2) In the one diked area examined, there was some indication that numbers of individuals and species were reduced following dredging for a period of approximately two months. (3) Diversity of fishes and macroinvertebrates over the two years of study was similar at most stations. (4) Benthos sampling in the vicinity of Altamaha Sound during 1972 confirmed the reliability of the sampling method chosen. (5) Recolonization appears to occur very rapidly. (6) Data collection at Ossabaw Sound indicate that the population standing crop in the Hell Gate dredging site was significantly higher than that at a control site. (Little-Battelle)
W74-08677

HETEROTROPHIC POTENTIAL FOR AMINO ACID UPTAKE IN A NATURALLY EUTROPHIC LAKE,
Oregon State Univ., Corvallis. Dept. of Microbiology.; and Oregon State Univ., Corvallis. School of Oceanography.
K. B. Burnison, and R. Y. Morita.
Applied Microbiology, Vol.27, No 3, p 488-495, March 1974. 5 fig, 2 tab, 29 ref. EPA 16010 EBB.

Descriptors: *Amino acids, *Microorganisms, *Eutrophication, Respiration, Inhibition, Aquatic microorganisms, In situ tests, Cyanophyta, Water temperature, *Oregon.
Identifiers: *Heterotrophic potential, Mineralization, *Klamath Lake(Ore).

The uptake of sixteen 14C-labeled amino acids by the indigenous heterotrophic microflora of Upper Klamath Lake, Oregon, was measured using the kinetic approach. The year-long study showed a seasonal variation in the maximum uptake velocity, Vmax, of all the amino acids which was proportional to temperature. The maximum total flux of amino acids by the heterotrophic microflora ranged from 1.2 to 11.9 micromol of C per liter per day (spring to summer). Glutamate, asparagine, aspartate, and serine had the highest Vmax values and were respired to the greatest extent. The percentages of the gross (net + respired) uptake of the amino acids which were respired to CO2 ranged from 2% for leucine to 63% for glutamate. Serine, lysine, and glycine were the most abundant amino acids found in Upper Klamath Lake surface water; at intermediate concentrations were alanine, asparate, and threonine; and the remaining amino acids were always below 7.5 X 10 to the minus 8 M (10 microgram/liter). The amino acid concentrations determined chemically appear to the sum of free and adsorbed amino acids, since the values obtained were usually greater than the (Kt + Sn) values obtained by the heterotrophic uptake experiments.
W74-08678

THE EFFECT OF MINERAL WATERS OF THE KVASY SPA ON SOME INDICES OF CHOLESTEROL AND SIALIC ACID METABOLISM, (IN RUSSIAN),
Odessa Inst. for Health Resort Therapy (USSR).
R. Ya. Kozachenko.
Vopr Kurortol Fizioter Lech Fiz Kul't. Vol 36, No 5, p 444-448, 1971.
Identifiers: *Cholesterol, Dogs, *Metabolism, *Mineral waters, *Sialic-acid, Spa waters, *USSR(Kvasy region).

Kvasy mineral water exerted a hypercholesterolemic effect, facilitated excretion of cholesterol with the bile, intensified transformation of cholesterol into bile acids and stimulated the bile secretory function of the liver. The condition of connective tissue was improved, as indicated by decreased blood levels of sialic acids. Mineral water had maximal effects after 18-24 days of administration in dogs. Kvasy mineral water is recommended as part of treatment for vascular disorders associated with disturbances of cholesterol and mucopolysaccharide metabolism and also for stimulation of bile secretion and liver function.--Copyright 1973, Biological Abstracts, Inc.
W74-08686

FREE-LIVING AMOEBAE ISOLATED FROM WATERS FREQUENTED BY PEOPLE IN THE VICINITY OF POZNAN: POLAND: EXPERIMENTAL STUDIES IN MICE ON THE PATHOGENICITY OF THE ISOLATES,
Medical Academy, Poznan (Poland). Dept. of Biological and Medical Parasitology.
W. Kasprzak, and T. Mazur.
Z Tropenmed Parasitol. Vol 23, No 4, p 391-398, 1972.
Identifiers: *Acanthamoeba, *Amoebae, *Human diseases, Lung, Mice, Pathogenicity, *Poland(Poznan).

The investigations were instigated by the fact that free-living amoebae may cause lethal infections in man. The survey included 22 lakes, 1 river and 1 canal frequented by people in the area of Poznan. Small free-living amoebae were isolated from all samples examined. Almost all waters showed the presence of amoebae virulent for mice when given intranasally or intracerebrally. The amoebae invaded the brain and/or the lungs causing the death of animals within a period ranging from a few days to several weeks. Although the species composition of all the isolates was not identified, the greater part of the amoebae investigated belong to the Acanthamoeba genus.--Copyright 1973, Biological Abstracts, Inc.
W74-08687

SANITARY-MICROBIOLOGICAL INVESTIGATIONS IN PREVENTING INFECTIONS OF BACTERIAL AND VIRAL ETIOLOGY, (IN RUSSIAN),
L. E. Korsh, G. A. Bagdasaryan, Yu. G. Talaeva, E. L. Lovtsevich, and T. Z. Artemova.
Vestn Akad Med Nauk SSSR. Vol 27, No 1, p 71-78, 1972.
Identifiers: Bacterial studies, *Human infections, Microbiological studies, Microorganisms, *Pseudomonas, Sanitary conditions, *Viral etiology, Water-borne viruses, *E. coli.

The problems of general control and prophylaxis of bacterial and viral diseases are presented. Better methods of differentiation between various Enterobacteriaceae, such as Escherichia coli and Pseudomonas, better growth media, automation in colony counting, the use of radioisotpes, membrane-filters and different types of instrumentation are discussed. The enormous growth of cities and various facilities necessitates a better understanding and means of coping with the sanitary situations, expecially those of water. More sensitive and simple procedures for identifying and registering new water-borne microorganisms are needed. The effect of various chemical, physical and biological factors on the development, life and mutation of these pathogens should be investigated. Similar techniques should be applied for viruses.--Copyright 1973, Biological Abstracts, Inc.
W74-08692

WATER QUALITY AND WATER POLLUTION CONTROL IN SWITZERLAND,
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
For primary bibliographic entry see Field 5G.
W74-08697

5D. Waste Treatment Processes

OPTIMIZATION OF THE ASSIMILATIVE WASTE CAPACITY OF THE UNSATURATED AND SATURATED ZONES OF AN UNCONFINED AQUIFER SYSTEM,
Univ., of California, Los Angeles. School of Engineering and Applied Science.
For primary bibliographic entry see Field 5B.
W74-08152

APPLICATION OF REVERSE OSMOSIS TO ACID MINE DRAINAGE TREATMENT,
Environmental Protection Agency, Rivesville, W. Va., Crown Mine Drainage Control Field Site.
R. C. Wilmoth.
Copy Available from GPO Sup Doc as EP1.23:670/2-73-100, $2.00; microfiche from NTIS as PB-232 449, $1.45. Environmental Protection Agency, Technology Series Report, EPA-670/2-73-100, December 1973. 157 p, 33 fig, 56 tab, 22 ref. EPA Program Element 1BB040/21AFY/31, Project 14010 TMC.

Descriptors: *Acid mine drainage, *Waste water treatment, *Reverse osmosis, Water reuse, *Calcium sulfate, Coal mines, Brine disposal, Water pollution control, Iron, *West Virginia, Manganese, *Pennsylvania.
Identifiers: *Neutrolosis, Water recovery.

Spiral-wound reverse osmosis systems were tested on four different acid mine drainage discharges in West Virginia and Pennsylvania. Comparison studies were made of the hollow-fiber, tubular, and spiral-wound systems at a ferrous iron acid discharge; and of hollow-fiber and spiral-wound systems at a ferric iron acid discharge. At all sites, the limiting factor in high recovery operation was calcium sulfate insolubility. An empirical formula was developed for predicting maximum recovery. Application of reverse osmosis was demonstrated to be technically feasible for a large percentage of acid mine drainage discharges. A process called 'neutrolisis' was developed in which the reverse osmosis brine is neutralized and clarified, and the supernatant recycled to the influent to the reverse osmosis unit. In this manner, the neutrolosis process discharges only a high quality product water and a neutralized sludge. Neutrolosis recoveries as high as 98.8 percent were achieved at a ferric iron acid discharge site. (EPA)
W74-08155

BEEF CATTLE FEEDLOT SITE SELECTION FOR ENVIRONMENTAL PROTECTION,
Robert S. Kerr Environmental Research Lab, Ada, Okla. National Animal Feedlot Wastes Research Program.
For primary bibliographic entry see Field 5G.
W74-08156

AN EXPERIMENTAL IRRADIATION FACILITY FOR THE STERILIZATION OF SEWAGE SLUDGE (EINE VERSUCHSBESTRAHLUNGSANLAGE ZUR HYGIENISIERUNG VON KLAERSCHLAMM),
Bayerische Landesanstalt fuer Bodenkulter, Pflanzenbau und Pflanzenschutz, Munich (West Germany).
A. Suess, H. Moetsch, E. Bosshard, G. Schurmann, and O. Luescher.
Kerntechnik, Vol 16, No 2, p 65-70, 1974. 4 fig, 11 ref.

Descriptors: *Waste water treatment, *Pilot plants, *Sewage sludge, *Sludge treatment, *Irradiation, Treatment facilities, Cobalt.

An experimental plant for sterilization of sewage sludge by irradiation with a 120kCi Co60 source is described. The main components of the facility are the irradiation shaft with a built-in central tube in which the sludge is recirculated during irradiation,

and the recirculation system which consists of an accessible pump shaft with recirculation and evacuation pumps, the necessary shutoff and regulation valves, and pipework. In this system untreated digested sludge is pumped from the conventional part of the sewage treatment plant to an above ground silo in which a voiding valve opens and allows a metered quantity of sludge to flow into the irradiation chamber upon signal. In the chamber the sludge is recirculated and forced to flow past both sides of the radiation sources for a certain predetermined time. The filling and voiding times of the irradiation chamber are at present about six minutes each. (Sandoski-FIRL)
W74-08198

THE CHEMICAL TREATMENT OF MUNICIPAL WASTE WATER (ZUR CHEMISCHEN BEHANDLUNG VON STAEDTISCHEN ABWASSERN),
Institute for Water and Air Pollution Research, Stockholm (Sweden).
H. O. Bouveng.
Staedtehygiene, Vol 25, No 11, p 260-261, 1973.

Descriptors: *Chemical precipitation, *Waste water treatment, *Municipal wastes, Treatment facilities, *Biochemical oxygen demand, Phosphorus.
Identifiers: *Sweden, Switzerland, Finland, *Chemical treatment.

The Swedish government has adopted a policy of financing 50 percent of the construction costs of municipal purification plants provided a 90 percent reduction of BOD and of the total phosphorus is achieved. This action has spurred the addition of chemical stages to the mechanical biologic purification plants since this stage has a higher BOD reduction capability. In Switzerland and Finland, simultaneous treatment through chemical precipitation is the most common practice. Incorporation of this phase into the existing purification plant scheme allows for better phosphorus concentration. (Sandoski-FIRL)
W74-08199

SMALL BALLS REPEAL SMELL,
Capricorn Industrial Services, Ltd., London (England).
H. E. Baum.
Water and Wastes Engineering, Vol 11, No 3, p 41-42, March, 1974. 2 fig.

Descriptors: *Sewage treatment, Activated sludge, *Liquid wastes, *Waste water treatment, *Odor, Pollution abatement, Air pollution.
Identifiers: *Great Britain, Ball blanket.

Tests at a British sewage plant show that smell can be virtually eliminated by covering liquid sewage with a ball blanket, the name given to a closely packed layer of hollow plastics balls floating on the surface of a liquid. Special polypropylene balls are used. A complete layer of balls arranged in staggered rows always covers 91% of the surface. The remaining 9% consists of small air pockets between the balls which can inhibit fumes emission from the surface in a liquid. Balls of 45 mm diameter were used to cover two 16 sq ft open sludge tanks. Immediately after the whole surface was covered, the smell of the sludge became undetectable. From additional laboratory tests it appears that the ball blanket encourages the water separation process. Other possible uses of balls for sewage treatment are being considered including their effect on agitated liquids and in reducing the amount of foaming in the tank. (Merritt-FIRL)
W74-08201

A KNOWLEDGE CRISIS IN SOLID-FLUID SEPARATION.
Chemical Engineering, Vol 81, No 7, p 26, 28, April 1, 1974. 2 fig, 1 tab.

Descriptors: *Waste water treatment, *Separation techniques, *Research and development, Industrial water, Water pollution control, Dewatering.
Identifiers: Solid-fluid separation.

Some opinions of world experts in solid fluid separation on ways to close the solid-fluid technology knowledge gap are presented. There is wider support for education and research in England, Japan, and Germany than in the United States because of greater population density which overloaded the capacity of the rivers and forced the technology. Other countries also have closer ties between educators and industry. Industry in the United States gives little research opportunities to universities. Most industrial research is done from within the company. The industrial application of solid fluid separation, including pollution control, which most needs improvement includes: hydrometallurgy, activated sludge separation, metal-hydroxide removal, alum sludge dewatering, sulfur dioxide removal systems, pigment and dyestuff processing, clarification of liquids in the food and beverage area, sewage sludge dewatering, radioactive material concentration, shale oil separation, tar sands separation, and removal of ash from liquefied coal. (Merritt-FIRL)
W74-08202

WATER RESOURCES: KEY TO WESTERN FUTURE.
For primary bibliographic entry see Field 5G.
W74-08204

THE ROLE OF DISINFECTION IN THE OPTIMUM ENVIRONMENT,
Georgia Inst. of Tech., Atlanta.
For primary bibliographic entry see Field 5F.
W74-08205

OXYGENATION SYSTEM FOR ACCELERATED SEWAGE TREATMENT,
FMC Corp., Englewood, Colo. Div. of Environmental Equipment.
R. B. Weber.
Mechanical Engineering, Vol 96, No 3, p 28-33, March, 1974. 7 fig, 4 ref.

Descriptors: *Sewage treatment, *Oxygenation, *Waste water treatment, Performance, Capital costs, Testing, Operating costs, Treatment facilities.
Identifiers: *Oxygen diffusion, *Passive diffuser system, *Active diffuser system.

The use of pure oxygen in sewage treatment has been investigated for several years; however, the acceptance of a pure oxygen system has been delayed due to a lack of satisfactory methods of diffusing oxygen into the sewage. The two types of diffuser systems detailed herein are designated as the passive system and the active system. The passive system has recently been installed at a waste treatment facility which handles a relatively high BOD waste. Testing the system has demonstrated that excellent bubble quality exhibiting greater than 95 percent efficiency of oxygen transfer in deep water is provided and that bubble quality does not degrade with time because of plugging or corrosion. The active system is being evaluated for performance in aerobic digestion of waste activated sludge. Results of batch and flow-through tests indicate superior wastewater treatment performance at a lower capital expenditure and lower operating cost when compared to existing systems. (Sandoski-FIRL)
W74-08207

POTABLE-WATER SUPPLY BY MEANS OF UPFLOW FILTRATION (L'EAU CLAIRE PROCESS),
Dept. of Tulane Univ., New Orleans, La. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5F.
W74-08210

ALL COSTS MUST BE COUNTED . . .
Camp Dresser and McKee Boston Mass.
A. A. Kalinske
Water and Wastes Engineering, Vol 11, No 3, p 49-51, March 1974. 2 fig.

Descriptors: *Waste water treatment, *Costs, *Sludge, Engineering, *Sludge treatment, Costs analysis, Recycling.

The determination of the costs of sludge and sidestreams is discussed. Often these costs are not properly identified, especially when relatively polluted streams are recycled. Recycling can significantly affect the loading on the process generating the stream and other processes, both directly and indirectly. To ensure that all pertinent costs are recognized, design engineers should consider the use of a complete flow diagram which quantitatively identifies all the recycled streams. By analyzing overall costs according to this scheme, it is possible to determine proper loadings, under equilibrium conditions, on various processes and equipment in the treatment plant. The analysis involve mass balance and a knowledge of the biological, physical, and chemical conversion processes. (Merritt-FIRL)
W74-08211

AUTOMATIC PROCESS CONTROL OF SEWAGE TREATMENT WORKS.
Bolivar Treatment Works (South Australia)
R. H. Casling
PACE, Vol 26, No 12, p 14-19, December 1973. 7 fig.

Descriptors: *Sewage treatment, *Automatic control, Activated sludge, Filtration, Sewage disposal, Operating costs, Instrumentation, Aeration, *Waste water treatment, *Australia, *Treatment facilities.

The sewage treatment processes employed in the new major plants to be found in the principal cities of Australia are described including the steps being taken to instrument and control them. Such plants, designed to process the sewage from populations in excess of 50,000 people can be economically instrumented and automated. Conventional sewage treatment is a combination of mechanical, physical, and biological processes. The intimate contact between the oxygen and sewage which is the essential part of secondary treatment is achieved in one of two ways. In activated sludge plants, the air is provided by air compressors with capacities of thousands of cubic feet of air per minute at pressures of approximately 6-8 lb/sq in. In filter plants, the settle sewage is distributed over thick beds of stone of graded size by some type of distributor fitted with spreading nozzles. The process parameters measured and used in treatment works can be classified as those concerned with physical quantities and those termed fluid characteristics as dissolved oxygen level, suspended solids, and BOD5. Automatic controls are used which have reduced the operating costs at the major treatment works while giving a standard of control which is closer to the optimum than can be achieved by manual means. (Merritt-FIRL)
W74-08212

BEST EFFLUENT THE GOAL,
Daniel, Mann, Johnson, and Mendenhall, Los Angeles, Calif.
J. E. Cotter.
Water and Wastes Engineering, Vol 11, No 2, p 46-49, February 1974. 4 fig.

Descriptors: *Effluents, Automatic control, *Water reuse, Water treatment, Waste water, Activated sludge, Sewage, Facilities, Filters, Computers, Instrumentation, Engineering, *Waste water treatment, *California.
Identifiers: *Plant design, *Los Angeles(Calif).

The advanced control system which is being installed to aid water reuse at the Sepulveda Water Reclamation Plant is described. The plant will provide secondary treatment by an activated sludge process. In addition, the effluent from the final settling tanks will be passed through filter beds for final polishing in order to make it suitable for its end use. Raw sewage in amounts up to 40 mgd will enter the headworks of the plant through screw pump lift stations. The plant will have a distinctive control system in that almost all control outputs will be derived from direct digital control logic supplied by a central computer system. In addition, all inputs and outputs to the process will be multiplexed remotely in the field and transmitted in serial digital form to the computer center over a common communications cable. (Merritt-FIRL)
W74-08214

VIRUS REMOVAL BY DIATOMACEOUS-EARTH FILTRATION - PART 1,
Gibbs and Hill, Inc., New York, N.Y.
For primary bibliographic entry see Field 5F.
W74-08215

THE RIVER ITCHEN SCHEME OF THE PORTSMOUTH WATER COMPANY.
For primary bibliographic entry see Field 8A.
W74-08216

THE AUTOMATIC FILTER PRESS FPAKM (DIE AUOTOMATISCHE FILTERPRESS FPAKM),
I. S. Ermakov, and M. J. Mesengisser.
Chemische Technik, Vol 26, No 1, p 32-33, 1974. 3 fig, 2 tab.

Descriptors: *Filters, *Automation, *Sludge treatment, Sewage sludge, Application methods, Equipment, *Waste water treatment.
Identifiers: *Filter press, Filter plates.

An automatic chamber filter press with horizontally arranged filter plates that can be moved electromechanically or hydraulically up and down is described. The endless filter band is conducted over rollers back and forth through the filtering chambers which are formed by the filtering plates. The upper section of the filtering plates forms the chamber for draining off the filtrate, the lower section forms an open frame which upon closing of the filter plates forms the chamber for formation of the filtering cake. Between upper and lower sections of the filter plates a rubber membrane is installed for separation of the liquid phase by water or compressed air. The operating time for opening, cake discharge, and closing takes about one to two minutes. The application of the chamber filter for sludge-containing industrial and communal wastewater is being tested. In Japan as well as the Soviet Union, this filter press is used for dewatering of sewage sludges. (Sandoski-FIRL)
W74-08217

REVERSE OSMOSIS AND ULTRAFILTRATION - A SURVEY OF AUXILIARY APPARATUSES AVAILABLE IN THIS FIELD (UMGEKEHRTE OSMOSE UND ULTRAFILTRATION - EIN UEBERBLICK UEBER DIE AUF DIESEM GEBIET VERFUEGBAREN APPARATIVEN HILFSMITTEL),
Alfa-Laval A.B., Tumba (Sweden).
J. Murkes.
Chemische Technik, Vol 25, No 10, p 601-603, 1973. 4 fig.

Descriptors: *Reverse osmosis, *Membrane processes, *Surveys, Application methods, *Desalination, *Waste water treatment,
Identifiers: Frame modules, Tubular modules, Spiral modules, Capillary fiber modules, *Ultrafiltration.

The principle of reverse osmosis is explained and a survey of the following apparatuses given: plate and frame modules, tubular modules, spiral modules, capillary fiber modules, and ultrafiltration modules. In plate and frame modules, round membranes are fastened to a porous supporting material and stacked in a pressure-resistant casing. With tubular modules, membranes are inserted into a tubular permeable supporting structure similar to the spiral modules but with a smaller membrane surface. Capillary fiber modules are comprised of many aromatic polyamide fibers with a large specific membrane surface and whose throughput is smaller than with plane or tubular cellulose acetate membranes. (Sandoski-FIRL)
W74-08218

MEASUREMENT AND MONITORING UNITS FOR WASTE WATER (MESS-UND UEBERWACHUNGSGERAETE FUER ABWASSER),
For primary bibliographic entry see Field 5A.
W74-08219

PLANT EXPANDED FOR ADVANCED WASTE TREATMENT,
URS Forrest and Cotton, Inc., Dallas, Texas.
D. P. McDuff, and D. B. Ward.
Public Works, Vol 105, No 3, p 56-59, March 1974. 4 fig.

Descriptors: *Tertiary treatment, *Sewage treatment, *Trickling filters, Water quality, Pre-treatment(Water), Filtration, Aeration, Adsorption, Disinfection sludge treatment, Dewatering, *Waste water treatment, Biochemical oxygen demand, Suspended solids, Water purification, Scum, *Treatment facilities, *Texas.
Identifiers: Recarbonation.

The expansion of the sewage treatment facility at Garland, Texas is described. It will feature a new and innovative treatment unit in parallel with an existing trickling filter plant in order to meet the demand for high quality waste effluent. The plant is designed to increase the capacity from 7.5 to 30 mgd and to provide treatment objectives of reducing both BOD and suspended solids to a concentration of less than 10 mg/liter. The proposed additional treatment processes at the existing plant include: equalization and aeration, pretreatment, chemical clarification, recarbonation, filtration, carbon adsorption, disinfection, sludge dewatering, and scum disposal. (Merritt-FIRL)
W74-08223

PRIMARY SLUDGES PRODUCED BY THE ADDITION OF LIME TO RAW WASTE WATER,
Washington Univ., Seattle. Dept. of Civil Engineering.
G. R. Minton, and D. A. Carlson.
Water Research, Vol 7, No 12, p 1821-1947, 1973. 10 fig, 8 tab, 45 ref.

Descriptors: *Sludge, Waste water, *Lime, Hydrogen ion concentration, *Waste treatment, Water purification, Activated sludge, Dewatering, Review, *Waste water treatment.

Information compiled on the primary sludge produced by the addition of lime to the raw waste water is summarized. The removal of moisture content of primary sludges containing lime will vary significantly with the waste water hardness/alkalinity, insolubilization, pH, and possibly the phosphorus concentration. The recommended minimum insolubilization pHs to ensure satisfactory thickening, vacuum filtration, sand bed drying, and centrifuging are tabulated. The minimum insolubilization pH required for satisfactory clarification corresponds to the minimum insolubilization pH for satisfactory removal of sludge moisture content with the possible exception of vacuum filtration. The degree to which the capacity and/or operating hours of the existing moisture removal processes must be increased to handle the new sludge will depend upon the aforementioned waste parameters and the existing operating characteristics, solids contents, and loading rates of the facility. Lime will significantly alter the quantity, composition, and quality of the solids and sludges produced by the treatment process. (Merritt-FIRL)
W74-08224

AUTOMATION COMES TO L.A.,
Brown and Caldwell, San Francisco, Calif.
M. J. Flanagan, and G. M. Jones.
Water and Wastes Engineering, Vol 11, No 2, p 41-46, February 1974. 7 fig.

Descriptors: *Automatic control, *Waste water treatment, *Sewage treatment, Activated sludge, Effluents, Computers, Digestion, *California, Treatment facilities.
Identifiers: *Los Angeles(Calif).

An expandable automated control system which will permit the addition of improved processing techniques as they become available is being installed in a Los Angeles waste water plant. The Hyperion sewage treatment plant provides primary treatment for an average dry weather flow of 420 mgd and a peak wet weather flow of 720 mgd. Secondary treatment by the activated sludge process is provided to a constant flow of 100 mgd. Under dry weather flow conditions, primary and secondary effluent are mixed and discharged to Santa Monica Bay through a 5 mi long outfall. When excessive wet weather flows impose too great a load on the 5 mi conduit, effluent from the activated sludge process is discharged through the plant's original 1 mi outfall. Solids from the treatment process are discharged through a 7 mi outfall after reduction by the anaerobic digestion process. (Merritt-FIRL)
W74-08225

THE PROS AND CONS OF AUTOMATED FILTERS,
Gary-Hobart Water Corp., Gary, Ind.
C. A. Froman, Jr.
Water and Wastes Engineering, Vol 11, No 3, p 43-44, 48, March 1974. 1 tab.

Descriptors: *Filtration, Economics, Water treatment, *Filters, Automation, Operation and maintenance, *Maintenance costs, *Waste water treatment.

The advantages and disadvantages of automated filters are discussed. An automated filter is defined as a filter with numerous automated features and is run without an operator who routinely inspects the filter during operation and is not in attendance during the backwashing function. Some common problems that have been associated with filter plant operations are filter bed clogging, cracks in filter bed, air binding, gravel shifting and sand boils, and loss of filter media. Some of these problems could be avoided if an operator were in attendance, therefore, the biggest disadvantage of automated filters is the loss of direct operator observation and control of process. Other disadvantages include the investment required, high maintenance costs and depreciation. Advantages include economy in operation and maintenance consistency of operation. One plant estimates its total annual savings at $17,500. (Merritt-FIRL)
W74-08226

THOSE NASTY PHOSPHATIC CLAY PONDS.
Environmental Science and Technology, Vol 8, No 4, p 312-313, April 1974. 2 fig.

Descriptors: *Phosphates, *Slime, *Dewatering, Flocculation, Coagulation, Dryers, Economics, Feasibility, Sands, Flocculation, Filtration, *Waste water treatment.

Methods of dewatering phosphate slimes are discussed. There are about 40,000 acres of active and inactive settling areas of phosphate slimes that are surrounded by over 300 miles of earth dams. Since 1942, some 20 dam failures occurred, releasing large amounts of phosphate slimes, and seriously, although temporarily, polluting surrounding waters. Two dewatering methods are deemed technically feasible and economically promising. One is mixing with tailings sand, and the other is chemical flocculation together with coagulation with tailings sand. Other possible methods include filtering and the use of a cross flow fluid bed dryer. The possibility of utilizing the slime is also being explored in areas of fertilizers, bricks, and sewer pipes. (Merritt-FIRL)
W74-08227

COUNTERCURRENT WASHING TURNS THE TIDE AGAINST RISING EFFLUENT COSTS,
Pierson and Co., Ltd., Manchester (England).
H. G. W. Pierson.
Progress Engineering, p 47, February 1974. 2 fig.

Descriptors: *Cleaning, *Filtration, Effluents, Treatment, Costs, *Waste water treatment.
Identifiers: *Great Britain, Countercurrent washing.

The use of countercurrent washing to reduce the volume of effluent by half and so reduce treatment cost is discussed. The countercurrent washing process is illustrated for a long slab like filter cake. The filter cake travels from left to right while the successive washes are piped the other way. Each of the three portions of the cake is washed three times. At each washing the filter cake has a higher concentration of soluble solids than the wash water and so the concentration of impurities in the cake is decreased at every washing. A 1% level of impurities can be obtained in a three stage countercurrent washing compared to a four stage countercurrent washing process. (Merritt-FIRL)
W74-08228

NEW TERTIARY SEWAGE PROCESS NEEDS NO CHLORINE TO DISINFECT.
Engineering News-Record, Vol 192, No 8, p 23, February 21, 1974.

Descriptors: *Tertiary treatment, *Disinfection, *Waste water treatment, Water purification, Ozone, Ultrasonics, Aquatic microorganisms.
Identifiers: *Ultrahigh frequency sound.

A tertiary waste water treatment process was developed that combines ultrahigh frequency sound with ozone and could replace chlorination for disinfection. Chlorine leaves a toxic residue that can be harmful to aquatic life. The cost of an entire 1 mgd physical/chemical plant using the process would be competitive with an activated sludge plant the same size. It would be feasible to expand the process for use on plants in the 50 mgd range. The process kills most viruses within 15 sec, as compared to 1-2 min when using ozone alone. Currently, a 27,000 gpd pilot plant is in operation, with plans for a 600,000 gpd sonozone plant. (Merritt-FIRL)
W74-08229

ANIMAL WASTE UTILIZATION FOR POLLUTION ABATEMENT TECHNOLOGY AND ECONOMICS. PHASE II,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
O. E. Cross.
Available from the National Technical Information Service as PB-232 409 $3.25 in paper copy, $1.45 in microfiche. Nebraska Water Resources Research, Lincoln, Institute Project Completion Report, February 1974. 15 fig, 2 tab, 6 ref. OWRR B-012-NEB(2). 14-31-0001-3610.

Descriptors: *Water pollution sources, *Farm wastes, *Runoff, Waste disposal, Fertilizers, Irrigation practices, Return flow.
Identifiers: Land disposal(Wastes), Manure disposal.

The pollution potential of the runoff from manured soil involves nitrate, sodium, and potassium. High manure applications to cultivated soils will cause limited pollution of surface runoff water and only during the first 15 minutes of the first runoff event. The concentration of pollutants in this runoff water is below the limits set for irrigation water. Hence, all runoff should be recycled for irrigation uses. After 4 years of testing heavy manure application, groundwater retained potable quality. Repeated annual application of heavy rates of manure on land may lead to deterioration of the physical properties of soil, owing to the large amounts of sodium and potassium in manure. In 1972 and 1973 these two elements did not continue to increase in concentration. Also, feeding excess quantities of sodium and potassium beyond the minimum requirement for the animals is being avoided. The initial intake of water into the soil increases as high manure loadings are applied. The basic intake rate is higher on areas plowed 8 inches deep. The basic intake rate on any specific manure loaded area increases with time elapsed from date of manure application. (See also W71-11405) (Knapp-USGS)
W74-08231

ADVANCED WASTE TREATMENT PROCESS SELECTION, PART TWO,
Culp Wesner Culp - Clean Water Consultants, Corona Del Mar, Calif.
G. L. Culp, and C. L. Hamann.
Public Works, Vol 105, No 4, p 69-74, April, 1974. 5 fig, 3 tab.

Descriptors: *Oxidation, *Phosphorus, *Adsorption, *Ozone, *Chemicals, Economics, Activated carbon, Iron, Aluminum, Application methods, Sewage treatment, *Waste water treatment, Organic wastes, Coagulation, Salts.
Identifiers: Powdered carbon, Granular carbon, Phosphorus removal.

The use of chemical oxidation and adsorption for removal of organics and application of coagulants for phosphorus reduction are discussed. Chemical oxidation processes showing any potential for economic use are limited to ozonation as the technique available at lowest cost. Chemical oxidation steps are unacceptable for application to removal of organics from raw sewage. Carbon adsorption may be applied to raw sewage for removal of organics rather than using biological processes, or it can be applied to secondary effluents. Powdered carbon and granular carbon adsorption, regeneration, and reuse are compared. Chemical coagulants for phosphorus removal may be added to the primary clarifier influent, the activated sludge aeration tank, or a tertiary chemical clarifier. The use of iron and aluminum salts as coagulants in the aforementioned treatment stages is discussed. (Sandoski-FIRL)
W74-08245

RELIEF CONCEPT CONCERNING MIXED SEWERS (ENTLASTUNGS-KONZEPTIONEN IM MISCHSYSTEM),
W. Munz.
Gas- and Wasserfach - Wasser/Abwasser, Vol 114, No 11, p 525-529, 1973. 4 fig, 11 ref.

Descriptors: *Combined sewers, *Overflow, Watersheds(Basins), *Rainfall, *Storm runoff, Waste water treatment.
Identifiers: *Sewer overflows.

The installation of rain catchment basins to protect the receiving streams from overflowing combined sewer systems has been an accepted practice for many years. These basins have the purpose of holding certain quantities of water during a rainfall, which is later returned to the purification plant for treatment. Calculation methods for construction of rainfall catchment basins are tabulated. (Sandoski-FIRL)
W74-08246

NEW METHODS TO DISPOSE OF USED METALWORKING EMULSIONS. (NEUE VERFAHREN ZUR BESEITIGUNG GEBRAUCHTER METALL-BEARBEITUNGS-EMULSIONEN),
Esso AG Forschungszentrum, Hamburg (West Germany).
U. J. Moeller, U. Boor and G. Runge.
Erdoel und Kohle-Erdgas-Petrochemie vereinigt mit Breunstoff Chemie, Vol 27, No 2, p 70-77, 1974. 11 fig, 11 tab, 32 ref.

Descriptors: *Emulsions, *Separation techniques, *Oily water, *Burning, Landfills, Waste disposal, Absorption.
Identifiers: *Flame evaporation.

A new method, flame evaporation, has been developed to separate emulsion into water and oil phases with the aid of heavy fuel oil. The water content of the emulsion is converted to steam and removed through the stack. Simultaneously, the oil phase and the auxiliary fuel oil is combusted to CO2 and water. The consumption of the heavy fuel oil is low; the heat of combustion of the emulsion and auxiliary fuel can be utilized. Disposal of emulsion by the landfill method includes the absorption of the oil phase onto aluminum hydroxide and the placement of the oil floc/water mixture in earth pits having a water permeable lining. The oil is converted to a usable compost by means of microorganistic activity or through use of activated sludge within six months. (Sandoski-FIRL)
W74-08247

FURNACE CONSTRUCTIONS FOR INCINERATION (OFENKONSTRUKTIONEN FUER DIE ABFALLVERBRENNUNG).
Wasser, Luft and Betrieb, Vol 18, No 1, p 28-30, 1974. 4 fig.

Descriptors: *Treatment facilities, *Incineration, *Waste treatment, *Liquid wastes, Sewage sludge.
Identifiers: Rotary kiln, Fluidized bed furnace, Radiation recuperators.

Various kinds of furnaces for incineration of a wide variety of waste products such as odorous wastes gases, communal and industrial sludges, and solid wastes are described. Such incineration processes include a fluidized bed furnace, radiation recuperators, a rotary kiln, and a fourth process for the specific treatment of liquid and gaseous wastes. In this process, waste products are injected to the combustion chamber via concentrically arranged burners after which fuel is injected through fine nozzles in a ring around the burners. As combustion products, sulfur dioxide and hydrogen chloride develop apart from water vapor and carbon dioxide which are removed in scrubbers. (Sandoski-FIRL)
W74-08248

RECONSTRUCTING AN EGG-SHAPED SEWER.
For primary bibliographic entry see Field 8A.
W74-08249

DISINFECTION OF WATER USING CHLORINE DIOXIDE,
Wallace and Tiernan, Inc., San Francisco, Calif.
J. F. Malpas.
Water Treatment and Examination, Vol 22, No 3, p 209-221, 1973. 1 tab, 14 ref.

Descriptors: *Disinfection, Sewage treatment, *Swimming pools, Potable water, Water purification, *Waste water treatment, *Chlorination.
Identifiers: *Chlorine dioxide, *Great Britain.

The use of chlorine dioxide for the disinfection of water is discussed. Although chlorine dioxide is widely used as a water treatment chemical for the specific purpose of taste removal, it is not generally thought of as an alternative to chlorine for disinfection. It is pound for pound far more expensive than chlorine, yet does not appear to have outstanding germicidal properties. There does appear to be three areas in which chlorine dioxide could be used advantageously as a disinfectant: firstly, in the potable water field, where abstraction from rivers high in ammonia makes break point chlorination impossible, or difficult; secondly, for the disinfection of sewage effluents; and lastly, in swimming pools because chlorine dioxide reportedly does not cause eye irritation. (Merritt-FIRL)
W74-08253

ENVIRONMENTAL EFFECT OF A COMPLEX NUCLEAR FACILITY,
DuPont de Nemours (E.I.) and Co., Aiken, S.C.
W. P. Bebbington.
Chemical Engineering Progress (Certification of Engineers), Vol 70, No 3, p 85-86, March, 1974. 1 fig.

Descriptors: Liquid wastes, *Environmental effects, Nuclear wastes, Salts, *Waste disposal, Waste storage, Sludge storage, Storage tanks, *South Carolina, Water pollution effects.
Identifiers: *Savannah River(So. Car.).

The storage and disposal of liquid wastes from the Atomic Energy Commission's Savannah River Plant are described in a discussion of the environmental effect of a complex nuclear facility. Most of the solids in the highly radioactive liquid wastes from the separations processes are nonradioactive salts containing aluminum and inorganic reagents. Sodium hydroxide is added and the volume of the alkaline waste is as much as 100 times that generated in the power reactor fuel cycle. This alkaline waste is stored underground in carbon steel tanks, most of which are enclosed in wholly or partially steel lined concrete vaults. Hydrated iron, manganese, and aluminum oxides occur as a sludge that settles from the waste and contains nearly all of the strontium-90. Sludge from several tanks has been combined into one tank. This supernatant liquid contains nearly all of the cesium-137. This solution is concentrated in evaporators, several tanks are now being filled with the resultant crystalline salts. (Merritt-FIRL)
W74-08254

IMPROVED CONTROL OF RADIOACTIVE WASTES,
Atomic Energy Commission, Bethesda, Md.
F. E. Stubblefield, and E. G. Jackson.
Chemical Engineering Progress (Certification of Engineers), Vol 70, No 3, p 87-88, March, 1974. 3 fig.

Descriptors: *Radioactive waste disposal, *Radioactive wastes, *Liquid wastes, Solid wastes, Waste storage, *Water pollution control, *Washington.
Identifiers: Plutonium, Uranium, *Richland(Wash).

Improved control methods are described for solid and liquid radioactive wastes at the Hanford plant of the Atomic Energy Commission at Richland, Wash. Previously, solid wastes were buried as received with no provisions for retrievability. The expansion of land use at a rate of 3.7 acres/yr necessitated the following improved procedure: segregate transuranic contaminated waste from other radioactive waste; segregate combustible and noncombustible transuranic waste; package the transuranic contaminated waste in retrieval type packages, and store in soil such that retrieval of contamination free packages can be accomplished for at least 20 yr after initial storage; implement volume reduction measures at the generation facility; implement improved land utilization; consolidate sites where practical, thus releasing land areas from contamination restriction. Liquid wastes were previously discharged to ground disposal sites, on surface ponds or swampls, or to subsurface structures (cribs) depending on the amount of total radioactivity. The improved method involves: process changes including the addition of effluent treatment facilities to minimize the amounts of radioactivity in stream; diversion facilities; and storage of plutonium containing streams in tanks. (Merritt-FIRL)
W74-08255

LETCHWORTH WATER POLLUTION CONTROL WORKS,
E. Taylor.
Public Health Engineer, No 7, p 21-34, January, 1974. 1 fig, 8 tab.

Descriptors: Water pollution control, *Costs, *Activated sludge, Intakes, Sedimentation, Separation techniques, Sludge digestion, Sludge disposal, Sludge treatment, Filters, Filtration, *Waste water treatment, Pumps, Pumping plants, Equipment, *Treatment facilities.
Identifiers: *Great Britain(Letchworth).

The extension of the Letchworth Water Pollution Control Works to a 4-5 mgd facility based on the diffused air activated sludge process is described. The numbers, dimension, and capacities of the following individual units are tabulated: inlet works, sedimentation tanks, aeration tanks, final settlement tanks, sludge pumps, sludge digestion tanks, sludge filter presses, biological filter beds, scavenge pumping stations, the administration building and compressor house, and tank washout and washdown facilities. The construction costs of the extension are tabulated and total about $3 million. (Merritt-FIRL)
W74-08260

SEWAGE TREATMENT AND DISPOSAL.
Water and Water Engineering, Vol 77, No 934, p 495-498, December, 1973. 2 fig.

Descriptors: Facilities, *Sewage treatment, *Waste water treatment, Water management(Applied), Waste disposal, Irrigation systems, Flood damage, Boating, Treatment facilities.
Identifiers: *Flood relief, *Great Britain, *Greece.

New sewage treatment and disposal facilities and projects are summarized. A water management study on treating sewage at Melbourne is being conducted. New sewers are being proposed for Banstead Urban District Council (UDC) and Bedworth UDC. Four automatic pumps were installed at the Faversham Sewage Works. New facilities have opened at the Isle of Sheppey, Northallerton Rural District Council (RDC), Village, Rugby Newbold, Spalding RDC, Stokesley RDC, Winchester RDC, and Zambia. In the United States, the Rosemont Treatment plant is being evaluated by the Environmental Protection Agency. A recent ruling made it unlawful to prohibit the discharge of sink waste from boats on streams in the area of the Lancashire River Authority. An important water management scheme is being developed in Greece to control the irrigation of local farmland. A flood relief scheme is being planned for South West Bristol. (Merritt-FIRL)
W74-08261

UTILITARIAN LEISURE FOR BURNHAM-ON-SEA.
Surveyor, Vol 143, No 4263, p 9, February, 1974. 4 fig.

Descriptors: *Drainage systems, *Sewage treatment, *Sewers, Surface waters, Water storage, *Waste water treatment.
Identifiers: *Great Britain(Burnham-on-Sea).

The proposed drainage scheme for Burnham-on-Sea Urban District Council (UDC) is described. The main drainage scheme is complete and is the first phase of a complete resewerage of the district. The entire plan includes a new regional sewage purification works and the abandonment of all existing untreated crude discharges to sea. Large areas of unused claypits were featured in the scheme to provide surface water storage capacity during tidelock conditions as an alternative to pumping arrangements. (Merritt-FIRL)
W74-08262

COST EFFECTIVENESS IN SEWAGE TREATMENT,
Anglian Water Authority (England). Lincolnshire Sewage Div.
I. Ramsden.
Surveyor, Vol 143, No 4263, p 28-29, February, 1974.

Descriptors: *Cost analysis, *Project planning, Optimum development plan, Project purposes, *Sewage treatment, Pipes, Personnel management, *Waste water treatment.
Identifiers: *Great Britain(E. Kesteven).

The effects of the removal of slag media from filter beds at the East Kesteven Rural District Council (RDC) and subsequent replacement with plastic filter media are described. The capacity of the beds has been increased by at least two-fold. This example is used to stimulate cost effectiveness ideas for the sewage treatment industry. (Sandoski-FIRL)
W74-08263

RESULTS OF EXAMINATIONS OF HOSPITAL WASTE WATER (ERGEBNISSE DER UNTERSUCHUNGEN VON KRANKENHAUSABWAESSERN),
Hygiene-Institut des Ruhrgebietz zu Gelsenkirchen (West Germany). Wasserhygiene Abteilung.
For primary bibliographic entry see Field 5B.
W74-08286

ENVIRONMENTAL RESEARCH IN 1973--ANNUAL REPORT.
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 5G.
W74-08309

PROCESS KINETICS FOR DENITRIFICATION,
Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering.
W. K. Johnson.
Journal of the Sanitary Engineering Division, American Society of Civil Engineers, Vol 98, No SA4, p 623-634, August, 1972. 3 fig, 1 tab, 29 ref.

Descriptors: *Sewage treatment, *Activated sludge, *Denitrification, Carbon filters, Environmental sanitation, Sanitary engineering, Sewage bacteria, Water quality, Water pollution sources, *Waste water treatment, *Kinetics, *Biological treatment.

Kinetic equations for biological growth, substrate utilization, and oxygen uptake with the activated sludge process may be modified and used to describe a denitrification process. A basis difference between the processes is that the dependency of variables is interchanged. For denitrification the oxygen equivalent from the nitrates is the independent variable and the substrate supplied is a dependent variable. Coefficients used in the kinetic equations for denitrification are not well defined as yet but will differ from activated sludge particularly due to the lower yield characteristics of the denitrification process. Experimental data support the validity of the equations as presented. The rate of nitrate reduction is shown to be a linear

function of the sludge loading rate, and the ratio of substrate applied to nitrate reduced BOD/N was found to be essentially constant over a wide range of sludge loadings. The exact magnitude of the BOD/N ratio is a function of the yield characteristics of the substrate and the yield characteristics of the biological treatment system employed. When the substrate or carbon source must be purchased process yields are particularly important. (Skogerboe-Colorado State)
W74-08320

MANUAL FOR CALCULATION OF CONVENTIONAL WATER TREATMENT COSTS,
Control Systems Research, Inc., Arlington, Va.
For primary bibliographic entry see Field 3A.
W74-08333

DEVELOPMENT OF LARGE SPIRAL MEMBRANE REVERSE OSMOSIS ELEMENTS FOR LOW-COST WATER PURIFICATION AND RECLAMATION,
Gulf General Atomic Co., San Diego, Calif.
For primary bibliographic entry see Field 3A.
W74-08338

DEFINITION OF REVERSE OSMOSIS PUMP REQUIREMENTS FOR SPACE VEHICLE REQUIREMENTS,
McDonnell Douglas Astronautics Co., West, Huntington Beach, Calif.
For primary bibliographic entry see Field 8C.
W74-08340

EVALUATION OF ION EXCHANGE PROCESSES FOR TREATMENT OF MINE DRAINAGE WATERS,
Burns and Roe, Inc., Paramus, N.J.
B. J. Intorre, E. G. Kaup, J. L. Hartman, H. D. Feiler, and R. M. Szostak.
Available from the National Technical Information Service as PB-227 734/AS; $5.50 in paper copy, $1.45 in microfiche. Office of Saline Water, Report INT-OSW-RDPR-74-92, January 1974. 183 p, 24 fig, 25 tab, 21 ref. OSW Contract 14-30-2691.

Descriptors: *Desalination process, *Pilot plants, *Ion exchange, *Waste water treatment, *Mine drainage, *Acid mine water.
Identifiers: Desal process, Cost estimates.

Laboratory and pilot plant research work was conducted on a modified Desal, Sul-biSul, and conventional ion exchange processes to evaluate their performance on acid mine drainage feed waters. The study included process variables, analytical techniques, daily monitor of acid mine drainage source, and economics of potable water production. This work was carried out at the Acid Mine Drainage Demonstration Plant at Hawk Run, Pennsylvania. Disposal of wastes is explored briefly. (OSW)
W74-08341

DEVELOPMENT OF A REVERSE OSMOSIS MODULE FOR WASH WATER RECYCLING IN A SPACE ENVIRONMENT AT 165 DEG F,
Environgenics Systems Co., El Monte, Calif.
R. W. Lawrence, R. A. Tidball, and C. W. Saltonstall, Jr.
Available from the National Technical Information Service as PB-226 632/AS; $3.00 in paper copy, $1.45 in microfiche. Office of Saline Water Report INT-OSW-RDPR-74-905, January 3, 1974. 28 p, 3 fig, 4 tab, 3 ref. OSW Contract 14-30-3221.

Descriptors: *Reverse osmosis, *Membranes, *Desalination, *Membrane processes, *Separation techniques, Ion exchange, Permeability, Detergents, Water quality, Ureas, Activated carbon, Prototype tests, *Recycling, *Waste water treatment.
Identifiers: Cellulose acetate blend membrane, *Wash water, Space application of reverse osmosis, High temperature resistant membranes, Reverse osmosis module, Laundry wastes, Lactic acid removal.

A spiral wound module 1.5 dia. and 18 in. long containing 3.3ft2 of blend (cellulose di- and triacetate) membrane was evaluated at 300 psig in real laundry water for 17 days at 165 deg F using a series of 30, 0.9 and 0.2 micron clarification filters. The flux declined from 6.2 to 4.3 gfd in that period. Throughout the test period, the rejections of detergent, lactic acid, ionic species, and total dissolved solids were above 98% at product recoveries ranging from 50 to 86%. A prototype system processing 27 gal of wash water in 8 hrs or less and employing 8 of the 1.5 in. dia X 18 in. modules was constructed and tested. With the exception of urea, all of the criteria for the product quality were easily met. Although the urea concentration in the product was below 50 ppm, the feed concentration was less than the required 58 ppm because of the small quantity of urea in the home laundry water. A carbon column was included in the prototype to remove traces of detergent that cause foaming in the product. An ion exchange column was also included to insure that ammonia nitrogen would remain below 5 ppm, but shop testing indicates that this column is probably not required. The addition of urease enzyme to laundry water at 74 deg C (165 deg F) was shown to be a feasible method for reducing urea content. A large excess of urease enzyme in laundry wash water hydolyzed all the urea present in 5.5 hrs or less. A problem in this method is the rapid loss activity of the enzyme at 74 deg C and the consequent necessity for use of a large excess. (OSW)
W74-08344

APPLICATIONS OF WASTE PROCESSING SYSTEMS FOR PRESSURIZED WATER REACTORS,
Westinghouse Electric Corp., Pittsburgh, Pa.
I. Garber, and W. Kearton.
IEEE Transactions on Power Apparatus and Systems, Vol PAS-93, No 1, p 149-157, January-February, 1974. 6 fig, 6 tab, 11 ref.

Descriptors: *Waste treatment, Application methods, Radioactive wastes, *Recycling, Storage, Monitoring, *Radioactive waste disposal, *Waste water treatment, Waste storage.
Identifiers: *Reactors.

The application of Waste Processing Systems in the Westinghouse Pressurized Water Reactor Plants is discussed. These systems employ the techniques of waste product concentration, long term storage, recycling, and radiation monitoring in order to implement the basic philosophy governing radioactive releases established by national and international guidelines. (Sanoski-FIRL)
W74-08349

BITUMINOUS COAL - A SUBSTITUTE FOR ANTHRACITE FILTER MEDIA IN TWO-LAYER FILTRATION OF WATER,
Central Public Health Engineering Research Inst., Nagpur (India).
For primary bibliographic entry see Field 5F.
W74-08350

VIRUS REMOVAL IN WASTE STABILISATION PONDS,
Indian Inst. of Tech., Kanpur. Dept. of Civil Engineering.
M. Chaudhuri.
Indian Journal of Environmental Health, Vol 16, No 3, p 171-177, July 1973. 1 tab, 32 ref.

Descriptors: Reviews, Data collections, *Oxidation lagoons, *Treatment facilities, *Waste treatment, *Waste water treatment, *Viruses.
Identifiers: *Virus removal.

A review of the published data indicates that waste stabilization ponds are effective in reducing the virus levels of raw waste water and treated effluents. Presence of algae and bacteria, chemical and organic contents of the pond water, detention time and temperature and sunlight may play significant roles in the removal or inactivation of viruses. A shallow pond with a longer detention time may be more effective in reducing virus concentrations. (Sandoski-FIRL)
W74-08352

SWEDISH TECHNIQUES TO COMBAT POLLUTION,
Vattenbyggnadsbyran I td., Stockholm (Sweden).
E. Isgard, and L. Ehrlen
Effluent and Water Treatment Journal, Vol 14, No 2, p 97-101, February 1974. 4 ref.

Descriptors: *Sewage treatment, *Treatment facilities, Water pollution control, Methodology, Regulations, Environmental control, Sludge treatment, Filtration, Operations, Operating costs, Water reuse, *Waste water treatment.
Identifiers: *Sweden

The demand on sewage treatment has increased in Sweden due to the increased population and the problems of waste disposal and subsequent water pollution. To facilitate the fulfillment of requirements set by the authorities as a result of the new environmental protection regulations, the national government grants contributions to certain municipal treatment plants. As of July 1973, wastes from 94 percent of the people living in urban areas were treated in sewage treatment plants, those facilities using either biological treatment or both biological and chemical treatment (estimated at more than 50 percent by 1975). Different mechanical, biological, and chemical treatment methods used in Sweden, their operational results, sludge treatment processes, operating costs of facilities, and various filtration and reuse procedures are discussed. (Sandoski-FIRL)
W74-08353

SOME USEFUL IDEAS ON WASTE WATER REDUCTION,
Western Electric Co., Inc., New York, N.Y.
R. H. Haralson.
Plating, Vol 61, No 4, p 310-313, April 1974. 5 fig.

Descriptors: *Design criteria, *Waste treatment, *Waste water treatment, Cleaning, Zinc, Corrosion.
Identifiers: Rinsing, Fog spraying, *Zinc plating process.

The reduction of waste must be made major design criteria in process planning, with a minimum of dilution and expense being the primary premises governing the design. Exemplified herein is a zinc plating process which consists of cleaning the surface to be plated, depositing the zinc on the surface, and passivating the surface to increase corrosion resistance. These steps of cleaning, rinsing, and fog spraying are discussed. (Sandoski-FIRL)
W74-08355

MODEL STUDIES ON REACTIONS OCCURRING IN OXIDATIONS OF LIGNIN WITH MOLECULAR OXYGEN IN ALKALINE MEDIA,
Vienna Univ. (Austria). Institut fuer Anorganische Chemie.
For primary bibliographic entry see Field 5B.
W74-08359

EXAMPLES OF SEWAGE SLUDGE INCINERATION IN THE UK,
I. C. Camp.
The Institution of Civil Engineers, Vol 56, Part 1, p 49-62, February 1974. 4 fig, 4 tab, 6 ref.

scriptors: *Sludge treatment, *Sewage sludge, cineration, *Treatment facilities, Municipal stes, Operating costs.
ntifiers: *United Kingdom.

ltiple hearth, rotary hearth, and fluidized bed inerators for sludge withdrawn from municipal vage are described followed by an account of installation now under construction for the ner Urban District Council. Reference is made similar schemes for the new City of Milton ynes, the Royal Borough of Caernarvon, and Borough of Banbury. The annual cost of in-eration is shown to range from $3.75 to $12.50 .50 = 1L) per person served by the system, the ount being dependent on the size of the installa-n and the hours run each day. (Sandoski-FIRL)
74-08364

LIDS SEPARATION FROM INDUSTRIAL ATERS AND EFFLUENTS: SCREENING AND RAINING,
ackett (F.W.) and Co., Ltd., Colchester ngland).
Berger.
emistry and Industry, No 2, p 50-52, Jan. 19, 74. 3 fig, 13 ref.

escriptors: Treatment facilities, Equipment, ater treatment, *Waste water treatment, creens, *Sieves, Filters, Filtration, Pumps, mping, *Sewage treatment, Pipelines, Industrial astes, Domestic wastes, Municipal wastes, eparation techniques.
entifiers: *Strainers.

reening (by gravity) is differentiated from raining (of pumped liquids in pipelines) by ference to the filtering force employed. Screens e classed into those having stationary or moving rfaces. The former include simple bar screens, tary or semirotary raking screens, and travelling ke screens. Moving screen surfaces include avelling bands and rotary drums. All travelling reens are self-cleaning. According to the screen-g degree required, rotary units comprise large-olume water screens (e.g., for cooling water in ower plants), sewage and effluent screens (e.g., sewage works inlets or sea outfall pumping sta-ons), and fine screens (e.g., for tertiary sewage eatment or raw reservoir water purification). trainers are distinguished from screens by being ways fully enclosed. Four basic strainer types in-ude the Y-type, the Sinlex basket, Duplex, and utomatic motorized self-cleaning strainers, such s the Bracket Strain-O-Matic. Recent develop-ents in the design, construction, and practical pplication of screens and strainers ared reviewed, nd probable future developments are indicated. Brown-IPC)
74-08393

TILIZATION OF INDUSTRIAL WASTES AND VASTE BY-PRODUCTS FOR PHOSPHORUS EMOVAL: AN INVENTORY AND ASSESS-IENT,
nvironmental Protection Service, Ottawa Ontario).
. J. A. Fowlie, and E. E. Shannon.
nvironment Canada Research Program for batement of Municipal Pollution, Canada-On-ario Agreement on Great Lakes Water Quality, esearch Report No. 6, June 1973. 87 p, 11 fig, 15 ab, 22 ref, 3 append. 72-3-5.

Descriptors: *Waste water treatment, *Industrial vastes, *Byproducts, *Sludge, *Phosphorus com-ounds, Chemical industry, *Canada, *Iron com-ounds, Effluents, Heavy metals, Hydrogen ion oncentration, Activated sludge, Chemical oxygen lemand, Sludge treatment, Incineration, Water euse, Recirculated water, Sulfates.
dentifiers: Pickle liquor, Ferrous sulfate, Ferric ulfate, Dunnville(Ontario), Ontario, Quebec.

A survey of 141 Ontario and Quebec companies resulted in an inventory of waste products. Discharges of 48 factories were evaluated for phosphorus removal efficency in jar tests. Several wastes having varying degrees of usefulness as by-products were identified, viz., pickle liquors, reclaimed ferrous sulfate heptahydrate, mill scale, spent mine acid, carbide lime, stack precipitator dusts, dross, red mud, and certain bag-house dusts and slags. Problems of waste reuse are discussed, and estimates are made of available quantities and of treatable waste water volumes. Effects of pickle liquor additions on a bench-scale activated sludge process were investigated. A liquor dosage of 20 g/liter (as Fe) gave effluent P levels consistently below 1 mg/liter for influent P levels as high as 9.3 mg/liter. The pickle liquor did not affect COD removal, effluent pH or effluent heavy metal content. Nearly all heavy metals added with the liquor accumulated in the mixed liquor solids. When ferric sulfate from sludge incinerator ash was evaluated for P removal on a pilot scale, a dosage slightly over 15 mg/liter (as Fe) gave effluent P levels below 1 mg/liter. Heavy metals again accumulated in the sludge and were not carried over into the effluent. Full-scale P removal studies at a wastewater treatment plant in Dunville, Ontario, using pickle liquor, were monitored for heavy metal levels in various plant streams. Except for Fe, no increase in metal transport occurred between baseline and pickle liquor addition. Significant increases occurred, however, in all metal concentrations in the mixed liquor, aerobic digester, and waste sludge solids. (Brown-IPC)
W74-08394

NUTRIENT CONTROL IN SEWAGE LAGOONS.
Pollutech Pollution Advisory Services Ltd., Oakville (Ontario).
Environment Canada, Research Program for Abatement of Municipal Pollution, Canada-Ontario Agreement on Great Lakes Water Quality, Research Report No. 8, (1973). 56 p, 27 fig, 2 tab, 7 ref, 3 append. 72-5-12.

Descriptors: *Phosphorus compounds, *Waste water treatment, *Aerated lagoons, *Phosphates, Aluminum, Iron compounds, Chemical precipitation, Solubility, *Simulation analysis, Computers, Effluents, Pollutants, Carbon, Temperature, Hydrogen ion concentration, Canada, Seasonal.
Identifiers: *Aluminum sulfate, *Ferric chloride, Shelbourne(Ontario).

Phosphorus (P) removal from waste waters by means of alum or ferric chloride additions to lagoon influents and subsequent precipitation of phosphates was studied, including design and operating problems, and effects of seasonal temperature variations and of pH. Lagoon conditions were simulated by two techniques. (1) Laboratory-scale simulators operating under controlled temperature and loading were seeded with bottom deposits and filled with effluent from full-scale lagoons in Shelbourne, Ontario. (2) A computer model was developed to simulate removal of soluble phosphates by alum precipitation. During periods of low dissolved oxygen, both P and C were resolubilized from bottom deposits in the full-scale control and the laboratory control lagoons. Resolubilization of P depended less on temperature and lagoon maturity than did the resolubilization of C. The P resolubilization could be controlled by continued alum addition to the laboratory lagoon; in the full-scale lagoon, the alum distribution was not sufficiently uniform to achieve such control. More extensive P resolubilization may occur at higher temperatures, but pH was not a governing factor. The computer model did not predict the P concentrations observed experimentally and would require extensive improvements not warranted at this time. Further studies are recommended. (Brown-IPC)
W74-08395

DESIGN AND PERFORMANCE CRITERIA FOR SETTLING TANKS FOR THE REMOVAL OF PHYSICAL-CHEMICAL FLOCS,
Toronto Univ. (Ontario). Inst. of Environmental Sciences and Engineering.
G. W. Heinke.
Environment Canada, Research Program for Abatement of Municipal Pollution, Canada-Ontario Agreement on Great Lakes Water Quality, Vol 1, Research Report No. 10, March 1973. 82 p, 20 fig, 12 tab, 44 ref, 2 append. 72-5-7.

Descriptors: *Treatment facilities, *Waste water treatment, *Flocculation, *Sedimentation rates, Aluminum, Iron compounds, *Lime, Sulfates, Sludge treatment, Recycling, Polymers, Sewage treatment, Effluents, Temperature.
Identifiers: *Ferric chloride, *Aluminum sulfate, Clarifiers, Aluminum compounds.

About 50 long-tube and short-tube laboratory settling tests were conducted on Humber sewage treatment plant raw wastewater with and without additions of alum, ferric chloride, lime, and polymers, supplemented by full-scale plant studies at Windsor and Sarnia for 8 and 1 month, respectively. Results were analyzed in terms of effluent solids and BOD, overflow rate, and detention time as functions of type and dosage of chemicals. All three inorganic additives increased the settling rate of solids. Lime gave the fastest, alum the slowest settling flocs. Addition of polymer and recycling of sludge further increased the settling rate. A scale-up factor of 2.0 was determined for the Sarnia clarifiers, indicating that laboratory settling or overflow rates must be halved for plant design to allow for the effects of turbulence and other variables in the clarifier. Variations in plant overflow rates between 300 and 600 gal/day/sq ft (or 15-30 cu m/sq m/day) affected the effluent quality only slightly. This may hold true at higher overflow rates, but needs to be confirmed by plant trials. (Brown-IPC)
W74-08396

HEAVY METALS IN AGRICULTURAL LANDS RECEIVING CHEMICAL SEWAGE SLUDGES,
Toronto Univ. (Ontario). Inst. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5E.
W74-08397

TO ESTABLISH VIABLE METHODS OF MAINTAINING WASTE TREATMENT FACILITY EFFICIENCIES WITH REFERENCE TO FLOW VARIATIONS.
Maclaren (James F.) Ltd., Willowdale (Ontario).
Environment Canada, Research Program for Abatement of Municipal Pollution, Canada-Ontario Agreement on Great Lakes Water Quality, Research Report No. 11, (1973). 91 p, 35 fig, 13 ref, 1 append. 72-5-10.

Descriptors: *Sewage treatment, *Treatment facilities, *Flow, *Equalizing reservoirs, *Hydraulic design, Hydraulic engineering, *Dimensional analysis, Dimensions, Aeration, Mathematical studies, Equations, Seasonal, Diurnal, Distribution patterns, Time, Variability, Design, Operation and maintenance.

Equalization of sewage flow variations has three major benefits: reduced unit size, more stable operation, and reduced bypassing of influent. A methodology for dimensioning of equalization facilities was developed, using actual flow data from a treatment plant of 40-50 MIGD (million Imperial gallons per day) capacity to account for diurnal and seasonal variations in sewage flow. Revised design criteria were established with the aid of basic concepts including modified hydraulic characteristics of equalized sewage flow. The method was then applied to a plant similar in size to that studied under equalized and varying flow conditions. Despite the conservative approach used (especially in dimensioning of aeration tanks

and final clarifiers), savings in capital costs seemed realizable from the installation of equalization facilities. The need for further investigations and more rigorous evaluation of the initial methodologies is pointed out. (Brown-IPC)
W74-08398

INTEGRATION OF PHYSICO-CHEMICAL AND BIOLOGICAL WASTE-WATER TREATMENT PROCESSES,
Waterloo Univ. (Ontario). Research Inst.
W. R. Dryman, and D. H. Haycock.
Environment Canada, Research Program for Abatement of Municipal Pollution, Canada-Ontario Agreement on Great Lakes Water Quality, Research Report No. 7, (1973). 112 p, 23 fig, 36 tab, 7 ref.

Descriptors: *Waste water treatment, *Activated sludge, *Phosphorus compounds, *Pilot plants, Aluminum, *Silica, *Aeration, Effluents, Phosphorus, Sulfates, Hydraulic design, Treatment facilities.
Identifiers: *Aluminum sulfate, Activated silica.

Alum was added to an activated sludge process for phosphorus removal, and the effects on the operation and performance of the system were investigated, using two parallel pilot plants with design capacities of 2 million gal/day (mgd) at various hydraulic loadings (1.5, 2.0, and 2.5 mgd). One plant was run as a control, while 100 mg/liter of alum and 4 mg/liter of activated silica were added to the aeration tank of the other for removal of P. Additional laboratory studies were performed with continuous-flow, bench-scale models to gain information unobtainable from the pilot plants. (Brown-IPC)
W74-08399

CHEMICAL DOSAGE CONTROL FOR PHOSPHORUS REMOVAL.
Pollutech Pollution Advisory Services Ltd., Oakville (Ontario).
Environment Canada, Research Program for Abatement of Municipal Pollution, Canada-Ontario Agreement on Great Lakes Water Quality, Research Report No. 4, March 1973. 80 p, 44 fig, 7 tab, 7 ref. 72-5-11.

Descriptors: *Sewage treatment, *Municipal wastes, *Sewage effluents, *Phosphorus compounds, *Chemical precipitation, *Chemcontrol, Rates of application, Economics, *Monitoring, Automatic control, Aeration, Aluminum, Correlation analysis, Phosphorus, Mixing, Testing, Sampling, Solubility, Chemicals, Cost-benefit analysis, Kinetics, *Waste water treatment.
Identifiers: Aluminum hydroxide, Aluminum sulfate, Aluminum compounds, Jar tests.

Jar tests and full-scale studies were conducted to determine whether a simple monitoring procedure could control the addition of chemicals in municipal waste treatment plants, whether proportional control of chemical dosing would be economical, to identify those specific parameters that could be monitored for dosage control, and where such controls should be advantageously located. The chemical dosage required for a 1 mg/liter phosphorus residual could be predicted if jar tests were repeated on the same waste sample. Savings in chemical consumption of 30-40% might be achieved if a controller capable of measuring chemical requirements to the same accuracy as the jar test could be developed. The full-scale studies revealed a reasonable correlation between final effluent P and soluble P in the aeration tank effluent after chemical addition; limiting the tank effluent's soluble P concentration to 0.2 mg/liter would be expected to give 1 mg/liter of P residual in the final effluent 80% of the time. The observed P removal was postulated to occur in 3 distinct steps, the majority being removed in the aeration tank. Addition of alum to mixed liquor resulted in immediate precipitation of a fairly constant percentage of soluble P, almost independently of the chemical dosing rate. Increasing the dosing rate caused an eventual decrease in the amount of P removed. Automatic control of chemical addition, based on final effluent P is technically feasible, but such a controller would have to be heavily damped. In the treatment plant, a sudden increase in the dosing rate did not immediately affect the aluminum hydroxide concentration. The latter increased slowly, resulting in an eventual improvement of final effluent quality. The system was thus shown to be strongly self-regulatory. Hence adequate control might be achieved by manual adjustment of dosing rates a few times daily after P measurements in the final effluent. (Brown-IPC)
W74-08400

RECENT DEVELOPMENTS IN TREATMENT OF PAPERMAKING EFFLUENTS IN FRANCE (DEVELOPPEMENTS RECENTS DU TRAITEMENT DES EFFLUENTS DE PAPETERIE EN FRANCE),
P. Treille.
La Papeterie, Vol 95, No 6, p 440-446, 449, June 1973. 9 fig, 4 tab.

Descriptors: *Treatment facilities, Equipment, *Pulp wastes, *Waste water treatment, *Sedimentation, *Flocculation, *Flotation, Pulp and paper industry, Europe, Fibers(Plant), Effluents, Industrial wastes, Organic loading, Dissolved solids, Suspended solids, Waste water(Pollution), Water pollution control, Pollution abatement.
Identifiers: *France, Savealls, Fiber recovery, Paper machines, White water.

Three relatively new types of effluent-treatment equipment are described: The 'Turbocirculator' is a circulatory rotor device designed specifically for use in sedimentation units of paper mills. A new flotation-type saveall is geared to handle effluents that are low in mineral and high in organic loadings, as well as to fiber and fines recovery from paper machine white waters. A new electroflocculator makes use of an electric field to flocculate suspended and dissolved solids. Three case histories are cited to illustrate the results obtained by one or more of these systems in pulp and paper mill waste water treatment plants. (Speckhard-IPC)
W74-08402

PULP, PAPER, AND BOARD IN THE ENVIRONMENT -- PART 8: ENVIRONMENTAL PROBLEMS OF THE WEST GERMAN PULP, PAPER, AND BOARD INDUSTRY.
For primary bibliographic entry see Field 5G.
W74-08405

PULP, PAPER, AND BOARD IN THE ENVIRONMENT -- PART 9. POLLUTION ABATEMENT IN THE FINNISH PULP AND PAPER INDUSTRY.
For primary bibliographic entry see Field 5G.
W74-08406

REPLACEMENT OF THE ANTHRACITE SUBLAYER IN ANION-EXCHANGE FILTERS OF WATER PURIFICATION EQUIPMENT (ZAMENA ANTRATSITOVOGO PODSLOYA V ANIONITOVYKH FIL'TRAKH VODOOCHISTNYKH USTANOVOK),
Ukrainskii Nauchno-Issledovatelskii Institut Bumagi, Kiev.
V. V. Mitkova, Kh. M. Pinskaya, L. M. Vaisman, A. I. Ivanov, and N. I. Vanina.
Bumazhnaya Promyshlennost', No 11, p 13, Nov. 1973. 1 tab.

Descriptors: *Waste water treatment, Pulp wastes, Water treatment, *Industrial water, Pulp and paper industry, *Ion exchange, *Electrical conductance, Water quality, *Water purification, Desalination, Carbon, Conductors, Conductivity, Cation exchange, Anion exchange, Coals.
Identifiers: *USSR(Kommunar Paper Mill), Capacitor papers, Electrical papers, Paper mills, Process water.

The process water needed for the manufacture of capacitor papers must be particularly pure, notably free of electroconductive contaminants. At the Kommunar Paper Mill (USSR), water is demineralized in ion-exchangers filled with cation- and anion-exchange resins. The treated water was, however, found to contain carbon particles originating from the anthracite that is used as a substrate layer in the second-stage anionic resin filters. Replacement of this layer by an unspecified new material reduced the number of electroconductive particles embedded in the manufactured paper from ca 32 to 11-13/sq m. The feasibility of ion-exchange without any substrate layers, as practiced in East German paper mills, should be researched for further improvements in the water supply quality. (Stapinski-IPC)
W74-08407

ROLE OF ULTRAFILTRATION IN INDUSTRIAL EFFLUENT PROBLEMS,
Dorr-Oliver, Ltd., Croydon (England).
F. Forbes.
Chemistry and Industry, No 2, p 56-58, Jan. 19, 1974. 2 fig.

Descriptors: *Reverse osmosis, *Filtration, *Membrane processes, *Separation techniques, *Dewatering, Water treatment, *Waste water treatment, Paints, Dairy industry, Activated sludge, Industrial wastes, Optimization, Electrophoresis, Polymers, Pressure, Temperature, Porosity, Membranes, Permeability, Solvents, Effluents, Proteins.
Identifiers: *Ultrafiltration.

The theoretical principle, operating variables, and optimized design of ultrafiltration systems for various applications are reviewed. Ultrafiltration is a pressure-activated process using semipermeable polymeric membranes to separate molecular or colloidal materials dissolved or suspended in a liquid phase according to molecular weight in the range of 5000 to 100,000. The first asymmetric membranes were produced by Loeb and Sourirajan at U.C.L.A. in the early 1960's. These membranes comprise an ultrathin (0.5-1.5 micrometer) surface layer of fine pore texture supported on a more porous thicker (5-10 mil) layer. Theoretical flux rates of 100-500 gal/sq ft/day have not been approached by commercial isotropic plastic films which are ca. 13 micrometer thick and can process only 0.1-1.0 gal/sq ft/day. Fouling of membrane surfaces by gel formation in the retained solute offers high resistance to flow. Membrane permeation rates are also a function of operating pressure, temperature, solids concentration, fluid viscosity, hydrophilic nature of solvents, and other variables. Process developments follow three different approaches: creation of a reversible hydrodynamic situation; periodic regeneration of membranes; and pretreatment of the feed to inhibit film formation. Industrial applications of ultrafilters include electrophoretic painting, lactose separation and protein concentration from dairy effluents, and effluent dewatering in combination with activated sludge treatment. (Brown-IPC)
W74-08408

TREATMENT SYSTEM HANDLES FLEXO INK AND STARCH WASTE IN SINGLE OPERATION,
Japan Corrugated Board and Box Inst., Tokyo.
T. Sugaya.
Paperboard Packaging, Vol 58, No 12, p 28, 30, 32-33, Dec. 1973. 3 tab, 4 fig.

Descriptors: *Waste water treatment, *Treatment facilities, *Water conservation, *Pulp wastes,

*Recirculated water, *Industrial wastes, Chemical precipitation, Coagulation, Dewatering, Sludge treatment, Calcium hydroxide, Iron compounds, Chlorides, Filtration, Coagulation, Recycling, Adhesives, Carbohydrates, Foreign research, Biochemical oxygen demand, Suspended solids, Chemical oxygen demand, Sedimentation rates, Costs.
Identifiers: Printing inks, Flexographic inks, Printing industry, Graphic arts, Corrugated boards, Starch, Corrugating adhesives, Starch paste, Wash water, Ferric chloride, Japan, Printing machines, Paperboards, Converting industry.

Waste waters from the manufacture of printed corrugated board contain residues of flexographic inks and starch paste. These pollutants are removed by a newly developed Japanese process. The mixed wastes are treated first with ferric chloride and calcium hydroxide in a mixing tank and then pumped to a settling tank. After rapid precipitation, the sludge is removed from the tank bottom and transferred to a dehydration tank where it is treated with coagulants and then dewatered by filtration. The clarified effluent from the settling tank is reused as wash water for the flexographic printing presses and as makeup water for the preparation of fresh corrugating adhesive. The treatment system removes 82% of the suspended solids, 96.4% of the BOD, and 97% of the COD from the combined starch/ink waste waters. Treatment costs for a typical corrugated board and box factory are indicated. (Witt-IPC)
W74-08409

PROCESS OF PHYSICAL-CHEMICAL PURIFICATION FOR WASTE WATERS FROM PAPER AND BOARD MILLS (PROCEDE DE NETTOYAGE CHIMICO-PHYSIQUE POUR LES RESTES D'EAUX USEES DES FABRIQUES DE PAPIER ET CARTON),
B. Morgeli.
La Papeterie, Vol 95, No 6, p 479-482, June 1973. 5 fig, 2 tab, 5 ref.

Descriptors: *Pulp wastes, *Treatment facilities, *Waste water treatment, *Water pollution control, Flocculation, Filtration, Oxidation, Ozone, Adsorption, Activated carbon, Waste water(Pollution), Pollutants, Discharge(Water), Pulp and paper industry, Effluents, Industrial wastes.
Identifiers: Board(Paperboard) mills.

Discussed is the use of various treatments combining flocculation, filtration, ozonization-oxidation, and activated carbon adsorption for the removal of pollutants from paper and paperboard mill waste waters prior to their discharge. (Speckhard-IPC)
W74-08410

PURIFICATION OF SULFITE MILL EFFLUENTS FROM LIGNOSULFONATES (OCHISTKA PROMSTOKOV SULFITNO-TSELLYULOZNOGO PROIZVODSTVA OT LIGNOSUL'FONATOV),
Moscow State Univ. (USSR).
O. I. Luk'yanova, E. S. Solov'eva, N. F. Pilinskaya, and P. A. Rebinder.
Bumazhnaya Promyshlennost', No 11, p 19-20, Nov 1973. 1 tab.

Descriptors: *Lignins, *Sulfonates, *Sulfite liquors, Water pollution control, *Waste water treatment, *Pulp wastes, *Adsorption, Calcium hydroxide, Magnesium hydroxide, *Chemical precipitation, Sedimentation rates, Pulp and paper industry, Effluents, Chemicals, Organic loading, Water pollution sources, Incineration, Oxides.
Identifiers: Chemical recovery, Calcium oxide, Magnesium oxide, Specific surface, Surface area, Adsorbents, Lignosulfonates, Lignosulfonic acids.

Spent sulfite pulping liquors and other sulfite mill effluents can be freed simply and economically of lignosulfonate salts (LS) by adsorption on Mg or Ca hydroxides. During in situ formation of these hydroxides, upon addition of MgO or CaO to the aqueous effluent, their surface area is greatly increased, up to 1000 sq m/g, so that they can sorb up to 3-4 g of LS per g of anhydrous oxide added. However, monovalent cation salts of lignosulfonic acids (Na and ammonium LS) adsorb poorly and should first be converted to Al or Fe salts. In practical trial runs, good results were achieved with relatively small additions of MgO, depending on the concentration of LS in solution. Thus, 3-4% of MgO (based on spent sulfite liquor weight) sorbed most of the LS from 2% solutions and 90% of the LS from 6-7% solutions. A slight excess of oxide over the theoretically required dosage is recommended to accelerate sedimentation of the resulting precipitate from which the oxide can then be recovered by calcination at 500-600C. This thermal treatment should again increase the specific surface of the oxides and hence their sorption capacity. (Stapinski-IPC)
W74-08412

AERATION OF EFFLUENTS IN AERATION TANKS (AERATSIYA STOCHNYKH VOD V AEROTENKAKH-VYTESNITELYAKH),
Vsesoyuznyi-Nauchnyi Planovii Otdel Bumazhnoi Promyshlennost (USSR).
V. G. Zav'yalov, L. I. Shmidt, V. M. Khazak, and A. V. Uglitskikh.
Bumazhnaya Promyshlennost', No 11, p 17-18, Nov 1973. 2 fig.

Descriptors: *Equipment, *Aeration, *Waste water treatment, *Pulp wastes, *Treatment facilities, Pulp and paper industry, Bubbles, Oxygen, Waste water(Pollution), Water pollution control, Pollution abatement, Foreign research, Efficiencies.
Identifiers: *USSR Solikamsk Pulp and Paper Mill.

An effective pneumo-mechanical aeration system developed in the USSR for use in pulp and paper mill effluent aeration tanks is expected to become commercially operative in 1975. In the mean time, a mechanical device for improved utilization of oxygen (beyond the 4-10% efficiency of presently installed aerator tubes or plates) has been tried out at the Solikamsk Pulp and Paper Mill (USSR). The theoretical principle involved is prolonged contact of air bubbles with the waste water to be treated. This is achieved by posing mechanical obstacles in the path of rising air bubbles. The perforated plates and tubes developed and installed for this purpose are described in some detail. In comparative experiments, these perforated aerators almost doubled the biological purification efficiency (in terms of the ratio of COD to aeration time) compared to plain tubes and plates. (Stapinski-IPC)
W74-08413

POLLUTION ABATEMENT AT THE VENIZEL MILL OF LA ROCHETTE-CENPA (LUTTE ANTI-POLLUTION A L'USINE DE VENIZEL DE LA ROCHETTE-CENPA),
D. Ladmiral.
La Papeterie, Vol 95, No 6, p 469-470, 473, June 1973. 3 illus.

Descriptors: *Pulp wastes, *Sulfite liquors, *Pollution abatement, *Waste water treatment, Water pollution control, *Treatment facilities, Europe, Pulp and paper industry, Waste water treatment, Aerated lagoons, Effluents, Incineration, Evaporation.
Identifiers: *France, Clarifiers.

A French sulfite pulp and paper mill has switched from calcium-base sulfite liquor to the ammonium sulfite semichemical process, partly for ecological reasons, and has installed equipment and processes for evaporation and combustion of the spent cooking liquor, as well as a clarifier and three aeration lagoons for effluent treatment. The facilities are described. (Speckhard-IPC)
W74-08416

OPERATION OF PILOT PLANT EQUIPMENT FOR PURIFICATION OF EFFLUENTS FROM THE STEFAN KIRADZHIEV PULP AND PAPER MILL IN NOVI KRICHIM (SYZLAVANE REZHIM NA RABOTA NA POLUPROIZVODSTVENA PRECHISTVATELNA STANTSIYA ZA PROMISHLENI OTPADYCHNI V ODI OT KTSKH 'STEFAN KIRADZHIEV' GR. NOVI KRICHIM),
M. Paskalev, and N. Markova.
Tseluloza i Khartiya (Sofia), Vol 4, No 5, p 30-31, Sept-Oct 1973. 2 tab, 3 ref.

Descriptors: *Pulp and paper industry, Europe, *Pulp wastes, *Waste water treatment, *Treatment facilities, *Pilot plants, Aeration, Sedimentation, Suspended solids, Biological treatment, Biochemical oxygen demand, Effluents, Water pollution treatment, Microorganisms, Biodegradation, Nutrients, Nitrogen compounds, Phosphorus compounds, Temperature, Neutralization, Sulfur compounds, Oxidation.
Identifiers: *Bulgaria.

A Bulgarian pulp and paper mill installed a pilot plant with a flow capacity of 15 liter per sec for effluent treatment prior to construction of a full-scale plant with 876 liter/sec capacity. Effluents are first mechanically freed of suspended solids, neutralized to pH 7.05-7.10, subjected to forced air for removal of sulfur compounds, and then treated with nutrients (to give a 5-day BOD:N:P ratio of 100:5:1) before passing to an aeration tank for biological purification. Of the two process variants tried, both developed in the USSR, the continuous method was found to be superior to the multistage method. It provided for continual spontaneous increase of microorganisms and gave a corresponding increase in purification efficiency even in winter at 10C effluent temperatures. After three months of pilot plant operation, a 5-day BOD reduction of up to 87.8% was achieved. (Stapinski-IPC)
W74-08417

SYSTEM OPTIMIZATION FOR PULP AND PAPER INDUSTRIAL WASTEWATER TREATMENT DESIGN,
Texas A and M Univ., College Station. Dept. of Industrial Engineering.
C. S. Shih, and P. Krishnan.
Water Research, Vol 7, No 12, p 1805-1820, Dec 1973. 8 fig, 11 tab, 13 ref.

Descriptors: *Pulp wastes, *Waste water treatment, *Optimization, Treatment facilities, *Dynamic programming, Theoretical analysis, *Decision making, Methodology, Economic justification, Planning, *Systems analysis, Cost-benefit analysis, Cost comparisons, Pollution abatement, Pulp and paper industry, Management, Mathematical models.

The rapid diversification of newly developed waste water treatment processes and facilities for combating ever-increasing industrial pollution loads necessitates a systems approach to the choice of the most suitable and economical among various alternatives. An optimization procedure is presented which integrates dynamic programming techniques into existing process design principles to permit decisions on the best combination of operations in a multistage system. The procedure, which makes use of 'decision inversion' and of specially developed practical cost functions, is illustrated by a numerical example of a typical pulp and paper mill effluent treatment installation. (Witt-IPC)
W74-08418

EXAMPLES OF THE USE OF THE 'SECLAR' DECANTER IN TREATING PAPER INDUSTRY EFFLUENTS (EXEMPLES D'APPLICATION DU

DECANTEUR 'SECLAR' AU TRAITEMENT D'EFFLUENTS DE L'INDUSTRIE PAPETIERE),
Societe Alsthom, Paris (France). Techniques des Fluides.
M. Delachanal, and P. Lejeune.
La Papeterie, Vol 95, No 6, p 450-452, 455-457, June 1973. 4 fig.

Descriptors: *Activated sludge, *Pulp wastes, *Biological treatment, Treatment facilities, *Waste water treatment, Water pollution treatment, Pollution abatement, Equipment, Europe, Pulp and paper industry.
Identifiers: *France, *Seclar clarifier, Clarifiers.

Three examples of effluent treatment installations using the 'Seclar' sedimentation saveall are described, viz., at Saint-Vallier (Papeterie de la Ferrandiniere), at Wardrecques (Cartonnerie de Gondarnennes), and at Fos-sur-Mer (Etablissement Voisin et Pascal) in France. Solids coagulation and flocculation in these units is achieved by additions of aluminum sulfate, lime, and anionic polyelectrolytes. Although BOD and COD reductions vary from case to case, solids removals of the order of 93-99% are reported. (Speckhard-IPC)
W74-08419

WASTE WATER PROBLEMS OF THE TEXTILE INDUSTRY. PART I. OXYGEN DEMAND OF PRINTING PASTE THICKENERS. (PROBLEMI INERENTI LE ACQUE DI SCARICO NELL'INDUSTRIA TESSILE. IO. LA DOMANDA DI OSSIGENO DI ADDENSANTI DA STAMPA),
Stazione Sperimentale per la Cellulosa, Carta e Fibre Tessili Vegetali ed Artificiali, Milan (Italy). Laboratorio Analisi delle Acque.
For primary bibliographic entry see Field 5B.
W74-08421

A 6000 GALLON/TON FINE PAPER MACHINE WATER SYSTEM,
American-Israeli Paper Mills Ltd., Hadera (Israel).
L. Rakosh.
Pulp and Paper Magazine of Canada, Vol 75, No 3, p 63-66, Technical Paper T69-72, March 1974. 3 fig, 2 tab.

Descriptors: *Water reuse, Freshwater, *Reclaimed water, *Pulp and paper industry, Water pollution, Activated sludge, Effluents, Pulp wastes, Water conservation, Suspended solids, Biochemical oxygen demand, Water consumption(Except consumptive use), Activated sludge, Pilot plants, Fibers(Plant), Recycling.
Identifiers: Paper machines, White water, Deinking, Savealls, Waste paper, *Israel.

Fresh water consumption on a fine paper machine at American-Israeli Paper Mills Ltd. (Hadera, Israel) was reduced over a 10 year period from 35,000 to 6,000 gallons per ton of paper produced. Modifications to the white water systems, savealls, and press section flows to achieve this savings are described. Daily calculations are made of water consumption and effluent flows, and irregular losses are traced and coded. Machine effluent was reduced by 87%, suspended solids and BOD were reduced by 60%. Fiber savings are 500 tons per year. Part of the machine effluent is used as wash water in the deinking plant. An activated sludge process is under pilot plant study. (Buchanan-IPC)
W74-08424

PERMEABILITY OF HIGH ASH PAPERMILL SLUDGE,
Michigan State Univ., East Lansing. Dept. of Civil Engineering.
O. B. Andersland, and R. W. Laza.
Journal of the Sanitary Engineering Division, American Society of Civil Engineers, Vol 98, No SA6, p 927-936, Dec 1972. 5 fig, 2 tab, 17 ref.

Descriptors: *Sludge treatment, *Pulp wastes, *Bubbles, *Gases, *Deaeration, *Hydraulic properties, *Permeability, Sludge, Pressure, Mercury, Waste treatment.

The permeability of a secondary fiber mill sludge was greatly decreased by trapped gas bubbles. The threshold hydraulic gradient required to initiate flow dropped with increased back pressures and approached zero when the pressure sufficed to dissolve the gas. Pretreatment with HgO and vacuum removed the bubbles effectively. In the absence of gas bubbles, sludge permeability increased with increased organic content, particularly at low solids contents. The addition of 10% lime or fly ash improved the permeability. (Buchanan-IPC)
W74-08425

VOITH CIRCULAR CLARIFYING BASIN FOR BAIERSBRONN (VOITH-RUNDKLAERBECKEN FUER BAIERSBRONN).
Der Papiermacher, Vol 22, No 6, p 92, June 9, 1973. 1 fig.

Descriptors: *Waste water treatment, *Pulp wastes, *Equipment, Filtration, Europe, Pulp and paper industry, Industrial wastes, Pollution abatement, Filters, Screens.
Identifiers: *West Germany, Fiber recovery, White water, Paper machines, Board(Paperboard) mills, Savealls.

The design, constructional, and operational characteristics of a white water saveall made by the J. M. Voith Co. (Austria) are described, along with its use in fine fiber recovery from paper machine white waters and for waste water purification at the paperboard mill of the Deutsche Zundholzfabriken GmbH at Baiersbronn, West Germany. The basin has a diameter of 15 m, an average water level of 4m, and a capacity of ca. 770 cu m. It is designed to process 5000 liters of waste water per minute. (Speckhard-IPC)
W74-08427

POLLUTION OF THE DRAMMENS RIVER BY THE WOOD-PROCESSING INDUSTRY (TREFOREDLINGSINDUSTRIENS UTSLIPP TIL DRAMMENSVASSDRAGET),
For primary bibliographic entry see Field 5B.
W74-08428

SOME RESULTS OF WATER PURIFICATION AT VISCOSE RAYON FACTORIES (NEKOTORYE ITOGI RABOTY VODOOCHISTNYKH SOORUZHENNII PREDPRIYATII VISKOZNYKH VOLOKON),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Iskusstvennogo Volokna, Leningrad (USSR). Leningradskii Filial.
E. S. Shapiro, V. A. Klyueva, A. Z. Ioffe, and M. I. Lokhnina.
Khimicheskie Volokna, Vol 14, No 4, p 54-55, 1972. 3 tab.

Descriptors: *Textiles, *Industrial wastes, *Waste water treatment, Foreign countries, *Expenditures, *Costs, Economics, Pollution abatement, Water pollution control, Chemicals, Capital costs, Operating costs, Treatment facilities.
Identifiers: Viscose rayon, *USSR.

The economic aspects of water purification at twelve Soviet viscose rayon factories are discussed. Antipollution costs varied widely among installations. Capital expenditures were lowest in plants having minimal or incomplete treatment facilities, or which were about to start operation. A significant proportion of purification costs was due to purchase of chemical reagents. (Chern-IPC)
W74-08429

CENTRIFUGAL DEWATERING OF SECONDARY WASTE SLUDGES,
Organization Pennwalt Ltd., Camberley (England)
J. Ford
Chemistry and Industry, No 2, p 58-61, Jan 19, 1974. 7 fig, 1 ref

Descriptors: *Centrifugation, *Equipment, *Treatment facilities, *Sludge treatment, *Dewatering, *Waste water treatment, Industrial wastes, Operation and maintenance, Costs, Capital cost, Operating cost
Identifiers: Centrifuges, SludgePak centrifuge.

The design, operation, and practical performance, including cost, of the 'SludgePak' imperforate bowl knife centrifuge are discussed, particularly with regard to the dewatering of sewage works secondary sludges, industrial aerobic sludges, and water treatment alum sludges. All of these sludges are light and slimy and difficult to dewater by filtration techniques. Cost savings are attributed partly to the unit's operation without need for polyelectrolyte additives. (Brown-IPC)
W74-08431

MEDIA FILTRATION IN EFFLUENT AND WASTE WATER TREATMENT,
D. B. Purchas.
Chemistry and Industry, No 2, p 53-55, Jan. 19, 1974. 5 tab, 1 diag, 8 ref.

Descriptors: *Filters, *Filtration, *Treatment facilities, *Equipment, *Waste water treatment, *Water treatment, Separation techniques, Dewatering, Suspended solids, Centrifugation, Effluents.

Mechanical solids-liquid separation techniques include filtration and sedimentation as major subgroups. Filters comprise essentially two parts, the filter medium and the supporting hardware. Media can be classed according to their rigidity, porosity, and relative performance. In addition, the selection of the right filter for a given application must also consider pretreatment methods, such as chemical dosing, heating, freeze/thaw, ultrasonic, ionized radiation, and prethickening. Waste water and effluent filtration comprises two broad categories: clarification (removal of small amounts of solids from large volumes of liquid, e.g., by sand filters) and cake filtration (recovery of large amounts of solids from concentrated slurries, e.g., by filter presses). Modern trends in filter design are outlined, such as the Immedium upward-flow, precoat pressure (swimming pool), Granger reversible, and vacuum filters. The Johnson-Progress X-press, the Soviet FPKAM filter, the Guva tower press, and the Osprey filterbelt press are examples of variable-volume belt-type units employing mechanical squeezing as the driving force without need for suction or pump pressure. (Brown-IPC)
W74-08432

AN EVALUATION OF THE ADSORPTIVE PROPERTIES OF FLY ASH AND BARK-DERIVED ACTIVATED CHAR,
National Council of the Paper Industry for Air and Stream Improvement, Inc. New York.
R. C. Whittemore.
NCASI Stream Improvement Technical Bulletin, No 267, 41 p, May 1973. 4 fig, 22 tab, 56 ref.

Descriptors: *Fly ash, *Activated carbon, Bark, *Wood wastes, *Adsorption, Pulp wastes, *Waste water treatment, Phenols, Iodine, Color, *Biochemical oxygen demand, *Bleaching wastes, Hardwood, Softwood, Alkalinity, Acidity, Hydrogen ion concentration, Lime, Effluents, Water pollution treatment, Pollution abatement, Water pollution control, Pulp and paper industry.
Identifiers: Adsorbents, Charcoal, Woodrooms(Pulp mill), Bleach plants, White water, Paper machines, Paper mills, Pulp mills.

The pollutant-adsorbing characteristics of 18 representative fly ash samples were evaluated. Fly derived from conifer bark adsorbed phenol nearly as well as did a commercial activated carbon, but were less effective toward iodine. Fly ashes from deciduous bark effectively removed both color and BOD from an alkaline bleach plant effluent, partly owing to the high lime content of these wastes. Bark-derived chars removed BOD and color from an acidic bleach plant effluent and from a caustic woodroom effluent, but were ineffective toward a caustic bleach plant effluent and a clarified paper mill waste water. (Buchanan-IPC)
W74-08435

PULP INDUSTRY AND ENVIRONMENTAL PROTECTION (ZELLSTOFF-INDUSTRIE UND UMWELTSCHUTZ),
R. H. Seidl.
Oesterreichische Papier-Zeitung, Vol 79, No 6, p 1, June 1973.

Descriptors: Pulp and paper industry, Europe, *Pulp wastes, *Sulfite liquors, Treatment facilities, *Mangnesium compounds, *Sulfur compounds, Pollution abatement, Costs, Capital costs, Water pollution control.
Identifiers: Austria, *Lenzing pulping process, Chemical recovery, Spent sulfite liquors, Dissolving pulps, Magnesium bisulfite.

An outline is presented of pollution-control efforts by the pulp and paper industry in Austria. The magnesium bisulfite pulping and chemical recovery process developed by Chemiefaser Lenzing AG. is described in particular. It is geared to the use of commercially available Austrian magnesite for the manufacture of dissolving-grade pulps with recovery of MgO (85%) and sulfur (70%). About 95% of all spent liquors are being subjected to the evaporation, combustion, and chemical recovery process. Another Austrian installation treats 97-98% of its spent liquors in a three-stage pressure filter plant that cost ca. 80 million Austrian shillings. (Speckhard-IPC)
W74-08436

LAMELLAR SEDIMENTATION OF FIBER-CARRYING WASTE WATERS (LAMELLSEDIMENTERING AV FIBERHOLDIG VANN),
Norwegian Pulp and Paper Research Inst., Oslo.
O. Ronning.
Norsk Skogindustri, Vol 27, No 11, p 310-314, Nov 1973. 10 fig, 2 tab, 5 ref. English summary.

Descriptors: *Pulp wastes, *Fibers(Plant), Suspended solids, *Waste water treatment, *Sedimentation, Flow around objects, *Flow augmentation, *Flow separation, Theoretical analysis, Equipment, *Treatment facilities, Pulp and paper industry, Pollution abatement.
Identifiers: Surface area, Specific surface, Lamellar savealls, Savealls, White water, Fiber recovery, Fines(Fine fibers), Paper machines, Clarifiers.

The lamellar principle of solids recovery from paper-machine white water is based on the use of inclined plates in the sedimentation unit in order to increase the effective area available for the settling of fines (fine fibers). Three white waters from different paper machines were subjected to lamellar sedimentation at different overflow rates. The optimum overflow rate was found to depend on the settling behavior of fibers tested in a laboratory sedimentation pipe. The lamellar principle can increase the capacity of existing clarifiers and the efficiency of fines recovery from white water systems. Some theoretical and practical details of the principle are described and illustrated. (Brown-IPC)
W74-08437

SLUDGE INCINERATION AND AFTERBURNING,
Dorr-Oliver, Inc., Stamford, Conn.
R. B. Zang.
Deeds and Data (Water Pollution Control Federation), April 1974, p D2-D3, D5, D10. 1 fig, 6 ref.

Descriptors: *Incineration, *Sludge treatment, *Dewatering, *Drying, *Fly ash, *Air pollution, *Odor, Fuels, Operation and maintenance, Treatment facilities, Sludge disposal, Sludge.
Identifiers: Furnaces, Flue gases(Stack gases).

The installation of afterburners is not justifiable from a process viewpoint. The further use of high-cost afterburners with concomitant problems of equipment dimensioning should be discouraged. A return to the basic principle of multiple-hearth furnace operation is advocated. Effective incineration of sludge without offensive exhaust gases can be achieved by allowing domestic sludge to dry to 50% moisture on the upper hearths, using only the heat from rising flue gases, in the absence of direct flame, and then dropping the sludge to a burning hearth at temperatures sufficient to destroy organic compounds. At least two or three full hearths should be allowed for sludge predrying without auxiliary fuel. Under varying loads, the drying and burning zones of sludge incinerators should be maintained by changing the speed of the center shaft, in addition to controlling the auxiliary fuel. Scrubbers should be designed to remove not only fly ash but also any water-soluble volatile acids that might excape. Subcooling of the flue gases will also limit the visible plumes that have created the erroneous impression that sludge incinerators are serious sources of air pollution. (Brown-IPC)
W74-08441

AUTOMATIC WASTE SLUDGE SAMPLER,
Hampton Township Water Pollution Control Plant, Allison Park, Pa.
For primary bibliographic entry see Field 5A.
W74-08442

ANAEROBIC BIOLOGICAL STABILIZATION OF SANITARY LANDFILL LEACHATE,
Kentucky Univ., Lexington. Office of Research and Engineering Services.
E. G. Foree, and V. M. Reid.
Available from NTIS, Springfield, Va. 22151, PB-219 043, Price $4.50 printed copy; $0.95 microfiche. College of Engineering Technical Report 65-73-CE 17, January 1973. 43 p, 8 fig, 4 tab, 14 ref.

Descriptors: *Landfills, *Leaching, *Water pollution control, *Waste water treatment, Water pollution treatment, Biodegradation, Oxygen demand, *Anaerobic digestion.
Identifiers: *Anaerobic filters.

Sanitary landfill leachate was treated anaerobic biological methods. Two treatment systems, the anaerobic digester and the submerged anaerobic filter, were evaluated. Three digesters operated at 35 deg C and loaded at 40 lb COD/1000 cu ft/day (20-day detention time) had COD removal efficiencies from 93% to 95%. A fourth digester operated 35 deg C and loaded at 80 lb COD/1000 cu ft/day (10-day detention time) had a COD removal efficiency of 92%. A fifth digester operated at 20 deg C loaded at 40 lb COD/1000 cu ft/day (20-day detention time) had a COD removal efficiency of 77%. COD removal efficiencies were calculated based on the soluble COD of the effluent. The anaerobic filter had a loading of 80 lb COD/1000 cu ft/day (10-day detention time) and a final COD removal efficiency of 96%. An activated sludge unit, added for further stabilization of the filter effluent, increased the total COD removal efficiency to 97%. (Knapp-USGS)
W74-08448

BIOLOGICAL, PHYSICAL AND CHEMICAL TREATMENT OF WOOD SOAKING VAT WASTEWATER,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
E. G. Foree, and R. J. Bruner, III.
Available from NTIS, Springfield, Va. 22151, PB-219 020, Price $3.00 printed copy; $0.95 microfiche. College of Engineering Technical Report 66-73-CE 18, January 1973. 42 p, 5 fig, 9 tab, 9 ref.

Descriptors: *Waste water treatment, *Activated sludge, Activated carbon, Chemical oxygen demand, Chlorination, Color, *Biological treatment, *Anaerobic digestion.

A treatment process was developed for wood soaking vat leachate. The wastewater from these soaking vats is highly colored (2200 to 5000 color units) and had a relatively high COD (3500 mg/liter to 7700 mg/liter). Several laboratory-scale activated sludge units and one anaerobic digester were evaluated. Anaerobic digestion was not a satisfactory treatment process, but activated sludge treatment at a 10-day retention time without sludge recycle gave efficient treatment (97% COD removal and 78% color removal). Activated sludge treatment was followed by alum-lime flocculation to speed sludge settling, and to increase color and COD removal. This treatment used 750 mg/liter alum and 20 mg/liter lime and yielded total COD removal efficiency of 98.1% and total color removal of 93.6%. The effluent from the flocculation treatment was further polished by chlorination and activated carbon treatment. The maximum removal efficiency achieved from this process was 99.0% COD removal and 99.5% color removal. (Knapp-USGS)
W74-08449

WATER RESOURCES, ENVIRONMENT AND NATIONAL DEVELOPMENT--VOLUME I: SUMMARY OF PROCEEDINGS, AND VOLUME II: SELECTED PAPERS.
For primary bibliographic entry see Field 5G.
W74-08454

THE REUSE OF SEWAGE EFFLUENT FOR INDUSTRIAL PURPOSES IN SINGAPORE,
Singapore Dept. of Public Works. Sewerage Branch.
In: Water Resources, Environment and National Development--Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 61-71, 1972. 3 fig, 2 tab, 1 ref.

Descriptors: *Water reuse, *Reclaimed water, Sewage treatment, *Waste water treatment, Industrial water, Recycling.
Identifiers: *Singapore.

Reuse of sewage effluent in Singapore has been practiced since the first treatment works, the Alexandra Road Sewage Disposal Works, was established in 1915. Reclaimed water is used for multiple purposes such as cleaning tanks, watering plants, and cooling. The final effluent from the Ulu Pandan Sewage Treatment Works is treated for reuse as industrial water by filtration and chlorination. About 3 mgd of industrial water is used daily by some 34 industries. (See also W74-08454) (Knapp-USGS)
W74-08458

MUNICIPAL WASTEWATER RECLAMATION AND REUSE,
Camp, Dresser and McKee International, Inc., Boston, Mass.
R. H. Culver, and R. H. Thomas.
In: Water Resources, Environment and National Development--Volume II: Selected Papers;

Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 87-94, 1972. 2 tab, 13 ref.

Descriptors: *Water reuse, *Reclaimed water, *Waste water treatment, Sewage treatment, *Municipal water, Water supply, Water quality, California.
Identifiers: South Africa.

Methods used to reclaim usable water from municipal wastewater are reviewed. The results obtained, the costs of construction and operation, the precautions to be observed in the use of reclaimed water, and alternative potential uses of reclaimed water are considered. The water reclamation projects at Santee and South Lake Tahoe in California, and at Windhoek in South West Africa are described in detail. (See also W74-08454) (Knapp-USGS)
W74-08461

PLANNING FOR WATER REUSE,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
D. A. Okun.
In: Water Resources, Environment and National Development--Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 121-127, 1972. 46 ref.

Descriptors: *Water reuse, *Water distribution(Applied), Water management(Applied), *Reclaimed water, Public utilities, Water conservation, *Planning.

Reclaiming wastewaters for nonpotable purposes, such as for urban irrigation, industry, and toilet flushing, in a planned water resource program relieves the pressure on limited resources of high quality water, reduces the cost of water for nonpotable purposes, reduces pollution of the receiving bodies of water, and reduces the risk in polluted waters that would be used for drinking if such a water reclamation program was not instituted. A hierarchy of water quality is proposed, whereby high quality freshwaters would be reserved for high quality uses such as drinking and cooking, while polluted waters and reclaimed wastewaters would be used for nonpotable purposes. (See also W74-08454) (Knapp-USGS)
W74-08465

SEWERAGE; SEWAGE TREATMENT AND DISPOSAL IN SINGAPORE,
Singapore Dept. of Public Works. Sewerage Branch.
In: Water Resources, Environment and National Development--Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 143-180, 1972. 10 fig, 3 tab, 6 ref.

Descriptors: *Sewage treatment, *Waste water disposal, Waste treatment, Environmental sanitation, Sanitary engineering, Sewage disposal.
Identifiers: *Singapore.

The history of the sewerage system in Singapore from its inception to the present is discussed. The method of treatment and modus operandi are described; capital and operating costs are discussed. The future of the existing works, the need for additional treatment for the future and the types of works for the future also discussed. (See also W74-08454) (Knapp-USGS)
W74-08467

DISPOSAL OF INDUSTRIAL TRADE EFFLUENTS FROM THE FOOD INDUSTRIES,
Singapore Inst. of Standards and Industrial Research.
Tan Hui Boon.
In: Water Resources, Environment and National Development--Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 181-188, 1972. 2 tab, 15 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Food processing industry, Industrial wastes, Organic matter, Heavy metals
Identifiers: *Singapore.

The problems of trade effluent disposal faced by the food industries in Singapore are discussed. The food industry includes manufacture of meat, vegetable, dairy, oil and fermented products. Partly because of the character of the trade effluents, it may be possible to channel such wastes directly into sewers subject to a levy imposed by the relevant authority. (See also W74-08454) (Knapp-USGS)
W74-08468

PETROLEUM REFINERY EFFLUENT QUALITY CONTROL,
Esso Research and Engineering Co., Linden, N.J.
R. Kilpert.
In: Water Resources, Environment and National Development--Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 224-230, 1972. 9 fig.

Descriptors: *Water pollution control, *Waste water treatment, *Oily water, *Oil industry, Tertiary treatment, Oil fields, Oil wastes, Membrane processes, Industrial wastes.

The protection of water is of concern to the petroleum industry. Further, population growth, greater energy demand, and urbanization increase regulation of industrial discharges. Effective and economical long-range planning and implementation of pollution control facilities require a reasonable, scientific approach when setting allowable contaminant levels. Dissolved air flotation, mixed media filtration, and chemical flocculation are used to separate oil and water. For oxygen demand reduction, various biological treatment processes are available including stabilization lagoons, trickling filters, and activated sludge. Chemical oxidation, using sodium peroxide or chlorine, is known but rarely used. Adsorption on carbon is also possible. Hydrogen sulfide may be removed by stream, air and flue gas stripping or fractionation. Ammonia may be reduced by high temperature stripping, fractionation or biological treatment. Biological treatment is also effective for phenol removal as are adsorption on carbon and injection into refinery desalters. Ion exchange, for example, can be used to reduce chemical oxygen demand (COD), total dissolved solids (TDS) and suspended solids. At the same time, odor- and color-producing contaminants and some toxic substances are substantially removed. Promising membrane processes include reverse osmosis and electrodialysis. (See also W74-08454) (Knapp-USGS)
W74-08473

POLLUTION CONTROL OF DISCHARGE INTO RIVERS, LAKES AND COASTAL WATERS IN THE PHILIPPINES,
National Water and Air Pollution Control Commission, Manila (Philippines).
For primary bibliographic entry see Field 5G.
W74-08482

ANALYSIS OF WATER REUSE ALTERNATIVES IN AN INTEGRATED URBAN AND AGRICULTURAL AREA,
Utah Water Research Lab., Logan.
A. B. Bishop, and D. W. Hendricks.
In: Systems Planning and Design: Case Studies in Modeling, Optimization, and Evaluation (Ed. by R. de Neufville and D. H. Marks). Prentice Hall, Inc., Englewood Cliffs, New Jersey, p 169-189 (Chapter 13), 1974. 8 fig, 3 tab, 8 equ, 12 ref.

Descriptors: *Water allocation(Policy), *Water utilization, *Water reuse, *Linear programming, Water supply, *Water demand, *Alternative planning, Transportation, Waste water treatment, Evaluation, Regions, Optimization, Design, Analytical techniques, Recycling, Decision making, Water quality, Water quantity, Constraints, Water costs, Desalination, Tertiary treatment, Systems analysis, Mathematical models, *Utah
Identifiers: Cost minimization, Multiobjective planning, *Salt Lake City(Utah), Urban areas, Agricultural areas, Sequential reuse, Parametric analysis.

A methodology is developed for exploring all permutations of water use and selecting the best alternatives. Presented is a conceptual framework for analyzing water reuse alternatives; a linear programming model for evaluating alternatives of sequential and recycle reuse in an integrated agricultural and urban environment is developed. The model determines the optimal allocations of water from each supply source to each use sector, and can be used either to minimize cost or maximize net benefits. Since quality constraints may necessitate treatment before reuse, three levels of treatment are considered: (1) conventional primary-secondary; (2) tertiary; and (3) desalting. The model is used to solve transportation problem, the objective being to minimize the cost to the region of transporting and treating water subject to constraints. Next, problems associated with water treatment operations, desalting plants, blending facilities, and physical system limitations are considered in terms of being incorporated into the basic transportation model. The reuse model is applied to the Salt Lake City, Utah area. The study indicates: how primary, secondary, and recycle supply sources should be allocated to satisfy demands at least cost; given a constant water supply and projections of future demands, it shows the types of treatment processes for water reuse which would meet demands most cheaply; The required capacities for treatment facilities are indicated, as well as, through parametric analysis, the time when they should be phased into the system. (See also W74-08506) (Bell-Cornell)
W74-08510

LABORATORY FLOTATION STUDIES OF TENNESSEE PHOSPHATES IN THE PRESENCE OF SLIMES,
Bureau of Mines, Tuscaloosa, Ala. Tuscaloosa Metallurgy Research Center.
W. E. Lamont, C. E. Spruiell, Jr., D. R. Brooks, and I. L. Feld.
Bureau of Mines Report of Investigations 7601, 1972. 17 p, 17 tab.

Descriptors: *Phosphates, *Mine wastes, *Recycling, *Flotation, *Waste treatment, Separation techniques, Water pollution control, Industrial wastes, *Tennessee, *Slime.
Identifiers: Phosphate slimes.

Phosphate-bearing waste pond materials, low-grade washer products, and raw ores, all from the Tennessee brown phosphate district, could be treated without desliming to recovery high-grad phosphate concentrates. Fine grinding before flotation was a requisite for increased recovery of the phosphate values. The optimum pH conditions were in the range of 10.0 to 10.5 when using anionic collectors. Multiple cleaning of the rougher phosphate concentrate was required to produce high-grade concentrates. Phosphates

recoveries ranged from 60% to 82% and were inversely related to the grade of concentrate produced. (Knapp-USGS)
W74-08588

RECOVERY OF PHOSPHATES AND METALS FROM PHOSPHATE SLUDGE BY SOLVENT EXTRACTION,
Bureau of Mines, Rolla, Mo. Rolla Metallurgy Research Center.
H. E. Powell, L. L. Smith, and A. A. Cochran.
Bureau of Mines Report of Investigation 7662, 1972. 12 p, 4 fig, 6 tab, 11 ref.

Descriptors: *Phosphates, *Mine wastes, *Recycling, *Solvent extractions, *Waste treatment, Separation techniques, Water pollution control, Industrial wastes, Slime.
Identifiers: Phosphate slimes.

A solvent extraction procedure was developed for recovering trisodium phosphate, zinc, and iron from waste phosphate sludge. The sludge is dissolved in hydrochloric acid, and iron is extracted as ferric chloride by isopropyl ether. Zinc is extracted by di-2-ethylhexyl phosphoric acid in kerosine. The efficiencies of the one- and two-stage extractions range from 98% to nearly 100%. Trisodium phosphate is recovered by crystallization from the raffinate. The value of two marketable products is considerably more than the costs of the major reagent. The process was developed to permit recycling of values in this waste and to consequently reduce stream pollution. (Knapp-USGS)
W74-08590

ELECTROPHORESIS AND COAGULATION STUDIES OF SOME FLORIDA PHOSPHATE SLIMES,
Bureau of Mines, Tuscaloosa, Ala. Tuscaloosa Metallurgy Research Lab.
O. Terichow, and A. May.
Bureau of Mines Report of Investigations 7816, 1973. 2 fig, 4 ref.

Descriptors: *Waste disposal, *Coagulation, *Mine wastes, *Phosphates, Water pollution control, Clays, *Waste treatment, Industrial wastes, Flocculation, Ion exchange, Separation techniques, *Florida, *Slime.
Identifiers: Phosphate slimes.

A method is being developed to promote rapid settling of the solids in wastes from phosphate processing by the addition of a particle system not intrinsically associated with the slimes. The fines from phosphate-rock beneficiation are discharged as a waste clay-slime in a slurry of about 5% solids. Current practice is to store the slimes behind dikes or dams for settling, which takes place very slowly, sometimes extending well over a decade. The problem is aggrevated by the volume of the slimes that occupy 1.5 times the volume of the cavity left from mining the matrix, and storage of the slime in surface impoundments poses a potential environmental hazard, even with well-constructed dams and dikes. Electrophoretic mobility measurements were made on samples of Florida phosphate slimes to determine the optimum conditions of coagulation and precipitation in aluminum sulfate solutions. Addition of silica sand and other selected materials as mutual coagulants demonstrates the practicability of coagulating two dissimilar particle systems by elimination of the repulsive double layers. By proper selection of the solution and its concentration, reduction of the double layer to a zero point of charge causes coagulation and rapid precipitation of both particle systems. (Knapp-USGS)
W74-08591

ANALYSES OF TARS, CHARS, GASES, AND WATER FOUND IN EFFLUENTS FROM THE SYNTHANE PROCESS,
Bureau of Mines, Pittsburgh, Pa. Pittsburgh Energy Research Center.
For primary bibliographic entry see Field 5A.
W74-08592

CONTROL OF MINE DRAINAGE FROM COAL MINE MINERAL WASTES: PHASE II. POLLUTION ABATEMENT AND MONITORING,
Consolidation Coal Co., Pinckneyville, Ill. Midwestern Div.
For primary bibliographic entry see Field 5G.
W74-08661

INDUSTRIAL PROCESSING WITH MEMBRANES.
Wiley-Interscience, New York, N.Y. 1972. R. E. Lacey and S. Loeb, editors. 348 p.

Descriptors: *Membrane processes, *Waste water treatment, *Reverse osmosis, *Filtration, *Infiltration, *Permeability, *Electrodialysis, *Water purification, Pulp wastes, Industrial wastes, Pollution abatement, Treatment facilities, Economics.
Identifiers: *Ultrafiltration.

The 13 chapters of this volume, authored by different experts, discuss the theoretical principles, physical chemistry, technology, practical applications, and economic aspects of electrically driven and pressure-driven membrane processes, notably reverse osmosis, ultrafiltration, and gas permeation. Included are 2 chapters on applications of electrodialysis and reverse osmosis to the treatment of pulp and paper mill and other industrial wastes. Pertinent references to the literature are listed after each chapter. A subject index is appended. (Brown-IPC)
W74-08664

5E. Ultimate Disposal Of Wastes

RIPPON SQUASHES CENTRAL WASTE TREATMENT PRECEDENT,
M. Shwer.
Surveyor, Vol 143, No 4263, p 10, February 1974.

Descriptors: *Administrative decisions, *Chemical wastes, *Waste disposal, Sites, Waste treatment, *Waste water treatment, *Treatment facilities.
Identifiers: *Great Britain(Birmingham).

A decision regarding the site of a chemical waste treatment plant near Birmingham, England is discussed. Environment Minister Geoffrey Rippon refused the site because local residents put up a strong opposition to a waste treatment plant on the grounds they had suffered from previous industrial development. The proposed plant was to have handled up to 10 tons of solids and 45,000 gallons of concentrated aqueous wastes per week by chemical treatment. A further two tons of both liquid and solid wastes were to have been incinerated per hour, adding up to 350 tons per week incinerated. This last figure is the equivalent of 80,000 gallons a day of solvents. The chemical plant effluent would have been about 10-20,000 gallons per day, and residues were expected to amount to some 20 tons per week from chemical treatment and 60-70 tons per week from incineration. (Merritt-FIRL)
W74-08213

AUTOMATION COMES TO L.A.,
Brown and Caldwell, San Francisco, Calif.
For primary bibliographic entry see Field 5D.
W74-08225

THOSE NASTY PHOSPHATIC CLAY PONDS.
For primary bibliographic entry see Field 5D.
W74-08227

NEW METHODS TO DISPOSE OF USED METALWORKING EMULSIONS, (NEUE VERFAHREN ZUR BESEITIGUNG GEBRAUGHTER METALL-BEARBEITUNGS-EMULSIONEN),
Esso AG Forschungszentrum, Hamburg (West Germany).
For primary bibliographic entry see Field 5D.
W74-08247

SEWAGE TREATMENT AND DISPOSAL.
For primary bibliographic entry see Field 5D.
W74-08261

EXAMPLES OF SEWAGE SLUDGE INCINERATION IN THE UK,
For primary bibliographic entry see Field 5D.
W74-08364

HEAVY METALS IN AGRICULTURAL LANDS RECEIVING CHEMICAL SEWAGE SLUDGES,
Toronto Univ. (Ontario). Inst. of Environmental Sciences and Engineering.
J. C. Van Loon.
Environment Canada, Research Program for Abatement of Municipal Pollution, Canada-Ontario Agreement on Great Lakes Water Quality, Research Report No. 9, March 1973. 37 p, 3 fig, 10 tab, 31 ref, 2 append. 72-5-3.

Descriptors: *Sewage treatment, *Sludge disposal, *Fertilizers, *Land management, Agriculture, Agronomic crops, *Soil disposal fields, Nutrients, *Toxicity, *Heavy metals, Surveys, Publications, Data collections, Sludge, Standards, Sampling, Soil-water-plant relationships, Plant growth.

The spreading of sewage treatment plant sludges on agricultural lands could achieve a double objective as a disposal mechanism and as a source of plant nutrients, provided that toxic effects (e.g., from heavy metal contaminations) can be alleviated. A survey of research reports from various countries disclosed few precise results on plant-metal interactions. The use of standard and control samples for validating the data is urged. No conclusions, except a few generalizations, are warranted at present. (Brown-IPC)
W74-08397

PERMEABILITY OF HIGH ASH PAPERMILL SLUDGE,
Michigan State Univ., East Lansing. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W74-08425

SLUDGE INCINERATION AND AFTERBURNING,
Dorr-Oliver, Inc., Stamford, Conn.
For primary bibliographic entry see Field 5D.
W74-08441

ACTIVATED SLUDGE DISPOSAL IN A SUBARCTIC ENVIRONMENT,
Hill, Ingman, Chase and Co., Seattle, Wash.
C. Patterson.
Deeds and Data (Water Pollution Control Federation), April 1974, p D6-D8, 3 tab, 3 fig, 2 ref. (Paper presented at 46th Annual Conference, WPCF, Cleveland, Ohio, Sept. 30-Oct 4, 1973).

Descriptors: *Subarctic, *Alaska, *Sludge disposal, *Activated sludge, *Cold regions, *Costs, *Operating costs, *Transportation, Climatology, Temperature, Heating, Ice fog, Fog, Weather, Weather patterns, Microorganisms, Pathogenic bacteria.
Identifiers: Trucks, Trucking.

Subarctic environments pose special problems which aggravate the already difficult tasks of

sludge disposal. These problems include survival of pathogenic microorganisms, the generation of ice fog, the prevalence of subzero temperatures, and the need for seasonal adjustments in operating procedures. A flexible solution to these problems has been attempted in Fairbanks, Alaska. It makes use of temperate-climate technologies plus appropriate adaptations, such as heated trucks. Costs of such an operating system are also indicated. (Brown-IPC)
W74-08443

SEWERAGE; SEWAGE TREATMENT AND DISPOSAL IN SINGAPORE,
Singapore Dept. of Public Works. Sewerage Branch.
For primary bibliographic entry see Field 5D.
W74-08467

EFFECTIVE USE OF HIGH WATER TABLE AREAS FOR SANITARY LANDFILL.
VTN, Orlando, Fla.
Available from the National Technical Information Service as PB-224 996, $5.25 in paper copy, $1.45 in microfiche. Final Report, 1973. 172 p, 36 fig, 42 tab, 25 ref, 1 append. S-802283.

Descriptors: *Landfills, *Water management(Applied), Pollution, *Water table, *Drainage systems, *Solid wastes, *Florida, Groundwater, Waste water, Sewage treatment, Sewage effluents, Water pollution sources, Water pollution, Water quality, Leachate, Water wells, Wellpoints, Future planning(Projected), Long-term planning, Drainage programs, Drainage water, Drainage wells, Flood control, Flooding, Floods.
Identifiers: *Orange County(Florida), Sanitary fill, Solid waste demonstration grant, Little Econlockhatchee River(Fla), Demonstration cells.

A long-range program upgrading the Orange County, Florida, solid waste disposal system is being implemented. While sanitary landfilling is the disposal method used, information concerning sanitary landfill in areas with a high ground water table is lacking. To obtain it, the county obtained a Solid Waste Demonstration Grant from the Environmental Protection Agency to carry out a three-year program of tests. A survey of the first two years' progress is presented. Evidence shows that 'demonstration cell' designs for public use and franchised refuse collection are satisfactory, while procedures for handling smaller public vehicles are being studied. The drainage system is effective in preventing project flooding during intensive rainfall, but rains have caused localized flooding. Water quality investigations of Little Econlockhatchee River show pollution from two areas of domestic waste effluents. With one exception, shallow well chemical sampling shows pollution-free water, providing excellent natural baseline data facilitating contamination detection from sanitary landfill leachates. Total Model Landfill expenses showed a cost/ton ratio of $3.37, but is expected to drop to $2.81 due to stability of operating techniques, equipment maintenance improvement, and personnel experience. (Grden-North Carolina)
W74-08486

WASTE DISPOSAL SYSTEMS FROM A GROUNDWATER HYDROLOGY AND POLLUTION POINT OF VIEW,
Ministry of the Environment, Ottawa (Ontario). Water Quality Branch.
R. J. Patterson.
Water and Sewage Works, Reference No 1974, p R92-R99, April 30, 1974. 3 fig, 2 tab, 3 ref.

Descriptors: *Waste water disposal, *Water pollution control, *Groundwater, Groundwater movement, Infiltration, Seepage, Irrigation water, Sprinkler irrigation, Hydrogeology.
Identifiers: *Land disposal(Wastes), Spray irrigation.

Disposal and treatment of solid and liquid wastes on land are gaining wide acceptance. Numerous methods for dealing with the many types of waste are available: solids, depending on the source, may be landfilled or spread; while liquids are handled by systems employing infiltration basins, surface flooding and spray irrigation. In an unconfined aquifer situation the water-table will mound beneath the disposal site. As the height of the mound increases the rate of groundwater flow away from the site becomes greater. When a stable mound configuration is established the increase in groundwater flow from the site balances the new input of effluent. The development of a groundwater mound will alter natural water-table gradients, and may cause some of the waste to flow in different directions then the normal direction of groundwater flow. Proper and complete hydrogeologic, soil, and design data can permit prior recognition of areas susceptible to ground and surface water pollution. (Knapp-USGS)
W74-08594

5F. Water Treatment and Quality Alteration

THE ROLE OF DISINFECTION IN THE OPTIMUM ENVIRONMENT,
Georgia Inst. of Tech., Atlanta.
R. S. Ingols.
Journal of the Society for Water Treatment and Examinations, Vol 22, No 3, p 147-152, 1973. 10 ref.

Descriptors: *Disinfection, *Water purification, *Swimming pools, Chlorine, *Chlorination, Industrial wastes, Public health, Ecology, Environment, *Waste water treatment.

A philosophical discussion on the definiation of an optimum environment and the role of disinfection in achieving it is presented. Part of the dilemma facing today's control agencies lie in the fact that the answer to yesterday's major problem is today's enigma. The best example of confusion in the aquatic environment is the required maintenance of high free chlorine residuals to kill all bacteria and viruses instantly in public and semipublic swimming pools. Yet, chlorine was added to industrial wastes and failed to reduce the bacterial count of coliform organisms. In a report of studies upon the bacterial numbers found in the swimming beaches of several small lakes, it was found the people who swam there had fewer infections than those people who swam in chlorinated pools. The public health philosophy stresses a high free chlorine content, while the ecologists feel that a clear water is not more likely to induce disease transmission than personal contact in any other environment. (Merritt-FIRL)
W74-08205

POTABLE-WATER SUPPLY BY MEANS OF UPFLOW FILTRATION (L'EAU CLAIRE PROCESS),
Dept. of Tulane Univ., New Orleans, La. Dept. of Civil Engineering.
B. J. Haney, and S. E. Steimle.
Journal of the American Water Works Association, Vol 66, No 2, p 117-123, Feb, 1974. 8 fig, 5 tab, 15 ref.

Descriptors: *Flitration, Evaluation, *Polyelectrolytes, *Potable water, *Water supply, *Waste water treatment, Performance, Filters, Turbidity, Water quality, Treatment facilities, *Water treatment.
Identifiers: Upflow filtration, L'Eau Claire Process.

Upflow filtration is a recent development in the history of water filtration. By using polyelectrolytes and progressively finer filter media a potable water can be produced that compared favorably with waters treated by conventional methods that require flocculation, sedimentation and filtration. The L'Eau Claire process is a water treatment method that uses both of these developments. To recognize the potential of upflow filtration in potable water production, an upflow research project was initiated using a 4-foot diameter upflow filter in the evaluation. Test results indicate that the process with effluent disinfection can be used as a means of potable water treatment of surface supplies, yielding excellent quality water under continuing operation. It should be noted that turbidities above 280 Jtu the utility of the process is limited by very short filter runs. However, process parameters and plant configuration can be altered to compensate for this deficiency. (Sandoski-FIRL)
W74-08210

VIRUS REMOVAL BY DIATOMACEOUS-EARTH FILTRATION - PART 1,
Gibbs and Hill, Inc., New York, N.Y.
T. S. Brown, J. F. Malina, Jr., and B. D. Moore
Journal of the American Water Works Association, Vol 66, No 2, p 98-102, February 1974. 3 fig, 6 tab, 11 ref.

Descriptors: *Diatomaceous earth, *E. coli, *Viruses, *Bacteriophage, *Filtration, Desorption, Hydrogen ion concentration, Efficiencies, *Waste water treatment, *Water treatment.
Identifiers: *Virus removal.

This study, involving the removal of bacterial viruses from water using diatomaceous earth filter aids, covers the comparative properties of uncoated and polyelectrolyte-coated products as they affect the process. The work is based on studies using bacteriophage T2 for Escherichia coli. The removal efficiencies presented were calculated to represent only that removal due to attachment to the diatomaceous earth and filtration through the filter aid. The optimal T2 recovery required attachment at pH 6.25 and desorption at pH 9.55. The procedure for coating the filter aid with inorganic coagulants affects the efficiency of T2 virus removal. (Sandoski-FIRL)
W74-08215

THE COUNTING OF AEROBIC ACTINOMYCETES IN WATER SAMPLES (DENOMBREMENT DES ACTINOMYCETES AEROBIES DE L'EAU),
Institut Pasteur, Lille (France). Laboratoire d'Hydrobiologie.
For primary bibliographic entry see Field 5A.
W74-08220

THE PROS AND CONS OF AUTOMATED FILTERS,
Gary-Hobart Water Corp., Gary, Ind.
For primary bibliographic entry see Field 5D.
W74-08226

DISINFECTION OF WATER USING CHLORINE DIOXIDE,
Wallace and Tiernan, Inc., San Francisco, Calif.
For primary bibliographic entry see Field 5D.
W74-08253

NITRATE REMOVED AT WATER TREATMENT PLANT,
Bowne (Sidney B.) and Son, Mineola, N.Y.
J. C. Gregg.
Civil Engineering-ASCE, Vol 43, No 4, p 45-47, April, 1973. 1 fig.

Descriptors: *Water treatment, *Water quality, Water pollution sources, *Nitrates, *Ion exchange, *New York, Water supply.
Identifiers: *Long Island(N.Y.).

ising nitrate content in the water supply in Long land has become a problem, mainly due to harply increasing population and the widespread se of septic tanks and cesspools there. In one ater district, it was serious enough to shut down ells with a potential reduction of 60% in the rea's water supply. A solution seems to be found y adapting an ion exchange method to remove the itrates from the water. (Skogerboe-Colorado tate)
W74-08317

MANUAL FOR CALCULATION OF CONVENTIONAL WATER TREATMENT COSTS,
Control Systems Research, Inc., Arlington, Va.
For primary bibliographic entry see Field 3A.
W74-08333

BRACKISH WATER DESALTING, TESTING AND EVALUATION PROCEDURES WITH MOBILE TEST FACILITY,
Burns and Roe Construction Corp., Paramus, N.J.
For primary bibliographic entry see Field 3A.
W74-08335

BITUMINOUS COAL - A SUBSTITUTE FOR ANTHRACITE FILTER MEDIA IN TWO-LAYER FILTRATION OF WATER,
Central Public Health Engineering Research Inst., Nagpur (India).
R. Paramasivam, S. K. Gadkari, N. S. Joshi, and A. W. Deshpande.
Indian Journal of Environmental Health, Vol 16, No 3, p 178-188, July, 1973. 4 fig, 1 tab, 9 ref.

Descriptors: *Filtration, *Application methods, *Water treatment, *Bituminous materials, *Filters, Pilot plants, Laboratory tests, *Waste water treatment.
Identifiers: *India.

High rate filtration using two-layer and mixed media filters is finding increasing application in both overloaded filters and new filter plants. Work done on the suitability of indigenous bituminous coal as a substitute material for anthracite filter media, which is not available in India, is described. Laboratory and pilot studies show that rates up to 50-100 percent higher than conventional filters can be achieved by adoption of two-layer filters using bituminous coal. (Sandoski-FIRL)
W74-08350

REPLACEMENT OF THE ANTHRACITE SUBLAYER IN ANION-EXCHANGE FILTERS OF WATER PURIFICATION EQUIPMENT (ZAMENA ANTRATSITOVOGO PODSLOYA V ANIONITOVYKH FIL'TRAKH VODOOCHISTNYKH USTANOVOK),
Ukrainskii Nauchno-Issledovatelskii Institut Bumagi, Kiev.
For primary bibliographic entry see Field 5D.
W74-08407

DEVELOPMENT OF WATER SUPPLY IN VIETNAM,
Ministry of Health, Saigon (Vietnam). Environmental Sanitation Service.
For primary bibliographic entry see Field 5G.
W74-08460

5G. Water Quality Control

APPLICATION OF REVERSE OSMOSIS TO ACID MINE DRAINAGE TREATMENT,
Environmental Protection Agency, Rivesville, W. Va., Crown Mine Drainage Control Field Site.
For primary bibliographic entry see Field 5D.
W74-08155

BEEF CATTLE FEEDLOT SITE SELECTION FOR ENVIRONMENTAL PROTECTION,
Robert S. Kerr Environmental Research Lab, Ada, Okla. National Animal Feedlot Wastes Research Program.
R. D. Kreis, and L. R. Shuyler.
Copy available from GPO Sup Doc as EP1.23/2:72-129, $1.00; microfiche from NTIS as PB-232 701, $1.45. Environmental Protection Agency National Environmental Research Center Report EPA-R2-72-129, November 1972. 39 p, 5 fig, 55 ref, append.

Descriptors: *Water pollution control, *Feed lots, Farm wastes, Cattle, Confinement pens, Path of pollutants, Farm management, Planning, Sites.
Identifiers: *Site selection(Feedlots).

Environmental pollution can be significantly reduced in feedlots by adequate facility planning, management, and most importantly, by proper site selection Climatic, topographic, and local weather extremes of the general area, selected with regard to economic and market factors, should be considered when planning the type of feeding facility. A site should then be selected which would decrease the pollution potentials and be readily adapted to necessary controls. This report should be used when locating a new facility or when modifying an existing feedlot. Many of the concepts and ideas presented cannot be economically superimposed on an existing operation. (Knapp-USGS)
W74-08156

THE ECOLOGICAL ROLE OF INLAND WETLANDS,
Connecticut Coll., New London. Dept. of Botany.
For primary bibliographic entry see Field 2L.
W74-08164

INSECTS (CHRYSOPS FLIES) IN CONNECTICUT SALT MARSHES,
Connecticut Agricultural Experiment Station, New Haven.
For primary bibliographic entry see Field 2L.
W74-08166

FEDERAL POLICY TOWARDS WETLANDS,
Environmental Protection Agency, Edison, N.J. Federal Water Programs.
R. J. Nadeau.
In: Proceedings of First Wetlands Conference, Storrs, Connecticut, June 20, 1973: Connecticut University Institute of Water Resources Report No 21, p 144-145, December 1973.

Descriptors: *Wetlands, *Connecticut, *Water law, *Federal water pollution control act, Legislation, Judicial decisions, Public rights, Water resources development, Swamps, Marshes, Tidal marshes, Land use.

The U.S. Environmental Protection Agency takes particular note concerning decisions on proposals that potentially will damage wetlands, to recognize the interrelationship between man and the wetlands, and to preserve and protect them from damaging misuses. The Agency minimizes alterations of natural water flow that nourishes wetlands by protecting them from adverse dredging or filling practices, solid waste management practices, siltation or pesticide contamination or toxic material spills and through construction activities; and to maintain applicable water quality standards. The Agency does not grant Federal funds for construction of municipal waste water treatment facilities if such activities will interfere with the existing wetland ecosystem; the exception being that no other alternative of lesser environmental damage is found to be feasible. This policy implicates and involves all EPA program activities. (See also W74-08157) (Knapp-USGS)
W74-08170

PRELIMINARY SYSTEM DEVELOPMENT--CHEMICAL HAZARDS RESPONSE INFORMATION SYSTEM (CHRIS), APPENDIX VII--SUPPORTING INFORMATION.
Little (Arthur D.) Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5B.
W74-08181

THE CONTROL OF POLLUTION FROM HYDROGRAPHIC MODIFICATIONS.
Environmental Protection Agency, Washington, D.C. Office of Air and Water Programs.
Available from Sup Doc, GPO, Washington, D.C. 20402, price $1.95. Report EPA-430/9-73-017, 1973. 188 p, 9 fig, 4 tab, 59 ref.

Descriptors: *Water pollution control, *Channel improvement, Urbanization, Reservoirs, Levees, Dams, Water pollution sources, Thermal stratification, Aeration, Path of pollutants.
Identifiers: Water pollution control act.

Nonpoint sources of pollutants and processes, procedures, and methods to control pollution resulting from changes in the movement, flow or circulation of any navigable waters or groundwaters, including changes caused by the construction of dams, levees, channels, or flow diversion facilities are discussed. Changes in flow patterns through channel modification, reservoir construction, urbanization, and other causes are identified and, if possible, methods to reverse or alleviate damages are described. (Knapp-USGS)
W74-08186

GRANGEMOUTH TUNNEL SEWER,
For primary bibliographic entry see Field 8A.
W74-08197

CLEANUP DOWN BY THE OLD MILL STREAM.
Environmental Science and Technology, Vol 8, No 4, p 314-315, April, 1974.

Descriptors: *Federal Water Pollution Control Act, *Industrial Plants, *Legislation, Administration, Political aspects, Administrative decisions, Evaluation.
Identifiers: Amendments.

Critical comments from industrial representatives on the Federal Water Pollution Control Act Amendments of 1972 are presented. The guidelines are considered too exact and inflexible to accommodate new pertinent information that may result from research and development. Technical people from industry have no opportunities to comment on the proposed guidelines until the final stages of development. There does not always appear to be ground rules for implementation of effluent guidelines. Little consideration is given to differences between individual companies or sites. The 30-day period for industry and public response is not sufficient for proper technical reviews and constructive industry input. A better two way communication between industry and government is called for so that industry can elicit uniform definitions, consistently explained regulations, and agreed upon ranges of numbers, and arrive at intelligent decisions and effect cost/benefit analyses. (Merritt-FIRL)
W74-08203

WATER RESOURCES: KEY TO WESTERN FUTURE.
Civil Engineering-ASCE, Vol 44, No 3, p 84-91, March, 1974. 5 fig.

Descriptors: Water resources, *Water reuse, *Water conservation, *Municipal wastes, Cloud seeding, *Tunnels, Excavation, Dredging, Reservoirs, Bulb turbines, Gravels, Mining, Salaries, Sanitary engineering, Industrial wastes, Water pollution sources, Pollution control, Leachate,

Landfills, Sludge treatment, Tertiary treatment, Aquifers, Saline water, Surge tanks, Land use, Ecology, Legislation, Political decisions, *Waste water treatment.

Highlights of papers from the American Society of Civil Engineers 1974 National Meeting on Water Resources Engineering are presented. In the area of water reclamation, papers were presented on water conservation in Los Angeles; deep well injection of highly treated municipal sewage in Chicago; cloud seeding in South Dakota; and cloud seeding and citizen's participation. Papers on water related construction included the tightening of tunnel regulations; excavation in the dry in California; dredge spoil and ecology; repair of a quake demanged underground reservoir in the San Fernando Valley; the first U.S. bulb turbine; and gravel mining in the Mississippi River. Professional and planning papers included those in political contributions, a pension bill in Congress, and salary guidelines. Papers on sanitary engineering discussed the problem in Los Angeles of source control of industrial pollutants; leachate from landfills; methods of treating sewage sludge; a P-C tertiary plant in Cleveland; the disposal of waste water into a saline aquifer; and land and pond treatment around Lake Michigan. Other topics included the ecological impact of thermal discharge; surge storage tanks; land use planning and poor political ecological decisions. (Merritt-FIRL)
W74-08204

PROJECT OF THE AGRICULTURAL AND MARINE POLLUTION CONTROL SECTION, MARCH 1973,
Environmental Protection Agency, Washington, D.C. Applied Science and Technology Branch.
K. Jakobson.
Copy Available from GPO Sup Doc as EP1.23/2:73-171, $2.60; microfiche from NTIS as PB-227 340 $1.45. EPA Office of Research and Monitoring Report EPA-R2-73-171, March 1973. 201 p.

Descriptors: *Water pollution control, *Farm wastes, *Navigation, *Projects, Water pollution sources, Boats, Ships, Oil spills.
Identifiers: *Agricultural pollution control, *Marine pollution control, Nonpoint pollution.

The Agricultural and Marine Pollution Control Program of EPA is described in a compilation of the information sheets of the 160 projects initiated from fiscal year 1968 through fiscal year 1972. Each sheet contains the objectives, statistical information and a brief description of an initiated project. General introductory information on the Environmental Protection Agency's Agricultural and Marine Pollution Control Program is presented to provide perspective on the magnitude of these nonpoint pollution problems and the research direction that must be pursued in order to develop the technology to adequately control nonpoint sources in the United States. (Knapp-USGS)
W74-08237

ENVIRONMENTAL RESEARCH AND HIGHWAYS,
For primary bibliographic entry see Field 5B.
W74-08251

IMPROVED CONTROL OF RADIOACTIVE WASTES,
Atomic Energy Commission, Bethesda, Md.
For primary bibliographic entry see Field 5D.
W74-08255

EFFECTS OF STRAW, CALCIUM CHLORIDE, AND SUBMERGENCE ON A SODIC SOIL,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W74-08274

GATED PIPE AND REUSE SYSTEM.
For primary bibliographic entry see Field 3F
W74-08284

THE CITIZEN AND WATER MANAGEMENT: AN ATLAS OF WATER ATTITUDES IN SOUTHERN MINNESOTA,
Gustavus Adolphus Coll. St. Peter, Minn. Dept. of Geography.
For primary bibliographic entry see Field 6B.
W74-08288

DETERMINATION OF OIL LOSS RATES FROM A HIGH SEAS OIL CONTAINMENT BARRIER,
California Univ., Santa Barbara.
J. E. Estes, P. Mikolaj, and R. R. Thaman.
Available from NTIS, Springfield, Va. 22151 AD-762 339 Price $4.85 printed copy; $1.45 microfiche. Coast Guard Office of Research and Development Contract Report, June 1972. 71 p, 19 fig, 7 append. Coast Guard Contract DOT-CG-23260-A.

Descriptors: *Water pollution control, *Oil spills, *Oily water, Equipment, *Barriers, Sampling, *California, Oil pollution.

Field tests of a high seas oil containment barrier were conducted to evaluate the barrier's oil containment efficiency under varying configurations and tow speeds. Coincident ground truth measurements of soybean oil film thickness and remote sensing imagery were acquired during the tests in order to determine the time dependent rate of oil loss and thereby establish an oil budget. The barrier performed effieciently when towing speeds approximated 0.5 knots, adequately at speeds under 1 knot, while there was catastrophic failure at speeds over 1 knot. (Knapp-USGS)
W74-08290

IDENTIFICATION AND CONTROL OF POLLUTION FROM SALT WATER INTRUSION.
Environmental Protection Agency, Washington, D.C. Div. of Water Quality and Non-Point Source Control.
For primary bibliographic entry see Field 5B.
W74-08293

ENVIRONMENTAL RESEARCH IN 1973--ANNUAL REPORT.
National Environmental Research Center, Cincinnati, Ohio.
Report EPA-670/9-74-001, February 1974. 99 p, 50 fig, 9 tab.

Descriptors: *Pollution abatement, *Research and development, Environment, *Laboratories, *Research facilities, Air pollution, *Water pollution, Water analysis.

The research program of the National Environmental Research Center (EPA) in Cincinnati, Ohio, is directed toward solving major environmental problems in wastewater management and treatment, drinking water, solid wastes, toxicants from automobile exhaust and other sources, industrial and hazardous waste mangement and control, radioactivity emissions from nuclear powerplants, and methods development and quality assurance. The work of the Center is principally governed by legislative mandates. In the Second Annual Report of the National Environmental Research Center, the programs are described and progress during 1973 is delineated. Reports are from: Office of Director, Advanced Waste Treatment Research Laboratory, Analytical Quality Control Laboratory, Edison Water Quality Research Laboratory, Environmental Toxicology Research Laboratory, Radiochemistry and Nuclear Engineering Branch and Facility, Solid and Hazardous Waste Research Laboratory, Water Supply Research Laboratory, and International Activities. Topics discussed in detail include evaluation of asbestos-like fibers in drinking water from Lake Superior, improved techniques to identify spilled asphalts, ion-selective electrodes in water analysis, nutrient control at El Lago, Texas, research on a hazardous material spill in the Little Menomonee River, sanitary landfill leachate, and toxicology of atmospheric pollutants associated with the use of automobile catalytic converters. (Knapp-USGS)
W74-08309

ABSORPTION OF MERCURIC CATION BY TANNINS IN AGRICULTURAL RESIDUES,
Agricultural Research Service, Berkeley, Calif. Western Regional Research Lab
A. C. Waiss, Jr., M. E. Wiley, J. A. Kuhnle, A. L. Potter, and R. M. McCready
Journal of Environmental Quality, Vol 2, No 3, p 369-371, July-September, 1973. 5 tab, 15 ref.

Descriptors: *Water pollution treatment, *Cation adsorption, *Heavy metals, Mercury, Chelation, Oxidation, Reduction, *Absorption, Farm wastes.
Identifiers: Agricultural residues.

Two common environmental pollutants are agricultural residues and waste streams of water containing only traces of heavy metals (such as mercury at 10 or more ppb) from mining or manufacturing operations. Agricultural residues contain tannins, polyphenolic substances, pectin, and other polymers -- all with chemically reactive groups that can chelate, reduce, oxidize, demonstrate ion exchange properties, and aid in removing traces of heavy metals from dilute waste water streams at low cost. Finely ground and water-washed agricultural residues were slurried in water and packed into columns for absorption tests with heavy metals. Solutions of known concentrations of heavy metals were passed through the packed columns which were then eluted with water or with alkaline or acidic solutions. The fractions and the column absorbents were then analyzed by standard atomic absorption methods. The nature of the physical and chemical forces that are effective in metal absorption from agricultural residues is not clear. (Skogerboe-Colorado State)
W74-08314

CHEMICAL AND BIOCHEMICAL CONSIDATIONS FOR MAXIMIZING THE EFFICIENCY OF FERTILIZER NITROGEN,
Agricultural Research Service, Baton Rouge, La.
For primary bibliographic entry see Field 5B.
W74-08326

RECIPIENT CAPACITY TO LIMIT DISCHARGE OF POLLUTANTS TO RECEIVING WATERS,
Bhabha Atomic Research Centre, Bombay (India). Health Physics Div.
For primary bibliographic entry see Field 5B.
W74-08351

PINCH VALVES TAKE HOLD ON THE INDUSTRY,
Red Valve Co., Inc., Carnegie, Pa.
For primary bibliographic entry see Field 8A.
W74-08363

ENVIRONMENTAL INFORMATION SOURCES -- ENGINEERING AND INDUSTRIAL APPLICATIONS: A SELECTED ANNOTATED BIBLIOGRAPHY.
Massachusetts Inst. of Tech., Boston. James Madison Barker Engineering Library.
For primary bibliographic entry see Field 10C.
W74-08401

PULP, PAPER, AND BOARD IN THE ENVIRONMENT -- PART 8: ENVIRONMENTAL

PROBLEMS OF THE WEST GERMAN PULP, PAPER, AND BOARD INDUSTRY.
Paper (London), Vol 179, No 9, p 513, 515, 529, May 2, 1973. 1 tab.

Descriptors: *Pulp and paper industry, Europe, Water quality control, *Pollution abatement, *Water pollution control, *Environmental control, Costs, Expenditures, Treatment facilities, Legislation, Water law, *Regulation, Governments, *Waste water treatment, Air pollution, Water pollution sources, Government supports, Economics, Marketing, Competition, Competitive prices, Cost comparisons.
Identifiers: *West Germany.

Problems of industrial water consumption and conservation, as well as pending legislations on waste water treatment and effluent discharges are discussed in general and with special reference to European and West German conditions. Environmental protection expenditures of the major West European countries are compared and found to be substantially higher (per ton of manufactured product) than in other Common Market countries. They are expected to increase by ca. 10% in the near-future as a result of public pressures and increasingly severe governmental regulations. Governmental subsidies for pollution abatement facilities in various countries are contrasted, and their effects on international market competition are brought out. (Hansen-IPC)
W74-08405

PULP, PAPER, AND BOARD IN THE ENVIRONMENT -- PART 9. POLLUTION ABATEMENT IN THE FINNISH PULP AND PAPER INDUSTRY.
Paper (London), Vol 179, No 9, p 521-522, May 2, 1973.

Descriptors: *Pulp and paper industry, Europe, *Pollution abatement, Costs, Economics, Water quality control, *Waste water treatment, *Pulp wastes, Expenditures, *Sulfite liquors, Incineration, Waste water(Pollution), Industrial water, Water consumption(Except consumptive use), Industrial wastes, *Biochemical oxygen demand, Water pollution sources.
Identifiers: *Finland, Kraft mills, Sulfite mills, Hardboard mills, Forest products industries.

Finnish industrial investment in pollution control is dominated by the pulp and paper industry which consumes ca. 70% of the total water drawn from watercourses and discharges 88% of the total waste load (in terms of BOD). Large sums have been spent in recent years for pollution abatement by nearly all Finnish forest enterprises. Most Finnish sulfite pulp mills are now burning their waste liquors. Typical examples of environmental protection measures instituted by kraft, sulfite, and hardboard mills are cited. (Hansen-IPC)
W74-08406

CONCEPTS OF POLLUTION AND ITS CONTROL,
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
W. Stumm, and E. Stumm-Zollinger.
Technology Review, Vol 75, No 1, p 19-25, Oct/Nov 1972. 3 fig, 2 tab.

Descriptors: *Environmental control, Balance of nature, *Pollution abatement, *Model studies, *Ecology, *Recycling, *Water pollution, *Air pollution, Water resources, Water management(Applied), Waste treatment, Watershed management, Resources, Land management, Ecology, Environment, Population.

A simple 'closed bottle' model of the terrestrial envelope (biosphere) has been used to demonstrate how ecological constraints demand that human social and economic systems move toward a stationary state, where resources and materials are increasingly recycled. Present industrial development and its interference with natural relationships counteract the indigenous forces of natural selection and may cause a partial and localized reversal in evolutionary trends. These conclusions are discussed and documented in some detail, with special reference to water and air pollution control. Water pollution control is seen as consisting not solely of waste treatment. Various physical and biological means of stream management may be directed towards restoring an ecological balance. Some examples of corrective measures are listed. The closed-bottle model makes it clear that zoning of land in the watershed, particularly the restriction of land use in the corridor adjoining the surface waters so as to give preference to diversified ecosystems with long food chains, is among the most powerful antipollution measures. (Brown-IPC)
W74-08422

POLLUTION ABATEMENT IN EFFLUENTS FROM CONSTRUCTIONAL FIBERBOARD MANUFACTURE (Z BADAN NAD REDUKCJA OBCIZENIA SCIEKOW W PRZEMYSLE PLYT PILSNIOWYCH),
For primary bibliographic entry see Field 3E.
W74-08426

HOW SAFE ARE SEWERS FOR CONSTRUCTION AND MAINTENANCE CREWS,
Howard, Needles, Tammen and Bergendoff, Inc., Indianapolis, Ind.
V. G. Wagner.
Deeds and Data (Water Pollution Control Federation), April 1974, p D1, D9, D12. 2 tab, 2 ref.

Descriptors: *Treatment facilities, *Safety, Accidents, Hazards, Labor, Manpower, *Operation and maintenance, *Sewers, Manholes, *Sewerage, Protection, Regulation.

A three-year summation of accident statistics shows that the average frequency of worker injuries (ratio of disabling injury per million work hours) in water and sewage works is 25.78, which is over three times as high as in electric and gas utilities. Negligence is blamed for a major portion of these accidents, despite various existing regulations. Case histories are cited to demonstrate the need for prevention of cave-ins and better protection of manhole workers. (Brown-IPC)
W74-08440

TEST AND EVALUATION OF OIL POLLUTION ABATEMENT DEVICES FOR SHIPBOARD USE, PHASE 1,
Coast Guard, Washington, D.C. Naval Engineering Div.
L. B. Norton, and F. Perrini.
Available from NTIS, Springfield, Va. 22151, AD-762 498, Price $3.75 printed copy; $1.45 microfiche. March, 1972. 32 p, 5 fig.

Descriptors: *Oily water, *Water pollution treatment, *Oil spills, *Monitoring, Instrumentation, Equipment, Filters, *Separation techniques, Filtration.

Tests were conducted on equipment designed to separate oil from water and to continuously detect oil in water. The principles of operation for the test separators were filter coalescence, gravity, combination gravity filter coalescence, and centrifugal force. The gravity separator and centrifugal separators tested did not produce optically clear water effluents. Monitors utilizing infrared absorption, ultraviolet fluorescence and visible light scattering were tested. The monitors utilizing ultraviolet light exhibited large errors from water soluble substances extracted from the test oils. Infrared adsorption monitors appear suitable for controlling filter coalescer operation using multiple oils. White light absorption indicators also appear suitable. (Knapp-USGS)
W74-08450

WATER RESOURCES, ENVIRONMENT AND NATIONAL DEVELOPMENT--VOLUME I: SUMMARY OF PROCEEDINGS, AND VOLUME II: SELECTED PAPERS.
Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, 1972. 116 p (Vol I); 441 p (Vol II).

Descriptors: *Regional development, *Water pollution control, *Asia, *Conferences, Urbanization, Industrial wastes, Municipal wastes, Resources development.
Identifiers: *Singapore, Malaysia, *Indonsia, *philippines.

Rapid industrialization has brought economic benefits to many people in Southeast Asia by providing them with jobs and a better livelihood. However, industrialization has also created the problem of pollution of the air and pollution of streams, rivers and seas. The problem of the environment and national development is therefore a very complex one. While the technology for the production of marketable goods is very well developed, the technology for disposing of the wastes produced by the manufacturing processes is still in its infancy. This workshop was held to identify the problems of water resources in particular, and of the environment in general, in relation to national development. (See W74-08455 thru W74-08485) (Knapp-USGS)
W74-08454

GROUNDWATER INVESTIGATIONS IN SINGAPORE,
Singapore Public Utilities. Water Planning Unit.
For primary bibliographic entry see Field 4B.
W74-08455

FLOOD CONTROL AND WATER CONSERVATION WORKS IN BUKIT TIMAH CATCHMENT, SINGAPORE,
Singapore Dept. of Public Works. Drainage and Marine Branch.
For primary bibliographic entry see Field 4A.
W74-08456

HYDROLOGICAL ACTIVITIES IN SINGAPORE,
Singapore Dept. of Public Works. Drainage and Marine Branch.
For primary bibliographic entry see Field 7C.
W74-08457

THE REUSE OF SEWAGE EFFLUENT FOR INDUSTRIAL PURPOSES IN SINGAPORE,
Singapore Dept. of Public Works. Sewerage Branch.
For primary bibliographic entry see Field 5D.
W74-08458

SOME FACTORS AFFECTING THE ANNUAL RAILFALL OF SINGAPORE,
Singapore Meteorological Service.
For primary bibliographic entry see Field 2B.
W74-08459

DEVELOPMENT OF WATER SUPPLY IN VIETNAM,
Ministry of Health, Saigon (Vietnam). Environmental Sanitation Service.
N. S. Tin.
In: Water Resources, Environment and National Development--Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17,

1972: Science Council of Singapore, p 84-86, 1972. 1 fig.

Descriptors: *Water supply, Water resources development, *Municipal water, Industrial water, Monsoons, Rainfall, *Potable water, *Water quality, *Rural areas.
Identifiers: *South Vietnam.

The water supply system of South Vietnam includes municipal water supply and rural water supply. The municipal water supply system is under the responsibility of the National Water Supply Agency, dating back to 1957. The cities of Saigon and Danang have their own Water Board. In rural areas, the Ministry of Health is responsible for water supply for villages and hamlets having a population of 5,000 or less. The Ministry of Health is responsible for the quality of drinking water and for stipulating water standards. In addition to quality control of drinking water, training courses for plant operators are organized. (See also W74-08454) (Knapp-USGS)
W74-08460

MUNICIPAL WASTEWATER RECLAMATION AND REUSE,
Camp, Dresser and McKee International, Inc., Boston, Mass.
For primary bibliographic entry see Field 5D.
W74-08461

DIFFICULTIES IN PLANNING WATER SUPPLY SCHEMES IN WEST MALAYSIA,
Malaysia Dept. of Water Supply, Kuala Lumpur.
For primary bibliographic entry see Field 6B.
W74-08462

WATER RESOURCES DEVELOPMENT IN WEST MALAYSIA,
Drainage and Irrigation Dept., Kuala Lumpur, (Malaysia).
For primary bibliographic entry see Field 3B.
W74-08463

IMPROVED WATER MANAGEMENT FOR PADDY RICE PRODUCTION IN THE PHILIPPINES,
National Irrigation Administration, Manila (Philippines). Water Management Project.
For primary bibliographic entry see Field 3F.
W74-08464

PLANNING FOR WATER REUSE,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5D.
W74-08465

RATIONAL USE OF WATER,
Ministry of Public Works and Electrical Energy, Djakarta (Indonesia). Water Resources Development.
For primary bibliographic entry see Field 6B.
W74-08466

SEWERAGE; SEWAGE TREATMENT AND DISPOSAL IN SINGAPORE,
Singapore Dept. of Public Works. Sewerage Branch.
For primary bibliographic entry see Field 5D.
W74-08467

DISPOSAL OF INDUSTRIAL TRADE EFFLUENTS FROM THE FOOD INDUSTRIES,
Singapore Inst. of Standards and Industrial Research.
For primary bibliographic entry see Field 5D.
W74-08468

POLLUTION CONTROL OF DISCHARGES INTO RIVERS, STREAMS AND SEA,
BP Refinery Singapore Pty Ltd
C. N. McColl.
In: Water Resources, Environment and National Development--Volume II Selected Papers, Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 189-191, 1972. 2 tab.

Descriptors: *Water pollution control, *Industrial wastes, *Oil industry, *Oil wastes, Waste treatment, Legislation, Regulation.

Apart from oil, refinery operations can produce other chemicals and pollutants. Steam condensate from stripping operations on crude distillation units can contain sulfides and phenols. Similar condensate from catalytic crackers can also contain cyanides, ammonia salts and higher concentrations of phenols. The effluent water from desalters contains sulfides, phenols and naphthenic acids. Legislation is necessary in order to provide a uniform code on pollution control for industries to conform to. The technical solutions to pollution problems are generally known, as are also the costs of overcoming or avoiding such problems. In an industrially competitive society the additional costs of achieving pollution control are eventually passed to the consumer. Realistic control limits are therefore needed. (See also W74-08454) (Knapp-USGS)
W74-08469

AIMS OF WATER POLLUTION CONTROL,
Binnie and Partners, London (England).
P. J. Norris.
In:: Water Resources, Environment and National Development--Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 192-195, 1972.

Descriptors: *Water pollution control, *Public health, Economics, Water conservation, *Water supply, *Costs.

The aims of water pollution control are to ensure the availability of water for public supply, to eliminate health risks and to preserve amenities. Water pollution is being reduced in many countries and the measures needed to bring it under control are well established. The cost is the limiting factor and is likely to continue to be so for many years. In England it is proposed to increase by over 50% the present outlay on new pollution control measures in the next five years, resulting in much higher capital expenditure than is being allocated to new water supply projects. (See also W74-08454) (Knapp-USGS)
W74-08470

THE SLOP OIL PROBLEM IN SINGAPORE,
Ministry of Science and Technology, Singapore. Industrial Liaison Unit.
W. P. S. Tan.
In: Water Resources, Environment and National Development--Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 196-211, 1972. 5 fig, 3 tab, 2 append.

Descriptors: *Oil spills, *Oily water, *Water pollution control, *Ships, Water pollution sources.
Identifiers: *Singapore, Oil tankers.

Slop oil is the oily water resulting from tank cleaning operations from ocean-going tankers. At this moment over 3,300 tankers totaling 177 million deadweight tons are plying the oil routes of the world. On an average of one a year to eighteen months, these tankers are docked for inspection and repairs. Safety ordinances require their tanks to be cleaned, gas freed and the slop discharged before the tankers can be docked or berthed. If shore reception facilities do not exist, half a million tons of oil would be discharged into the seas from repairing tankers alone. Including normal tanker operations, accidents, and the discharge from ships bilge, the total oil spill (from ships) could come to over a million tons per year. By 1975 Singapore will be repairing nearly 20% of the world's tankers. Reception facilities start with the provision of wharves suitable for berthing super tankers in ballast condition. The oil is recovered from the slop and stored for final disposal or reuse. (See also W74-08454) (Knapp-USGS)
W74-08471

THE CONTROL OF WASTEWATER AND OIL DISCHARGES TO THE SEA WITH PARTICULAR REGARD TO STUDIES RECENTLY CARRIED OUT IN SINGAPORE'S SOUTHERN COASTAL WATERS,
Watson (J. D. and D. M.), London (England)
J. R. Preston.
In: Water Resources, Environment and National Development--Volume II. Selected Papers, Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 212-223, 1972. 2 fig.

Descriptors: *Water pollution control, *Oil spills, *Sewage disposal, Waste water treatment, Sanitary engineering.
Identifiers: *Singapore.

Pollution in waste water can be described and quantified by suspended solids, biochemical oxygen demand, coliform bacteria, oils and greases, heavy metals and other toxics, and nutrient concentrations. The standards commonly associated with waste-water discharges into inland waterways are compared with standards which might be upheld for marine discharges, taking health, amenity, fishing and shipping into account. The difficulties in quantifying ecological factors and the importance of such factors in enclosed waterways are discussed. Marine investigations recently carried out in Singapore's southern waters are summarized and related to the general parameters of water pollution. Singapore has an efficient method for dealing with emergency spills. Floating booms, skimming devices, and detergents are available in the Republic, and they can be brought quickly into use in the event of an emergency. (See also W74-08454) (Knapp-USGS)
W74-08472

PETROLEUM REFINERY EFFLUENT QUALITY CONTROL,
Esso Research and Engineering Co., Linden, N.J.
For primary bibliographic entry see Field 5D.
W74-08473

THE HANDLING OF OIL SPILLS,
Esso Research and Engineering Co., Linden, N.J.
R. Kilpert.
In: Water Resources, Environment and National Development--Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 231-237, 1972. 14 fig.

Descriptors: *Oil spills, *Oily water, *Water pollution treatment, Water pollution sources, Water pollution control.

The effectiveness of oil spill cleanup is significantly influenced by environmental conditions at the spill area and the degree of preparedness that

has been achieved. Anticipated problems are defined, based on historical data from past incidents, in terms of spill size, location, type of oil involved, and wind and sea conditions. The characteristics of the oil spilled, the location and extent of the spill, and existing environmental factors influence the decisions on how an oil spill should be handled. Containment, confinement, removal and disposal are commonly used for control and recovery of spilled oil. Current rate of the art involving equipment and materials for removing oil from the surface of water is reviewed. Included in the discussion are booms, sorbent materials, chemicals and skimming devices. The basic requirements of preplanning and subsequent development of effective contingency plans are discussed. In the event containment and removal are not feasible, the role that chemical dispersion can play in minimizing and/or mitigating the harmful effect of the spilled oil is outlined. (See also W74-08454) (Knapp-USGS)
W74-08474

SEA POLLUTION IN SINGAPORE,
Port of Singapore Authority.
For primary bibliographic entry see Field 5B.
W74-08475

INDICATIONS OF THE RELATIONSHIP BETWEEN PHYTO-PLANKTON DISTRIBUTION AND PHOSPHATE LEVELS,
Singapore Primary Production Dept.
For primary bibliographic entry see Field 5C.
W74-08476

RESEARCH ON THE CULTURE OF CERTAIN COMMON MARINE ORGANISMS IN SINGAPORE WATERS,
Singapore Univ. Fisheries Biology Unit.
For primary bibliographic entry see Field 3F.
W74-08477

DEVELOPMENT OF BLUE-GREEN ALGAL BLOOMS IN NON-ALKALINE WATERS,
Singapore Univ. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W74-08478

WATER POLLUTION AND ENVIRONMENTAL HEALTH,
Ministry of Health, Kuala Lumpur (Malaysia).
A. Sekarajasekaran.
In: Water Resources, Environment and National Development--Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 268-271, 1972.

Descriptors: *Water pollution control, *Legislation, Urbanization, Environmental sanitation, Public health, Land use, Manpower, Training.
Identifiers: *Malaysia.

Urbanization, industrialization and land development in West Malaysia have been growing at a rapid rate. Existing legislation was designed to cope with special problems as they have arisen and was designed on the basis of expediency to try to eliminate some of the gross and obvious nuisance problems. This legislation has failed to control pollution and this has been due to inability to recruit and train adequate technical staff to carry out knowledgeable implementation. Comprehensive water quality control legislation should be coordinated with an overall environmental quality control enabling act. Such legislation must include provision for recruitment and training of adequate staff and other factors relating to implementation. (See also W74-08454) (Knapp-USGS)
W74-08479

TOXICITY CONTROL OF INDUSTRIAL WASTEWATERS AND PESTICIDE-POLLUTED WATERS IN VIETNAM,
Institut Pasteur du Vietnam, Saigon. Dept. of Water Sanitation and Toxicology.
For primary bibliographic entry see Field 5C.
W74-08480

IMPROVEMENT OF SOIL COVER FOR WATER CONSERVATION, PREVENTION OF SEDIMENTATION AND POLLUTION CONTROL IN THE PHILIPPINES,
National Inst. of Science and Technology, Manila (Philippines). Div. of Agriculture and Natural Resources Research.
P. N. Laudencia.
In: Water Resources, Environment and National Development--Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 277-285, 1972. 1 fig, 12 ref.

Descriptors: *Water pollution control, *Sediment control, *Erosion control, Land management, Forest management, Productivity, Fisheries, Turbidity, Sedimentation.
Identifiers: *Philippines.

Surface water resources in the Philippines are being clogged with sediments and soil deposits or are heavily polluted to the extent that only a few species of fish remain. Water turbidity caused by suspended fine particles carried by runoff water diminishes the population of phytoplankton which serve as food for fish. Suspended fine particles also suffocate fish by clogging their gills. Rivers and streams which used to be the source of potable water in the rural areas are becoming useless for such purpose. One activity by the Philippine Government which may help alleviate the worsening condition of surface water resources is the improvement of the soil cover designed to minimize water erosion, sedimentation and pollution. This is being accomplished through improvement of agricultural practices, engineering measures, and forest protection and reforestation. Research on planting of cover crops, pasture improvement and selection of fast-growing reforestation tree species which are also utilizable for pulp and paper manufacture is described. (See also W74-08454) (Knapp-USGS)
W74-08481

POLLUTION CONTROL OF DISCHARGE INTO RIVERS, LAKES AND COASTAL WATERS IN THE PHILIPPINES,
National Water and Air Pollution Control Commission, Manila (Philippines).
B. N. Garcia.
In: Water Resources, Environment and National Development--Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 286-292, 1972.

Descriptors: *Water pollution control, *Industrial wastes, Waste treatment, Regulation, Legislation, Water quality, Water pollution sources, Water pollution effects.
Identifiers: *Philippines.

Pollution control of discharge into rivers, lakes and coastal waters in the Philippines is vested by law under the National Water and Air Pollution Control Commission. Due to varied usage and location of different streams, lakes or other bodies of water, classification of bodies of water has to be based on their best usage. The water quality standard adopted is the basis for determining the degree of wastewater treatment required. (See also W74-08454) (Knapp-USGS)
W74-08482

WATER POLLUTION IN THAILAND,
Applied Scientific Research Corp., of Thailand, Bangkok. Environmental and Ecological Research Inst.
S. Ratasuk.
In: Water Resources, Environment and National Development--Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 293-307, 1972. 2 fig, 1 tab, 6 ref, 3 append.

Descriptors: *Water pollution sources, *Water pollution control, Industrial wastes, Municipal wastes, Water pollution effects.
Identifiers: *Thailand.

Water pollution is the most serious environmental problem in Thailand since a great percentage of people rely on surface waters for their daily living. Water pollution is a potential health hazard and it also damages fisheries, agriculture, and aesthetic value of the water. Serious problems of water pollution are experienced in Greater Bangkok and in a few areas of the country. Urban canals in Greater Bangkok, the Chao Phraya River, the Mae Klong River, and a number of streams in Chonburi are severely polluted. The condition of the Tachin River is also deteriorating. In the Greater Bangkok area, the most densely populated and heavily industrialized part of the country, domestic wastes and industrial wastes are responsible for the water pollution. In other areas, industrial wastes are the main cause. Organic pollution with depletion of dissolved oxygen is the most common nature of water pollution. Existing laws and regulations in Thailand concerning water pollution and wastewater discharges and neither clearly defined nor appropriate for the present situation. Their revision, amendment, and strong enforcement are indispensable for protecting the country's water resources. (See also W74-08454) (Knapp-USGS)
W74-08483

SUMMARY REPORT ON POLLUTION CONTROL IN INDONESIA,
Ministry of Public Works and Electrical Energy, Djakarta (Indonesia). Planning and Urban Development.
A. Aziz Sasmitadihardja.
In: Water Resources, Environment and National Development--Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 308-320, 1972. 3 append.

Descriptors: *Water pollution control, *Water pollution sources, *Urbanization, Water pollution effects, Municipal wastes, Industrial wastes, Waste disposal.
Identifiers: *Indonesia.

The size of Indonesia and its large population constitute major problems for economic development, including water management and its pollution control. There are about 124 million population in Indonesia, unevenly distributed over an Archipelago extending 3,200 miles west to east and 1,000 miles north to south. The islands of Java and Madura have 65% of the total population. Of the population about 100 million are rural. Rapid urbanization and industrialization in large cities are causing serious water pollution problems which result in major public health hazards and the general deterioration of natural water resources. In the city of Djakarta, a water pollution committee for the formulation of water pollution legislation was established in 1970 to cope with the problem. Steps have been taken in recent years through legislation, education, and research to deal with domestic trade and farm wastes. The problem has always been the lack of technical know-how and financial resources. (See also W74-08454) (Knapp-USGS)
W74-08484

SEA POLLUTION--SOME ASPECTS AND THE NEED TO FIGHT IT,
Indonesian Petroleum Inst., Djakarta.
For primary bibliographic entry see Field 5B.
W74-08485

EFFECTIVE USE OF HIGH WATER TABLE AREAS FOR SANITARY LANDFILL.
VTN, Orlando, Fla.
For primary bibliographic entry see Field 5E.
W74-08486

EROSION CONTROL AND BANK STABILIZATION IN METROPOLITAN TORONTO--10 YEAR PROGRAMME AND 5 YEAR PROJECT.
Metropolitan Toronto and Region Conservation Authority, Downsview (Ontario).
For primary bibliographic entry see Field 4D.
W74-08488

HONOLULU BOARD OF WATER SUPPLY ANNUAL REPORT FOR THE YEAR ENDED JUNE 30, 1973.
Board of Water Supply, Honolulu, Hawaii.
1973, 24 p, 1 fig, 7 tab, photos.

Descriptors: *Hawaii, *Water supply, Water management, *Water delivery, *Water costs, *Water development, Pumping, Research and development, Chlorination, Computers, Operations, Financing, Annual, Annual costs, Bond issues, Reservoir design.
Identifiers: Assets, Liabilities, *Honolulu(H.I.), Annual report.

Management of the sewer system was transferred from the city of Honolulu to the Board of Water Supply, and charges are to be assessed to sewer users in order to make the system self supporting. Pumpage increased to 26.3 mgd, an increase of 8.6 mgd. A research program was continued to determine the efficacy of using chlorinated effluent for the irrigation of sugar cane. Other research included the study of a 50 mgd construction project, and the computerization of consumption data. Microbiological testing of samples of municipal supply showed coliform densities well below the maximum allowed by USPHS, and pesticide and mercury monitoring showed no contamination. $5.5 million was spent in engineering construction, and a GMG reservoir design nears and completion. Main chlorination is done by 59 tap-ins. Water sales were $16,648,394, up $1,055,065. $8.5 million in General Obligation Water Bonds series 1973 were issued with a net interest rate of 5.0677%. Assets and liabilities were $147,872,305, the liabilities including $16,745,434 of retained earnings reinvested in the system. (LaPointe-North Carolina)
W74-08492

WATER AND SEWER SUPPLY DECISIONS: A CASE STUDY OF THE WASHINGTON SUBURBAN SANITARY COMMISSION,
Virginia Univ., Charlottesville.
F. X. Tannian.
PhD Dissertation. June, 1965. 209 p, 2 fig, 14 tab, 109 ref, 1 append.

Descriptors: *Land use, *Planning, *Water supply, *Sewerage, Costs, *Financing, Prices, *Pricing, *Maryland, Political aspects, Sewage treatment, Sewage disposal, Distribution systems, *District of Columbia, *Virginia.
Identifiers: Conflict of interest, Utility extension, Prince Georges County(Md.), Montogomery County(Md.).

The water supply decisions and performance of the Washington Suburban Sanitary Commission in Prince Georges and Montgomery Counties, Maryland, are analyzed with an emphasis on pricing policies and their implications, and the impacts of subsidies and inequities which result from average cost pricing and special rate structures. The relationships and cost interactions between water and sewer service caused by common reliance of both functions on rivers is established. Relationships of the Sanitary Commission to the residential construction and finance industries, to other local government agencies, as well as to its own announced investment program, and to the private interests of the Commissioners are outlined by tracing through a series of decisions to extend sewer lines. Among the study's conclusions are: (1) the agency allies itself with local and regional interests and organizations representing those who will benefit from WSSC decisions; (2) the special interests decision making of WSSC on investment and operation is geared to help the construction industry leapfrog to less costly land, generating a land use called sprawl. Also multiple average cost pricing by the Commission provides the financial subsidies needed to support leapfrog lines and sprawl; (3) the more land which subsidized sewer and water systems can reach, the more development can take place; (4) many of the Commissioners themselves stand to profit by WSSC's decisions; (5) most of the practices of the Commission serve to conceal these effects from the public; and (6) provisions of sewer and water supplies through the Sanitary Commission's institutional structure has induced misuse of public power by private initiative. (Edwards-North Carolina)
W74-08497

SYSTEMS PLANNING DESIGN: CASE STUDIES IN MODELING, OPTIMIZATION, AND EVALUATION,
Massachusetts Inst. of Tech., Cambridge. Center for Transportation Studies.
For primary bibliographic entry see Field 6A.
W74-08506

ENVIRONMENTAL IMPACT STATEMENTS.
Datatronic Systems Corp., Panorama City, Calif.
For primary bibliographic entry see Field 6G.
W74-08517

THE IMPACT OF GROWTH ON THE ENVIRONMENT.
For primary bibliographic entry see Field 6G.
W74-08523

EFFLUENT CHARGES ON AIR AND WATER POLLUTION,
Environmental Law Inst., Washington, D.C.
E. I. Selig.
Monograph Series 1, October 15 and 16, 1971. 102 p, 106 ref, 3 append.

Descriptors: *Regulation, *Adoption of practices, *Administration, *Water pollution sources, *Economic aspects, Economics, Project planning, Feasibility, Decision making, Cost-benefit analysis, Water quality control, Waste water treatment, Industrial waste, Specifications, Monitoring, Direct costs, Direct benefits, Water conservation, Legal aspects, State governments, Federal Government, Inspection, Natural resources, Standards.
Identifiers: *Administrative regulations.

Various plans for effluent charges or charge substitutes looked at by this conference all reflected disappointment with current regulatory efforts to control water pollution. Some planners thought direct regulation could be reinforced by supplementary charges. Three plans presented provided for statewide charges and two plans provided for national charges on water pollution. This would supplement existing law where polluters are usually required to meet effluent or equipment standards by deadline dates. Effluent standards are incompatible with effluent charges over the same ranges of potential waste reduction from an economic view of efficient allocation of resources. From that perspective each polluter must determine what level of charges he could withstand while seeking a least cost situation. It was suggested that pollution might be free below a certain threshold and prohibited above a certain ceiling. Pollution between the two levels would be subject to effluent charges. This system could be effective to forestall cumulative effects of pollution which ambient standards do not take into account. Also it would be effective to control localized effects for which single polluters may be mainly responsible. (Sperling-Florida)
W74-08524

WATER POLLUTION: ECONOMIC ASPECTS AND RESEARCH NEEDS,
Resources for the Future, Washington, D.C.
A. V. Kneese
Published by Johns Hopkins Press, Baltimore, 1962. 107 p, 106 ref, 1 append.

Descriptors: *Water requirements, *Water resources, *Water management(Applied), *Water utilization, Environmental sanitation, Economic aspects, Water conservation, Waste water treatment, Water costs, Federal Government, Water resource development, Water yield, Project planning, Water supply, Water treatment, Water quality, Water pollution, Water pollution sources, Industrial waste, Flow augmentation, Water quality control, Evaporation, Evapotranspiration, Water reuse, Consumptive use
Identifiers: Hazardous substances(Pollution).

Early projections of national water requirements failed to consider that water use is not completely consumptive. Later projections overreacted to this error in ascribing water consumption almost entirely to evaporation and transpiration. However, other changes resulting from water use may have a similar effect. The first comprehensive projection of water requirements specifically included requirements for pollution abatement. A larger share of water will be devoted to providing dilution for industrial and domestic wastes than will be consumed by evaporation and transpiration. This conclusion was based on the assumption that current ratios of wastes produced to population and economic activity would continue. It was also assumed that standard biological treatment and augmentation of low stream flows for waste dilution would be the only devices used to deal with pollution loadings. A minimum cost combination of flow augmentation and treatment would require an additional abatement investment of one hundred billion dollars by the year 2000. (Sperling-Florida)
W74-08525

ADVERSE EFFECTS OF COAL MINING ON FEDERAL RESERVOIR PROJECTS.
Hearing--Subcomm of the Comm on Government Operations, 93rd Cong, 1st Sess, U.S. House of Representatives, October 25, 1973. 634 p, 4 map, 17 photo.

Descriptors: *Coals, *Coal mines, *Coal mine wastes, *Water pollution sources, *Appalachian Mountain region, Water pollution, Water pollution control, Sediments, Sedimentation, Permits, Environment, Environmental effects, Navigable waters, Pollution abatement, Administrative agencies, Regulation, Investigation, Federal Government, Reservoirs, Water resources, Water resources development, Industrial wastes.
Identifiers: Congressional hearings.

These hearings were held by the Subcommittee on Conservation and Natural Resources to inquire as to what actions are being taken by various federal agencies, such as the Corps of Engineers and the Environmental Protection Agency (EPA), to protect the nation's waterways and federal reservoirs from the adverse effects of surface and deep coal mining. In January 1972, the subcommittee initiated an investigation into Corps of Engineers policies and procedures for protecting its multi-million dollar reservoir projects from the adverse effects of coal mining in Appalachia. The in-

vestigation showed that Fishtrap Lake in Eastern Kentucky had been extensively damaged by coal mining operations. In September 1972, the Corps was ordered to publish regulations to prevent such effects on other mining sites. Failure to do so led to a request by the subcommittee that the General Accounting Office (GAO) conduct a similar investigation. Recommendations by the GAO followed, but the Corps has still not implemented them and the purpose of these hearings was to determine the reasons for this nonfeasance. In addition, the subcommittee investigated the issuance of permits to discharge wastes into navigable waterways by the EPA with no requirement that the coal operator remove from navigable waterways the sediment deposits resulting from the mining work. (Ritchie-Florida)
W74-08528

PROGRESS EVALUATION MEETING IN THE MATTER OF POLLUTION OF THE INTERSTATE WATERS OF THE MISSOURI RIVER, OMAHA, NEBRASKA AREA (NEBRASKA-IOWA-MISSOURI-KANSAS).
Federal Water Pollution Control Administration, Washington, D.C.
March 8, 1967. 114 p, 1 map.

Descriptors: *Governmental interrelations, *Missouri River, *Comprehensive planning, *Water supply, *Water pollution treatment, Water resources development, Political aspects, Interstate rivers, River basin development, Planning utilities, Rivers, Filtration, Oily water, Pollutants, Sewage treatment, Waste water treatment, Water purification, Water quality, Water pollution control.

Representatives of the United States Department of the Interior as well as representatives of Iowa, Kansas, Missouri, Nebraska, and various cities on the Missouri River, met to evaluate their progress in controlling pollution of the waters of the Missouri in the Omaha, Nebraska area. This verbatim transcript of the proceedings records the conferees' reports of their pollution control activities. Discussion centered principally on grease removal from the discharge of meat packing plants and the creation of the Omaha Pollution Control Corporation. (Craig-Florida)
W74-08529

REPORT ON THE SECOND SESSION OF THE CONFERENCE IN THE MATTER OF POLLUTION OF THE SOUTH PLATTE RIVER BASIN.
Federal Water Pollution Control Administration, Washington, D.C.
April 27, 1966. 126 p, 27 fig, 11 map, 3 photo, 15 tab, 2 append.

Descriptors: *Colorado, *Water pollution, *Municipal wastes, *Industrial wastes, *Water quality standards, Water quality, Recreation, Agriculture, ground water, Water supply, Pollution abatement, Sewage treatment, Waste treatment, Fisheries, Flow augmentation, Water quality control, Irrigation, Water utilization, Coliforms, Biochemical oxygen demand, Solid wastes, Rivers.
Identifiers: *South Platte River(Colo).

The principal present water uses in the South Platte River Basin in central Colorado are agricultural, irrigation and industrial. If water quality is considerably improved, the waters can also be used for municipal water supply, recreation, establishment of a warm-water fishery and aesthetic enjoyment. Based on the present interferences with water uses resulting from discharges of untreated and inadequately treated municipal and industrial wastes, specific pollution abatement measures must be provided as well as programs for flow augmentation during periods of low flow. The waters at the present time are grossly polluted and significant contamination exists in portions of the shallow groundwater aquifer. Project findings show that coliform densities greatly exceed accepted standards., oxygen demanding wastes have resulted in near septic conditions, suspended and settleable solids have destroyed desirable aquatic life, and pollution of the South Platte River has affected groundwater supplies. In order to attain water quality objectives, municiplalities and industries must be required to treat their raw wastes with ninety percent efficiency. (Ritchie-Florida)
W74-08530

DEFINITION OF CRITICAL COASTAL AREAS AND APPROACHES TO STANDARDS FOR MANAGEMENT,
South Carolina Wildlife and Marine Resources Dept., Charleston.
For primary bibliographic entry see Field 2L.
W74-08532

MUNICIPAL POWERS UNDER FLIRIDA LAW WITH RESPECT TO PROTECTION OF ENVIRONMENTALLY ENDANGERED RIPARIAN LAND,
Miami Univ., Fla. Ocean Law Program.
For primary bibliographic entry see Field 6E.
W74-08534

UTAH ENVIRONMENTAL PROBLEMS AND LEGISLATIVE RESPONSE: II, LEGISLATIVE RESPONSE,
Environmental Protection Agency, Denver, Colo. Region VIII.
J. W. Raisch.
Utah Law Review, p 1-28, Spring 1972. 29 p, 255 ref.

Descriptors: *Utah, *Legislation, *Environmental control, *Water pollution control, *Regulation, *Federal Water Pollution Control Act, Water law, Permits, Public health, Penalties(Legal), State governments, Water pollution, Pollution abatement, Industrual wastes, Municipal wastes discharge(Water), Effluents, Water pollution control, Water quality control, Water quality standards.

Utah's environmental programs are examined in detail. The Division of Health of the Department of Social Services has responsibility for enforcement of Utah's environmental laws. The principal water pollution control statute is the Pollution of Waters Act (Act). The author examines the various sections of that act and criticizes its deficiencies. The fulcrum of the Act is the creation of a nine-member Committee on Water Pollution, six of which must represent specific interests. The author, highly critical of this provision, suggests the Federal Water Pollution Control Act Amendments of 1972 (FWPCA) may force a change in the composition of the Committee. The Act creates a discharge permit program, although it requires revision to comport with FWPCA requirements. The Act also authorizes the Committee to group the waters of the state into classes, according to their present most reasonable use. The several enforcement provisions of the Act are also examined, as well as the provision for judicial review. The author's final suggestion is that responsibility for administration of the state's environmental programs be placed in a single agency other than the health oriented Division of Health. (Craig-Florida)
W74-08535

STATE OF WASHINGTON, 1973 ANNUAL REPORT, NATURAL RESOURCES AND RECREATION AGENCIES.
For primary bibliographic entry see Field 6E.
W74-08536

ENVIRONMENTAL POLICIES AS A CONGRESSIONAL REQUIREMENT FOR SOCIAL EFFICACY,
Committee on Public Works (US-Senate).
For primary bibliographic entry see Field 6E.
W74-08539

NEW LAWS: CLEAN WATERS IN THE NEXT DECADE,
Army War Coll., Carlisle Barracks, Pa.
Douglas L. Haller.
Available from NATIONAL Technical Information Service, Springfield Va. 22151, as AD-761 050, for $3.75 paper copy, $1.45 microfiche. February 23, 1973. 75 p.

Descriptors: *Pollution abatement, *Water pollution treatment, *Federal government, *Water quality control, *Waste water treatment, *Federal Water Pollution Control Act, Inter-agency cooperation, Regulations, Grants, Mine water, Lake Erie, Lakes, River basins, Research and development, Pollutant identification, Inspection, Government finance, Sludge treatment, Effluents, Oily water, State governments, Treatment facilities, Supervisory control, Water resources development, Water policy.
Identifiers: *Water Pollution Control Act.

The scope of the Federal Water Pollution Control Act has been enlarged by the amendments of 1972. This Act represents an evolution from a program to control water pollution to one whose objective is to eliminate water pollution. The complexities and overlapping areas of responsibility require the federal government to assume the dominant role in planning, funding and standards of enforcement. However, maximum use is made of state, interstate and municipal authorities in administering the many facets of the water pollution program. The 1972 amendments establish statutory deadlines for meeting graduated standards that will require massive amounts of industrial, federal and local funds. The 1972 Act shifts from ambient water quality standards to employment of effluent limitations. It also requires all polluters to obtain permits and install monitoring equipment which is subject to authorized federal or state inspection. The federal government is no longer required to go through the conference, hearing and court procedure to enforce the water pollution standards. Substantial fines can be imposed on violators of the Act. The federal government may take control of state programs from states which fail to enforce standards or misuse permit authority. (Kelly-Florida)
W74-08542

FINAL REPORT ANALYZING COASTAL AND MARINE LAW TO DEVELOP AN AUTHORITY FOR COASTAL ZONE MANAGEMENT,
Texas Law Inst. of Coastal and Marine Resources, Houston.
For primary bibliographic entry see Field 6E.
W74-08544

ENVIRONMENTAL LAW--WATER POLLUTION--CONFLICT BETWEEN REFUSE ACT PERMIT PROGRAM AND NATIONAL ENVIRONMENTAL POLICY ACT,
F. Rasmussen.
Wisconsin Law Review, Vol 1973, p 280-290, 1973. 11 p, 90 ref.

Descriptors: *Environmental effects, *Federal Water Pollution Control Act, *Permits, *Legislation, *Judicial decisions, Legal review, Federal government, Federal jurisdiction, Pollution abatement, Pollution control, Environmental control, Rivers, Navigable waters, Navigable rivers, Water quality standards, Water pollution, Impaired water quality, Discharges(Water), Administrative agencies.
Identifiers: *National Environmental Policy Act, *Environmental impact statement, *Refuse Act.

The conflict between the Refuse Act Permit Program and the National Environmental Policy Act exemplified by a recent federal case is analyzed.

On December 23, 1970 the President announced a program to initiate the permit provisions of the Refuse Act and the Secretary of the Army published proposed regulations to implement the executive order. These were challenged for noncompliance with the National Environmental Policy Act as they applied to navigable and nonnavigable streams. The court in the subject case enjoined the issuance of permits, pending amendment of the regulations to require environmental impact statements. This was apparently desireable because the proposed program would have weakened the federal statutory basis for controlling water pollution. Moreover, the Federal Water Pollution Control Act Amendments of 1972 moots the case by incorporating a permit program, exempt from the National Environmental Policy Act, into the Federal Water Pollution Control Act and these amendments set water quality standards. (Whisler-Florida)
W74-08550

A BILL TO PRESERVE AND PROMOTE THE RESOURCES OF THE CONNECTICUT RIVER VALLEY.
For primary bibliographic entry see Field 6E.
W74-08553

OIL POLLUTION PROHIBITED ZONES--REGULATIONS.
For primary bibliographic entry see Field 6E.
W74-08555

VESSELS IN FOREIGN AND DOMESTIC TRADES--POLLUTION OF COASTAL AND NAVIGABLE WATERS.
For primary bibliographic entry see Field 6E.
W74-08556

POLLUTION PREVENTION VESSEL AND OIL TRANSFER FACILITIES.
For primary bibliographic entry see Field 6E.
W74-08558

POLLUTION PREVENTION INSPECTION OF VESSELS AND DECK AND ENGINEER OFFICERS' LICENSES.
For primary bibliographic entry see Field 6E.
W74-08559

STATE PROGRAM ELEMENTS NECESSARY FOR PARTICIPATION IN THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM.
For primary bibliographic entry see Field 6E.
W74-08560

OIL POLLUTION PREVENTION--NON-TRANSPORTATION-RELATED ONSHORE AND OFFSHORE FACILITIES--PROPOSED RULES.
For primary bibliographic entry see Field 6E.
W74-08561

POLLUTION OF COASTAL AND NAVIGABLE WATERS (CFR TITLE 19, PART 4).
For primary bibliographic entry see Field 6E.
W74-08562

INTERIM POLICY STATEMENT ON IMPLEMENTATION, FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972.
For primary bibliographic entry see Field 6E.
W74-08563

NATIONAL OIL AND HAZARDOUS SUBSTANCES POLLUTION CONTINGENCY PLAN.
For primary bibliographic entry see Field 6E.
W74-08564

POLLUTION CONTROL--WHO PUTS THE DIRT IN THE DRINKING WATER.
For primary bibliographic entry see Field 6E.
W74-08565

MEMORANDUM OF UNDERSTANDING REGARDING IMPLEMENTATION OF CERTAIN COMPLEMENTARY RESPONSIBILITIES--NOTICE.
For primary bibliographic entry see Field 6E.
W74-08566

OIL POLLUTION ACT AMENDMENTS OF 1973--LEGISLATIVE HISTORY.
For primary bibliographic entry see Field 6E.
W74-08567

POLLUTION AND OBSTRUCTION OF WATERS.
For primary bibliographic entry see Field 6E.
W74-08569

WATER AND SEWERAGE DISPOSAL AGENCIES,
For primary bibliographic entry see Field 6E.
W74-08571

STATE V BISHOP (ACTION FOR PUBLIC NUISANCE AND TREPASS IN FILLING AREA BELOW HIGH WATER MARK OF BAY).
For primary bibliographic entry see Field 6E.
W74-08573

MINING ACT OF 1971.
For primary bibliographic entry see Field 6E.
W74-08575

WATER POLLUTION CONTROL FACILITIES--TAX EXEMPTION.
For primary bibliographic entry see Field 6E.
W74-08577

AIR AND WATER POLLUTION CONTROL PERMIT BOARD.
For primary bibliographic entry see Field 6E.
W74-08579

OPERATION OF MINES.
For primary bibliographic entry see Field 6E.
W74-08580

SELECTIVE WITHDRAWAL FROM MAN-MADE LAKES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 4A.
W74-08585

SOLUBILITY OF 1,1,2,2-TETRABROMOETHANE IN WATER AS A FUNCTION OF TEMPERATURE,
Bureau of Mines, Tuscaloosa, Ala. Tuscaloosa Metallurgy Research Lab.
For primary bibliographic entry see Field 5B.
W74-08589

GEOLOGY AND WATER RESOURCES OF THE GIRDWOOD-ALYESKA AREA, ALASKA,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 4B.
W74-08595

THE MICROBIAL DEGRADATION OF OIL POLLUTANTS,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
For primary bibliographic entry see Field 5B.
W74-08609

MICROBIAL-FACILITATED DEGRADATION OF OIL: A PROSPECTUS,
Georgia State Univ., Atlanta. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W74-08610

MICROBIAL DEGRADATION OF OIL: PRESENT STATUS, PROBLEMS, AND PERSPECTIVES,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 5B.
W74-08611

BACTERIAL SEEDING TO ENHANCE BIODEGRADATION OF OIL SLICKS,
Texas Univ., Port Aransas. Marine Science Inst.
For primary bibliographic entry see Field 5B.
W74-08641

COASTAL ECOSYSTEMS. ECOLOGICAL CONSIDERATIONS FOR MANAGEMENT OF THE COASTAL ZONE,
Conservation Foundation, Washington, D.C.
For primary bibliographic entry see Field 2L.
W74-08642

CONTROL OF MINE DRAINAGE FROM COAL MINE MINERAL WASTES: PHASE II. POLLUTION ABATEMENT AND MONITORING.
Consolidation Coal Co., Pinckneyville, Ill. Midwestern Div.
Z. V. Kosowski.
Available from Sup Doc, GPO, Washington, D.C. 20402, Price $1.25 paper copy. Environmental Protection Agency Technology Series Report EPA-R2-73-230, May 1973. 83 p, 10 fig, 7 tab, 3 ref, append.

Descriptors: *Water pollution control, *Coal mine wastes, *Mine acids, Methodology, *Vegetation establishment, Erosion control, Controlled drainage, Lagoons, Costs, Land reclamation, *Illinois, *Waste water treatment.

Acid runoff from coal mining refuse piles can be controlled by covering the mineral wastes with soil, establishing a vegetative cover, and providing adequate drainage to minimize erosion. The average acid formation rate for the entire restored refuse pile was estimated at 16 lb acid as CaCO3/acre/day, or a reduction of 91+% when compared to the original unrestored pile. No significant differences were observed in acid formation rates from the three individual test plots covered with a nominal 1 foot, 2 feet, or 3 feet of soil. Slurry lagoons containing the fine coal rejects can be stabilized and the air pollution problem controlled by either a vegetative cover established directly on the mineral wastes without soil or by the application of a chemical stabilizer. Chemical stabilization is only a temporary measure, and vegetative covers should be the permanent solution to slurry lagoons. Cost data from this project indicate that it would cost approximately $6,100, $8,000, and $9,800 per acre to establish a grass cover on an abandoned refuse pile using 1, 2, and 3 feet of soil respectively. (See also W72-03785) (Woodard-USGS)
W74-08661

SALT-WATER INTRUSION AND ITS CONTROL,
California Univ., Berkeley. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W74-08662

DIFFICULTIES AHEAD FOR OREGON REGARDING ESTUARY REGULATIONS, CONTROL AND PROTECTION,
Oregon State Dept. of Environmental Quality, Portland.
For primary bibliographic entry see Field 2L.
W74-08670

TECHNICAL AND ECONOMIC ISSUES IN THE WATER QUALITY MANAGEMENT OF YAQUINA BAY,
Oregon State Univ., Corvallis. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 2L.
W74-08672

SANITARY-MICROBIOLOGICAL INVESTIGATIONS IN PREVENTING INFECTIONS OF BACTERIAL AND VIRAL ETIOLOGY, (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W74-08692

WATER QUALITY AND WATER POLLUTION CONTROL IN SWITZERLAND,
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
O. Jaag.
Biol Conserv. Vol 4, No 5, p 345-354, 1972. Illus.
Identifiers: Algae, *Eutrophication, Fish, Pollution, *Switzerland, Wastes, *Water quality, *Water pollution control, Organic matter.

Originally, the organic matter is Swiss waters was automatically and entirely mineralized. However, the wastewaters of civilization overloaded this auto-purification mechanism, and the Disturbed biological and chemical balance imperilled Swiss watersupply, fish and bathing sites. The first mechanical-biological wastewater treatment plant in Switzerland was set up in the city of St. Gallen in 1916, but it was only in 1955 that an effective law ensured more drastic water pollution measures. Today approximately 1/2 the population and industries of Switzerland are connected to wastewater treatment plants. Although the organic pollutants are decomposed, i.e., mineralized in these plants, their basic compounds, such as phosphates, nitrates, etc., are involuntarily discharged into rivers and lakes, which thereby become over-fertilized. This eutrophication is manifested by a dense production of filamentous and planktonic algae as well as of aquatic higher plants. When, at the end of the vegetation period, this mass of organic matter dies, it causes a sedimentation on the bottom of a lake as a partly undigested sludge. Eutrophying substances may be eliminated by chemical precipitation (P) or biological O2 reduction (N) in sewage treatment plants. Due to run-off (erosion) from agricultural soils, many mineral substances still flow uncontrolled into lakes. The effectiveness of 3-stage sewage purification has, at least in some cases already been proved.--Copyright 1973, Biological Abstracts, Inc.
W74-08697

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

OPTIMIZATION OF THE ASSIMILATIVE WASTE CAPACITY OF THE UNSATURATED AND SATURATED ZONES OF AN UNCONFINED AQUIFER SYSTEM,
Univ., of California, Los Angeles. School of Engineering and Applied Science.
For primary bibliographic entry see Field 5B.
W74-08152

PROBABILISTIC MODELS IN THE DESIGN AND OPERATION OF A MULTI-PURPOSE RESERVOIR SYSTEM,
Univ., of California, Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 4A.
W74-08153

SYSTEM OPTIMIZATION FOR PULP AND PAPER INDUSTRIAL WASTEWATER TREATMENT DESIGN,
Texas A and M Univ., College Station. Dept. of Industrial Engineering.
For primary bibliographic entry see Field 5D.
W74-08418

SYSTEMS PLANNING DESIGN: CASE STUDIES IN MODELING, OPTIMIZATION, AND EVALUATION,
Massachusetts Inst. of Tech., Cambridge. Center for Transportation Studies.
R. de Neufville, and D. H. Marks.
Prentice Hall, Inc., Englewood Cliffs, New Jersey, 1974. 446 p, 92 fig, 52 tab, 184 equ, 292 ref.

Descriptors: *Systems analysis, *Planning, *Design, Water resources, *Model studies, *Evaluation, *Optimization, Economics, Transportation, Decision making, Simulation analysis, Multiple-purpose projects, Computer programs, Linear programming, Social aspects, Technology.
Identifiers: Multiobjective analysis, Production function, Cost function, Demand function, Nonlinear programming, Geometric programming, Chance-constrained programming.

Systems analysis techniques are applied to actual problems in planning and design; case studies which illustration the usefulness and relative strengths of alternative approaches to formulating and solving large-scale planning problems are presented. Included are econometric and nonexperimental modeling, large-scale mathematical programming and simulation, decision analysis, and multiobjective evaluation. Three major sections focus on: (1) modeling the system, including the use of production, cost, and demand functions; (2) searching for optimal ranges of design, where techniques include nonlinear programming, simulation, chance-constrained and geometric programming; and (3) evaluation and choice of alternatives, wherein multiobjective analyses are utilized. Nine out of the book's twenty-seven chapters deal with water resource problems, such as cofferdam optimization, inland water transport economics, river basin planning using optimization and simulation, examples relating to the analysis of water reuse alternatives in an integrated urban-agricultural area, determination of reservoir discharge policy, and the multiobjective design of Indiana's Big Walnut project. Also treated in detail are economics of electrical power generation, airport access services, railroad passenger transportation, solid waste collection models, cost effectiveness of freeway design alternatives, unreliability in railroad network operations, decisions concerning harbor fills and airport development, computer systems planning, and a normative model for decisions on technological projects having social consequences. (See also W74-08507 thru W74-08515) (Bell-Cornell)
W74-08506

SYSTEMS ANALYSIS OF LARGE-SCALE PUBLIC FACILITIES: NEW YORK CITY'S WATER SUPPLY NETWORK AS A CASE STUDY,
Massachusetts Inst. of Tech., Cambridge. Center for Transportation Studies.
For primary bibliographic entry see Field 3D.
W74-08507

ECONOMICS OF INLAND WATER TRANSPORT,
Peat, Marwick, Mitchell and Co., Washington, D.C.
For primary bibliographic entry see Field 4A.
W74-08508

SUPPLY CURVE FOR THERMAL EFFICIENCY,
Stanford Univ., Calif. Graduate School of Business.
P. H. Cootner, and G. O. G. Lof.
In: Systems Planning and Design: Case Studies in Modeling, Optimization, and Evaluation (Ed. by R. de Neufville and D. H. Marks), Prentice Hall, Inc., Englewood Cliffs, New Jersey, p 80-97 (Chapter 7), 1974. 7 fig, 6 equ, 18 ref.

Descriptors: *Water resources development, Methodology, *Design, *Thermal powerplants, *Economic efficiency, *Cost analysis, Optimization, Electric power, Steam, Water demand, Cooling, Temperature, Pressure, Supply, Operating costs, Construction costs, Marginal costs, Water utilization, Thermal pollution, Equations, Planning, Management, Systems analysis, Mathematical models, *Forecasting.
Identifiers: *Thermal efficiency, Production function, Supply schedule, *Supply curve, Isoquants, Sensitivity analysis, Gas turbine power, Atomic power.

A methodology is presented for predicting the potential nature of future water resource developments. Based upon a detailed modeling of the production function for the generation of electric power, and of the prevailing and expected costs, a supply curve for thermal efficiency is developed. The supply curve indicates the costs of obtained higher thermal efficiency. Optimal designs are based upon consideration of models of the underlying technical processes (temperature and pressure) as represented by the production function, and of the economic cost functions (construction and operating costs). Both the production function and cost function are represented by isoquants. The two models are combined into supply functions: the technical (isoefficiency curves) and the cost (transformation curves) considerations are united, thus defining the most economically and technically optimal designs for various levels of thermal efficiency. Technically, the production of thermal efficiency exhibits diminishing returns to scale. The economic cost of achieving higher pressures and temperatures becomes more expensive. Results show both the technical and economic factors combine to increase the slope of the thermal efficiency supply curve at about 40%. To raise thermal efficiency appreciatively would be economically inefficient. Using sensitivity analysis, the possible results are examined of improvements in the design of existing power plants, and of the introduction of new methods of production: gas turbines and atomic power. (See also W74-08506) (Bell-Cornell)
W74-08509

ANALYSIS OF WATER REUSE ALTERNATIVES IN AN INTEGRATED URBAN AND AGRICULTURAL AREA,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5D.
W74-08510

A COFFERDAM DESIGN OPTIMIZATION,
Delaware Univ., Newark. Dept. of Civil Engineering; and Bell Telephone Labs., Murray Hill, N.J.
For primary bibliographic entry see Field 8A.
W74-08511

THE COMBINED USE OF OPTIMIZATION AND SIMULATION MODELS IN RIVER BASIN PLANNING.,
Massachusetts Inst. of Tech., Cambridge. Sloan School of Management.

For primary bibliographic entry see Field 4A.
W74-08512

DETERMINATION OF THE DISCHARGE POLICY FOR EXISTING RESERVOIR NETWORKS,
Hydro-Quebec, Montreal.
For primary bibliographic entry see Field 4A.
W74-08513

MULTIOBJECTIVE ANALYSIS IN WATER RESOURCE PLANNING,
Johns Hopkins Univ., Baltimore, Md. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 4A.
W74-08514

DIGITAL SIMULATION OF THE EFFECTS OF URBANIZATION ON RUNOFF IN THE UPPER SANTA ANA VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 4C.
W74-08598

TECHNICAL AND ECONOMIC ISSUES IN THE WATER QUALITY MANAGEMENT OF YAQUINA BAY,
Oregon State Univ., Corvallis. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 2L.
W74-08672

6B. Evaluation Process

THE USE OF QUESTIONNAIRES IN COLLECTING INFORMATION FOR URBAN FLOOD CONTROL PLANNING,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 6F.
W74-08151

ROAD LOG AND GUIDE--GEOLOGY AND HYDROLOGY FOR PLANNING, ANCHORAGE AREA.
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 4A.
W74-08180

THE CITIZEN AND WATER MANAGEMENT: AN ATLAS OF WATER ATTITUDES IN SOUTHERN MINNESOTA,
Gustavus Adolphus Coll. St. Peter, Minn. Dept. of Geography.
R. T. Moline.
Available from the National Technical Information Service as PB-232 504, $3.75 in paper copy, $1.45 in microfiche. Completion Report, April 1974. 68 p, 25 fig, 14 tab, 11 ref. OWRR B-042-Minn(1). 14-31-0001-3292.

Descriptors: *Attitudes, River basins *Planning, *Maps, Water resources, *Mangement, *Water pollution, *Social participation, *Minnesota, *Surveys.
Identifiers: Minnesota River basin.

A series of computer maps displaying the locational dimensions of attitudes toward water resources, water problems, and water planning in the Minnesota River Basin. Data were obtained from 1,184 responses to two mailed questionnaires sent to citizens throughout the Basin in 1971 and 1972. The questionnaires consisted of three parts, a short biographical introduction, a section wherein respondents were asked to rank their most important sources of water information and their most pressing water problem, and a section of 26 statements about water, water problems, and water planning patterned after Likert attitude measuring instruments. Results of this first phase of the study indicate that there was more areal similarity in attitudes than had been thought. Water pollution was regarded as the first priority problem in 10 of the 13 sub-basins. Inadequate water resource planning, and wet agricultural fields were also thought to be serios problems over large sections of the Basin. There were significant spatial differences in attitudes but no strong clustering in any areas of the basin. Similarly, the maps showed little spatial pattern to responses from the Likert-type statements. Citizens expressed a need for and a belief in water resource planning. It is suggested that participation may be enhanced and simplified by using communication linkages already existing in the Basin such as local newspapers and television. (Walton-Minnesota)
W74-08288

ESTIMATION OF OUTDOOR RECREATIONAL VALUES,
Florida Univ., Gainesville.
K. C. Gibbs, and J. F. McGuire, III.
Available from the National Technical Information Service as PB-232 503, $6.25 in paper copy, $1.45 in microfiche. University of Florida Institute of Food and Agricultural Sciences, Economics Report 53, July 1973. 58 p, 3 fig, 5 tab, 26 ref, 2 append. OWRR B-007-FLA(11). 14-31-0001-3267.

Descriptors: *Water allocation(Policy), Water values, Water utilization, Water demand, Decision making.

The Kissimmee River Basin area, prior to extensive water management, was subject to wide fluctuations in water level. Floods and droughts occurred with some regularity depending on the amount of rainfall. Water management structures such as canals, dikes, and dams have been installed to provide a more stable water level throughout the basin. By removing the excessive fluctuations in the water level, the extremes of flood and drought have been tempered enough to allow a more constant use of the total area throughout the year. Water levels are maintained at specified stages depending on the usage, rainfall, and other factors. A study was designed to develop and test two types of water allocation models: linear programming and simulation. In order to allocate water efficiently values of alternative uses must be estimated. The value of water for agriculturally oriented industries bordering the Kissimmee River Basin was estimated by determining the amount of water drawn from surface water areas and increased value of the crops due to this water. The value of water for flood control purposes was estimated as the added value obtained by not having an area subjected to damaging fluctuations. The value of water for outdoor recreation was estimated. (Morgan-Florida)
W74-08392

DIFFICULTIES IN PLANNING WATER SUPPLY SCHEMES IN WEST MALAYSIA,
Malaysia Dept. of Water Supply, Kuala Lumpur.
Goh Kiam Seng.
In: Water Resources, Environment and National Development--Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 95-99, 1972.

Descriptors: *Planning, *Water resources development, *Urbanization, *Municipal water, *Industrial water, Hydrogeology, Water quality, Groundwater, Surface waters, Water pollution.
Identifiers: *Malaysia.

The Government of Malaysia is spending large sums of money in extending existing water supplies and in developing new ones. There is a lack of long-range master planning for urban and industrial development. Problems encountered in water resources development are a result of rapid urbanization and changing patterns of industrialization. Lack of data and experienced staff make population estimation and estimation of reliable yield of water difficult. Problems also arise when there is conflict of interests of the beneficial uses of waterways among water resources development and industrial, mining and agricultural development. In recent years, attention has also been given to exploration for underground water. Results have not been satisfactory because of lack of experience in geohydrological investigations and the complete absence of details on geological data. These problems coupled with limited financial resources and lack of experienced technical personnel hamper the implementation of the plan for water resources development. (See also W74-08454) (Knapp-USGS)
W74-08462

WATER RESOURCES DEVELOPMENT IN WEST MALAYSIA,
Drainage and Irrigation Dept., Kuala Lumpur. (Malaysia)
For primary bibliographic entry see Field 3B
W74-08463

RATIONAL USE OF WATER,
Ministry of Public Works and Electrical Energy, Djakarta (Indonesia). Water Resources Development.
W. S. Srimoerni Doelhomid.
In: Water Resources, Environment and National Development--Volume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 128-139, 1972. 4 fig.

Descriptors: *Water utilization, *Planning, Water resources development, *Water storage, Water reuse.
Identifiers: *Indonesia.

In the densely populated islands of Java, Bali and Lombok water use is very intensive, not only for drinking and domestic purposes, but also for irrigation, industry and town water. Flood problems need to be solved. Indonesia has no problem of shortage of water resources, but has an unequal rainfall distribution over the year. The problem of Singapore is different; it has a real shortage of water resources. Even so, water is wasted; surface runoff is flowing unused into the sea. Estuarial storage in creeks along the coast has been proposed as the only way to store all available water, and could be a cheaper solution than recycling of very dirty town water or desalination of seawater. (See also W74-08454) (Knapp-USGS)
W74-08466

RESEARCH ON THE CULTURE OF CERTAIN COMMON MARINE ORGANISMS IN SINGAPORE WATERS,
Singapore Univ. Fisheries Biology Unit.
For primary bibliographic entry see Field 3F.
W74-08477

A GUIDE TO NATURAL RESOURCE INFORMATION OF GEORGIA.
Georgia Dept. of Natural Resources, Atlanta.
For primary bibliographic entry see Field 10C.
W74-08487

THE METROPOLITAN TORONTO AND REGION WATERFRONT PLAN, 1972-1976.
Metropolitan Toronto and Region Conservation Authority, Downsview (Ontario).
February 4, 1972. 58 p, 26 fig, 2 tab.

Descriptors: *Shore protection, *Water management(Applied), *Landfills, *Land development, *Recreation facilities, Regional development, Cost sharing, Public lands, Water conservation,

Water policy, Water resources development, Project planning, Ontario, Canada.
Identifiers: Metropolitan Toronto.

A five year $20,000,000 comprehensive plan for the development of the Lake Ontario waterfront area of Metropolitan Toronto is outlined. The cost of the project will be shared by the Province of Ontario and the municipalities in the Metropolitan Region. The city of Toronto will raise 93.5% of the revenues to come from the municipalities. The objective of the waterfront plan is to create a handsome waterfront, balanced in its land use, which will complement adjacent areas taking cognizance of existing residential development and making accessible, wherever possible, features which warrant public use. The project will encompass the area lying west of Dufferin Street and east of Coxwell Avenue to the limits of jurisdiction of the authority. This one area has been divided into seven sectors: Etobicoke, Western Beaches, Eastern Beaches, Scarborough, Pickering-Ajax, Mississauga, and the Central Sector. These sectors are further subdivided into sites for individual projects. The proposed development will include the creation of public shoreland and island parks by oceanfront landfills, hydraulic improvements to reduce channel silting, refurbishing of present recreational facilities, and the construction of additional facilities, erosion control, and construction of a trail system for hiking. The Authority will acquire some public and quasi public lands in order to retain them for waterfront purposes. (LaPointe-North Carolina)
W74-08489

RIVERFRONT DEVELOPMENT: THE POLITICS OF MASTER PLANNING,
Illinois Univ., Urbana. Inst. of Government and Public Affairs.
For primary bibliographic entry see Field 3D.
W74-08495

POTENTIAL FOR MARGINAL COST PRICING IN WATER RESOURCE MANAGEMENT,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering; and Johns Hopkins Univ., Baltimore, Md. Dept. of Political Economy.
For primary bibliographic entry see Field 6C.
W74-08496

WATER AND SEWER SUPPLY DECISIONS: A CASE STUDY OF THE WASHINGTON SUBURBAN SANITARY COMMISSION,
Virginia Univ., Charlottesville.
For primary bibliographic entry see Field 5G.
W74-08497

MULTIOBJECTIVE REDESIGN OF THE BIG WALNUT PROJECT,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W74-08515

WATER POLLUTION: ECONOMIC ASPECTS AND RESEARCH NEEDS,
Resources for the Future, Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-08525

NATIONAL WATER COMMISSION REPORT,
Hearings--Subcomm. on Water and Power Resources, Comm. on Interior and Insular Affairs, U.S. Senate, 93d Cong, 1st Sess, July 17, 1973. 431 p.

Descriptors: *Federal Government, *Water resources development, *Water demand, *Water policy, Water resources, Water conservation, Social aspects, Economic aspects, Water management(Applied, Water supply, Water shortage, Water utilization, State Governments, Coordination, Water sourced, Administration, Water allocation(Policy), Political aspects, Water users, Electric power, Recreation, Project planning, Water requirements, Adoption of practices.
Identifiers: *Congressional hearings.

The purpose of these hearings is to receive testimony from the National Water Commission concerning a five-year study of national water resources problems. Since the Commission's establishment, a national policy of preserving water resources in the form of wild and scenic rivers has been defined. Recreational demands upon water resources have greatly increased. The demands for water to support thermal-electric power generation have exceeded expectations. Greater varieties of water uses must be accomodated and larger populations must be served from a finite resource. Water resource planning must become more sophisticated and effective. Water development programs in the western United States profoundly effect all social development. State and local programs have been organized to supplement and complement federal programs. If major changes are made in federal programs, readjustments will be necessary not only in state and local water agencies, but perhaps in the entire outlook for social and economic development. (Sperling-Florida)
W74-08527

THE NATIONAL SHORELINE STUDY,
Corps of Engineers, Portland, Oreg.
For primary bibliographic entry see Field 2L.
W74-08671

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

OXYGENATION SYSTEM FOR ACCELERATED SEWAGE TREATMENT,
FMC Corp., Englewood, Colo. Div. of Environmental Equipment.
For primary bibliographic entry see Field 5D.
W74-08207

ALL COSTS MUST BE COUNTED . . . ,
Camp, Dresser and McKee, Boston, Mass.
For primary bibliographic entry see Field 5D.
W74-08211

COUNTERCURRENT WASHING TURNS THE TIDE AGAINST RISING EFFLUENT COSTS,
Pierson and Co., Ltd., Manchester (England).
For primary bibliographic entry see Field 5D.
W74-08228

COST EFFECTIVENESS IN SEWAGE TREATMENT,
Anglian Water Authority (England). Lincolnshire Sewage Div.
For primary bibliographic entry see Field 5D.
W74-08263

ECONOMIC OPTIMIZATION OF THE AVCO CRYSTALLIZATION PROCESS,
AVCO Systems Div., Wilmington, Mass.
For primary bibliographic entry see Field 3A.
W74-08337

AIMS OF WATER POLLUTION CONTROL,
Binnie and Partners, London (England).
For primary bibliographic entry see Field 5G.
W74-08470

HONOLULU BOARD OF WATER SUPPLY ANNUAL REPORT FOR THE YEAR ENDED JUNE 30, 1973.
Board of Water Supply, Honolulu, Hawaii.
For primary bibliographic entry see Field 5G.
W74-08492

POTENTIAL FOR MARGINAL COST PRICING IN WATER RESOURCE MANAGEMENT,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering; and Johns Hopkins Univ., Baltimore, Md. Dept. of Political Economy.
S. H. Hanke, and R. K. Davis.
Water Resources Research, Vol 9, No 4, p 808-825, August, 1973, 79 ref.

Descriptors: *Water resources, *Water management(Applied), *Economic efficiency, *Marginal costs, *Pricing, Administrative costs, Equity, Investment, Municipal water, Municipal wastes, Industrial wastes, Flood protection, Flood plain insurance, Navigation, Recreation, Irrigation, Hydroelectric power, Wildlife habitats.
Identifiers: Segment tolls.

An efficient pricing system to regulate demand and influence investment in water resources could be established for a variety of water uses. The tradeoffs to be recognized in establishing such a pricing system are economic efficiency, investment information, administrative and transaction costs, equity, and political realities. Following the policies of seasonal peak load rates, zonal rates, and frontfoot assessments, municipal water services lend themselves well to pricing policies. Imposition of prices on industrial and municipal sewage will establish a least cost adjustment to meet a given water quality standard. The introduction of segment tolls along navigable waterways is suggested to insure more equity and efficiency, and compulsory insurance programs in hurricane areas are advised to reduce flood damage in shoreline construction. Four other areas of water use, outdoor recreation, fish and wildlife habitats, irrigation, and hydroelectric power present difficult problems in establishing an efficient pricing policy. (LaPointe-North Carolina)
W74-08496

6D. Water Demand

THE SEVIER COUNTY WATER PLAN,
Tennessee Dept. of Conservation, Nashville. Div. of Water Resources.
J. W. Pinkerton.
Water Resources Series No 12, 1973. 68 p, 18 fig, 7 tab, 31 ref.

Descriptors: *Water management(Applied), *Water allocation, *Water demand, *Water supply, Water resources, Water requirements, *Tennessee, Reservoir operation, Water resources development, Water utilization, Water distribution, Water control, Wells, Springs, Utilities, Surface waters.
Identifiers: Sevier County(Tennessee), *Water distribution systems, Water distribution policy, Utility districts.

Tennessee generally has adequate rainfall and vast amounts of impounded reservoir water, yet water shortage difficulties arise in localized areas. Sevier County, with a phenomenal recreational interest and related investment, has an immediate need for more water. The Sevier County Water Plan projects maximum water needs, quantitatively and qualitatively assesses the potential growth of the region, identifies troublesome situations or those which may develop. It can also serve as a general water resources guide for governmental agencies. Water in Sevier County is available from wells, springs, surface streams, and procurements from utility districts in adjacent counties. While wells and springs are less expensive to develop, their

natural variability makes yield assessment difficult to ascertain. Surface supplies are more predictable, but usually require costly treatment. Methods for quantifying flow characteristics must be developed. Six utility districts provide a water distribution system for the county, while independent users, a large proportion of the population in outlying areas, still use wells and springs. Projected requirements of study sub-areas are compared with overall water availability so potential shortages can be identified; however, drought conditions are beyond the scope of the report. (Grden-North Carolina)
W74-08493

SUPPLY CURVE FOR THERMAL EFFICIENCY,
Stanford Univ., Calif. Graduate School of Business.
For primary bibliographic entry see Field 6A.
W74-08509

NATIONAL WATER COMMISSION REPORT,
For primary bibliographic entry see Field 6B.
W74-08527

6E. Water Law and Institutions

THE CONNECTICUT TIDAL WETLANDS SURVEY,
Connecticut Univ., Storrs. Systematic and Evolutionary Biology Section.
M. W. Lefor.
In: Proceedings of First Wetlands Conference, Storrs, Connecticut, June 20, 1973: Connecticut University Institute of Water Resources Report No 21 p 1-19, December 1973.

Descriptors: *Wetlands, *Connecticut, *Legislation, *Surveys, *Tidal marshes, Environment, Regulation, Land management.
Identifiers: Wetland protection, Tidal wetlands.

Connecticut passed legislation in 1969 to protect and regulate the use of tidal wetlands, and new statutes for the preservation of inland wetlands are in effect. The Act clearly stated that an immediate mapping and inventory must be made of Connecticut's salt marshes. The Act lists those species of higher plants which form the dominant vegetation of salt marshes. Because the acreage of salt marsh to be dealt with was not large, it was decided to conduct the surveys on the ground, actually driving stakes according to the legal biological criteria. (See also W74-08157) (Knapp-USGS)
W74-08158

THE CONNECTICUT TIDAL WETLANDS SURVEY,
Connecticut Inland Wetlands Project, Middletown.
D. S. McCluskey.
In: Proceedings of First Wetlands Conference, Storrs, Connecticut, June 20, 1973: Connecticut University Institute of Water Resources Report No 21, p 20-29, December 1973. 2 ref.

Descriptors: *Wetlands, *Connecticut, *Legislation, *Surveys, *Soil classification, Environment, Regulation, Land management, Marshes, Swamps.

The Inland Wetlands and Water Courses Act of Connecticut defines inland wetlands by soil classification rather than by vegetation. This direct contrast to the definition of tidal wetlands by plant species reflects the fact that a vegetative list is not definitive for the diverse freshwater wetlands where a series of variable plant associations may be encountered. Detailed soils maps are completed for over two-thirds of the state and general soils maps for the remainder, providing well established, easily identified criteria for delineating wetland boundaries. (See aslo W74-08157) (Knapp-USGS)
W74-08159

INLAND WETLAND SOILS,
Connecticut Agricultural Experiment Station, New Haven
For primary bibliographic entry see Field 2G.
W74-08160

LEGAL ASPECTS OF WETLANDS PROTECTION--LIMITS OF THE POLICE POWER,
H. N. Johnson.
In: Proceedings of First Wetlands Conference, Storrs, Connecticut, June 20, 1973: Connecticut University Institute of Water Resources Report No 21, p 135-136, December 1973.

Descriptors: *Wetlands, *Connecticut, *Water law, Legislation, Judicial decisions, Public rights, Water resources development, Swamps, Marshes, Tidal marshes, Land use.

The law relating to wetlands protection is a branch of what is referred to as the 'police power': it deals with the extent to which government may regulate people's conduct. In the instance of wetlands, it relates to the extent to which the state may regulate use of wetlands without being confiscatory. The issue that is going to have to be resolved by the courts is where the line should be drawn between the valid exercise of police power and taking of property. Test cases have been filed in various states, including Connecticut. Many rulings include strong language that wetlands must and should be protected under the police power. (See also W74-08157) (Knapp-USGS)
W74-08167

INLAND WETLANDS FROM THE ADMINISTRATORS VIEWPOINT--BASED ON EXPERIENCES WITH CONNECTICUT'S INLAND WETLANDS AND WATER COURSES ACT,
Connecticut Dept. of Environmental Protection, Hartford.
S. Suffern.
In: Proceedings of First Wetlands Conference, Storrs, Connecticut, June 20, 1973: Connecticut University Institute of Water Resources Report No 21, p 137-138, December 1973.

Descriptors: *Wetlands, *Connecticut, *Water law, Legislation, Judicial decisions, Public rights, Water resources development, Swamps, Marshes, Tidal marshes, Land use.

Connecticut's law applies to both water courses and wetlands. Water courses are defined as rivers, streams, brooks, waterways, lakes, ponds, marshes, swamps, bogs, and all other bodies of water, natural or artificial. Inland wetlands are defined as land, including submerged land, which consists of any of the soil types designated as poorly drained, very poorly drained, alluvial, and flood plain by the National Cooperative Soils Survey. The problems encountered in administering the bill are practical ones. Foremost among these is the definition of edges. It is necessary to refine the techniques to the point where the wetland boundary can be defined to within a very few feet or less. A second problem is that of assessing the value of wetlands. A third problem is the effect of this type of legislation on people's attitudes toward land ownership. Many consider land use regulation an infringement on rights of owners of private property. It is obvious that total development of a given wetland will have serious environmental consequences. It is much more difficult to evaluate piecemeal uses. (See also W74-08157) (Knapp-USGS)
W74-08168

THE SOIL CONSERVATION AND ITS ROLE IN WETLAND MANAGEMENT FOR CONNECTICUT,
Soil Conservation Service, Storrs, Conn.
E. E. Offerman.
In: Proceedings of First Wetlands Conference, Storrs, Connecticut June 20, 1973: Connecticut University Institute of Water Resources Report No 21, p 139-143, December 1973. 1 tab.

Descriptors: *Wetlands, *Connecticut, *Water law, *Soil surveys, Legislation, Judicial decisions, Public rights, Water resources development, Swamps, Marshes, Tidal marshes, Land use.
Identifiers: *Soil conservation service.

Soil survey information is a basis for defining inland wetlands as outlined in Connecticut Public Act 155, the Inland Wetlands and Watercourses Act. Soils included in the definition are the poorly and very poorly drained, alluvial and the flood-plain soils. The mission of the U.S. Department of Agriculture Soil Conservation Service (SCS) is to assist in the conservation, development and productive use of the nation's soil, water and related resources. The technical assistance provided to individual land owners, groups, or units of government is based on a planning approach. This approach is to help land users or decision makers to plan each land unit as a whole, integrating all aspects of land use and treatment. (See also W74-08157) (Knapp-USGS)
W74-08169

FEDERAL POLICY TOWARDS WETLANDS,
Environmental Protection Agency, Edison, N.J. Federal Water Programs.
For primary bibliographic entry see Field 5G.
W74-08170

INDUSTRIAL ASPECTS OF WETLAND USES,
Northeast Utilities Service Co., Hartford, Conn. Environmental Planning Coordination.
C. O. Fisher.
In: Proceedings of First Wetlands Conference, Storrs, Connecticut, June 20, 1973: Connecticut University Institute of Water Resources Report No 21, p 146-147, December 1973.

Descriptors: *Wetlands, *Connecticut, *Water law, *Electric power industry, Electric power-plants, Legislation, Judicial decisions, Public rights, Water resources development, Swamps, Marshes, Tidal marshes, Land use.

Reasons for past industrial development of low-lying and wet areas include: (1) the large level tracts available, often with few close neighbors; (2) relatively low-cost land, even after drainage and filling (and sometimes good building foundations because of impervious and underlying material causing the surface to remain wet); and (3) planning and zoning policies that encouraged industrial use by earmarking such areas for this use, or by failing to earmark enough other land for industrial use. Current public planning policies recognize wetland values previously underestimated and help to preserve wetland areas. A State land use policy should address needs for both preservation and development. Connecticut's inventory of acceptable sites is very low, and future sites will involve careful weighing of costs and benefits. Though some wetlands may be unavoidably used, other wetlands and natural areas may be preserved as a result of incorporation into a generating site. (See also W74-08157) (Knapp-USGS)
W74-08171

PANEL REVIEW AND COMMENTARY,
Connecticut Univ., Storrs. Inst. of Water Resources.
R. Deitchman.
In: Proceedings of First Wetlands Conference, Storrs, Connecticut, June 20, 1973: Connecticut

University Institute of Water Resources Report No 21, p 148-150, December 1973.

Descriptors: *Wetlands, *Connecticut, *Water law, *Conferences, Legislation, Judicial decisions, Public rights, Water resources development, Swamps, Marshes, Tidal marshes, Land use.

A panel discussion was held to let a group of knowledgeable persons with differing perspectives present their views on wetlands, particularly in Connecticut. The use of a soils definition of wetlands seems to have several weak spots, including legal and technical boundary problems and the fact that the State of Connecticut will not be completely mapped until 1976. Education and public information must be part of any wetlands preservation and use program. Several states are now moving to consider a public trust doctrine for regulation of land use. Under the public trust, the state serves as a fiduciary for the citizens of the state and for the administration of land uses. Change in concepts of property ownership would be a long-term response in thinking of land as part of the larger ecosystem and that individuals have no inherent rights to land ownership. Since wetland land values appear to be a poor indicator of the worth of these resources to society, industries and municipalities may be using, or abusing, these areas as an external diseconomy. (See also W74-08157) (Knapp-USGS)
W74-08172

CLEANUP DOWN BY THE OLD MILL STREAM.
For primary bibliographic entry see Field 5G.
W74-08203

WATER RESOURCES: KEY TO WESTERN FUTURE.
For primary bibliographic entry see Field 5G.
W74-08204

OBJECTIVES OF IRRIGATION MANAGEMENT COMMITTEE,
Agricultural Research Service, Fort Collins, Colo.
For primary bibliographic entry see Field 3F.
W74-08264

INTERSTATE AND INTERNATIONAL AQUIFERS,
Bittinger (M.W.) and Associates, Inc., Fort Collins, Colo.
M. W. Bittinger, and E. B. Jones.
Water Resources Bulletin, Vol 8, No 2, p 386-390, April, 1972. 11 ref.

Descriptors: *Groundwater, *Aquifers, Interstate, International waters, Water law, Water utilization.

Many important groundwater aquifers cross state and national boundaries. The flow of water in these aquifers is not influenced by the boundaries but may be materially influenced by man's activities on one or both sides of a boundary. Interstate and international problems may develop because of excessive groundwater lowering on one side of a boundary affecting water users on the opposite side of the line. Similarly, intensive groundwater development along a surface stream may influence the amount of surface water that flows across a boundary. A third type of problem may develop when pumping on one side of the boundary induces poor quality water into an aquifer on the other side of the boundary. Several specific interstate and international aquifer problems are briefly described. (Skogerboe-Colorado State)
W74-08276

ENVIRONMENTAL RESEARCH IN 1973--ANNUAL REPORT.
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 5G.
W74-08309

POLLUTION CONTROL OF DISCHARGE INTO RIVERS, LAKES AND COASTAL WATERS IN THE PHILIPPINES,
National Water and Air Pollution Control Commission, Manila (Philippines).
For primary bibliographic entry see Field 5G.
W74-08482

WATER POLLUTION IN THAILAND,
Applied Scientific Research Corp., of Thailand, Bangkok. Environmental and Ecological Research Inst.
For primary bibliographic entry see Field 5G.
W74-08483

SUMMARY REPORT ON POLLUTION CONTROL IN INDONESIA,
Ministry of Public Works and Electrical Energy, Djakarta (Indonesia). Planning and Urban Development.
For primary bibliographic entry see Field 5G.
W74-08484

RIVERFRONT DEVELOPMENT: THE POLITICS OF MASTER PLANNING,
Illinois Univ., Urbana. Inst. of Government and Public Affairs.
For primary bibliographic entry see Field 3D.
W74-08495

WATER AND SEWER SUPPLY DECISIONS: A CASE STUDY OF THE WASHINGTON SUBURBAN SANITARY COMMISSION,
Virginia Univ., Charlottesville.
For primary bibliographic entry see Field 5G.
W74-08497

SUBMERGED AND SUBMERSIBLE LANDS OF OREGON.
Advisory Committee to the State Land Board, Salem, Ore.
Available from Nat. Tech. Infor. Serv., Springfield, Va. 22151, as PB-232 701, for $8.75 paper copy; $1.45 microfiche. October 1970. 118 p. OWRR C-2177 (3378) (1).

Descriptors: *Oregon, *Beds, *Ownership of beds, *Navigation, *Riparian rights, Accretion(Legal aspects), Erosion, Avulsion, Navigable waters, Inland waterways, Estuaries, Streams, Streambeds, Rivers, Legal aspects, Legislation, Meanders, Banks, Pollution, Recreation, Tidal marshes, Tidal waters, Land management.

This compilation relates to a study assigned by the Oregon Legislature to the Advisory Committee to the State Land Board. It is a preliminary work designed to provide a legal base for defining problems and proposing solutions to conflicting governmental jurisdictions, opposing claims of riparian ownership, overlapping authority of agencies, limits of navigation involving state ownership of beds and banks of Oregon's waterways and questions bearing on offshore authority and powers. The beds of navigable waterways and their banks, to the mean high water line, were granted to Oregon by the federal government at the time of statehood (1859). However, rivers, in their meandering routes to the sea have oscillated tremendously. Old banks and beds were abandoned, new ones created. These changes have occurred through the processes of accretion, erosion and avulsion, and the type of change involved often determines ownership of the river bed. Limits of navigability as they existed in 1859 also are confusing. The problems of tidelands, offshore submerged and submersible lands, and estuarine management are equally complex. This study is thus primarily pointed toward re-evaluation, clarification and revision of the above legal problems. (Ritchie-Florida)
W74-08516

ENVIRONMENTAL IMPACT STATEMENTS.
Datatronic Systems Corp., Panorama City, Calif.
For primary bibliographic entry see Field 6G.
W74-08517

THE IMPACT OF GROWTH ON THE ENVIRONMENT.
For primary bibliographic entry see Field 6G.
W74-08523

EFFLUENT CHARGES ON AIR AND WATER POLLUTION,
Environmental Law Inst., Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-08524

ADVERSE EFFECTS OF COAL MINING ON FEDERAL RESERVOIR PROJECTS.
For primary bibliographic entry see Field 5G.
W74-08528

PROGRESS EVALUATION MEETING IN THE MATTER OF POLLUTION OF THE INTERSTATE WATERS OF THE MISSOURI RIVER, OMAHA, NEBRASKA AREA (NEBRASKA-IOWA-MISSOURI-KANSAS).
Federal Water Pollution Control Administration, Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-08529

REPORT ON THE SECOND SESSION OF THE CONFERENCE IN THE MATTER OF POLLUTION OF THE SOUTH PLATTE RIVER BASIN.
Federal Water Pollution Control Administration, Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-08530

WHAT ARE POWERS OF LOCAL GOVERNMENTAL AUTHORITIES UNDER FLORIDA LAW TO DISPOSE OF DERELICT AND ABANDONED VESSELS FOUND IN OR NEAR LOCAL NAVIGABLE WATERS,
Miami Univ., Fla. Ocean Law Program.
D. Cowan.
Report No. 2, September, 1973. 6 p.

Descriptors: *Florida, *Legal aspects, *Navigable waters, *Coasts, *Local governments, Cities, Ships, Navigation, State governments, Federal government, Federal jurisidiction, Federal-state water rights conflicts, State jurisidiction.
Identifiers: Navigation obstructions.

A recent opinion by the Attorney General of Florida negates the theory that rivers and submerged lands are to be classified as 'public property,' as that term relates exclusively to land based facilities dedicated to public use. Likewise, the statutory definition of 'abandoned property' found in the same chapter of the Florida statutes cannot be interpreted to provide local governments with a legal vehicle to control derelict and abandoned vessels found in public waters. The Oil Spill Prevention and Pollution Control Act of 1970 grants authority to the State Department of Natural Resources to remove any wrecked or abandoned vessels from public waters. The exercise of such power by local authorities requires that the statute be amended. Such state dominion does not obscure the right of local governments to deal with derelict and abandoned vessels deposited in local waters. If derelict or abandoned vessels are deposited upland of the mean high water line, they may be validly classified as 'abandoned property,' but still not subject to disposal by county authorities unless they are on 'public property.' But if they are abandoned on private property, they are

subject to disposal pursuant to the exercise of the county's police powers. (Ritchie-Florida)
W74-08533

MUNICIPAL POWERS UNDER FLIRIDA LAW WITH RESPECT TO PROTECTION OF ENVIRONMENTALLY ENDANGERED RIPARIAN LAND,
Miami Univ., Fla. Ocean Law Program.
D. Cowan.
Report No. 1, September 1973. 4 p.

Descriptors: *Local governments, *Florida, *Coasts, *Construction, *Riparian rights, *Land fills, Legislation, Constitutional law, Cities, Aquifers, Environmental Effects, Groundwater, Water supply, Land use, Zoning, Planning, Legal aspects, Non-structural alternatives.

The legal authority of a muncipality to prevent the proposed development of three tracts of land which front on a short tidal stream in North Miami, Florida, is analyzed. Though the parcels are not interconnected, they comprise integral segments of an underground eco-system. For such lands to be converted to residential use would require extensive filling in of shoreline areas, resulting in irreversible ecological damage according to city officials. A court order was issued requiring the City of North Miami to grant a construction permit for one of the three tracts of land, and this paper analyzes the legal possibilities for preventing the development of the remaining two tracts. Florida law grants the Department of Pollution Control authority to supervise underground water, and arguably the filling of this property would have effect on the underground aquifer located beneath this property. In addition, Florida municipalities have been granted extensive home rule powers, both constitutionally and statutorily. More specifically, they have been vested with authority to deal with filling of low-lying vacant lands, pursuant to which they could adopt plans and specifications to govern the problem at hand. (Ritchie-Florida=)
W74-08534

UTAH ENVIRONMENTAL PROBLEMS AND LEGISLATIVE RESPONSE: II, LEGISLATIVE RESPONSE,
Environmental Protection Agency, Denver, Colo. Region VIII.
For primary bibliographic entry see Field 5G.
W74-08535

STATE OF WASHINGTON, 1973 ANNUAL REPORT, NATURAL RESOURCES AND RECREATION AGENCIES.
1973. 68 p, 33 chart.

Descriptors: *Water resources, *Publications, *Wildlife habitats, *Soil environment, *State governments, *Washington, Water resources development, Inter-agency cooperation, Documentation, Hydrologic data, Administrative agencies, Environmental effects, Project planning, Water policy, Decision making, Coordination.

This report outlines the work of Washington's natural resources and recreation agencies during 1973 and their contribution to the task of maintaining the state's environmental quality. The Agriculture Department's report outlines its program, needs, goals, and gives a summary of each division's activities. The Ecology Department's report is similar and some of its programs deal with litter and noise control, shoreline management and air and water quality. The Fisheries Department reported on their hatcheries, management and research, hydraulics, construction and patrol divisions, as well as an outlook for 1974. The Game Department reported on its reorganization and describes the non-game program aimed towards wildlife conservation. The Natural Resources Department outlines its management framework, summarizes its activities and presents its various functions in graph form. The Oceanographic Commission outlines its strategy for meeting its newly-framed goals. The Committee for outdoor Recreation summarizes its establishment, goals and planning functions. The Parks and Recreation Commission reports its development, programs and future outlook. Also included are short summaries from the Shorelines and Pollution Control Board and the newly-formed Thermal Power Plant Site Committee. (Sutton-Florida)
W74-08536

LOUISIANA MOVES TOWARD COASTAL ZONE MANAGEMENT.
Louisiana State Univ., Baton Rouge. Sea Grant Legal Program.
Louisiana Coastal Law, Report No. 15, January 1974. 6 p.

Descriptors: *Coasts, *Water resources development, *Water resources, *Project planning, *State governments, Louisiana, Research and development, Local governments, Environment, Interagency cooperation, Water conservation, Land conservation, Project purposes, Administration, Water policy administrative agencies, Ecology.

This report provides an overview of Louisiana's coastal zone management activities--the present situation, the chronological development and likely future alternatives. The final decision regarding how the state's coastal zone program will be structured and which agencies will be responsible for carrying it out will be left up to the legislature. After a chronological listing of all activities, the report compares the two major proposals before the Legislature. The two proposals are very similar, the major difference being the designation and make-up of the coordinating and policy-making group. Under the plan for the Louisiana Advisory Commission on Coastal and Marine Resources, there would be a clear distinction between planning, research and management, with all three supervised by a newly-created state agency. The program proposed by the Louisiana Coastal Commission eliminates the need for this new agency, thus not adding to the proliferation of agencies and resulting in savings to the state. The report summarizes all potential advantages and disadvantages of each program. While refraining from any opinion on which program is the best, the report points out the urgent need for responsible, affirmative legislative action on the subject. (Sutton-Florida)
W74-08537

THE ATLANTIC STATES' CLAIM TO OFFSHORE OIL RIGHTS: UNITED STATES V. MAINE,
W. F. Henri.
Environmental Affairs, Vol 2, No 4, p 827-839, Spring 1973. 13 p, 62 ref.

Descriptors: *Judicial decisions, *Ownership of beds, *Submerged Lands Act, *Federal-state water rights conflicts, *Governmental interrelations, Natural resources, Oil, International law, Subsoil, Tidal waters, Continental shelf, Oceans, Atlantic Ocean, Cases, Water law, Coasts, Maine, State governments, Jurisidction, Water rights.

A critical question in the debate over the proper way to manage fuel resources is which level of government is best able to manage marine mineral resources. Central to this problem is the unsettled question of whether the federal government or the states have legal title to offshore areas. A case currently before the United States Supreme Court should settle this question. The original thirteen colonies are claiming ownership of the Atlantic seabed and subsoil in excess of three miles from their coastline, based on grants from the British Crown. Federal control of offshore waters had been judicially established, but the Submerged Lands Act reversed that concept, declaring state ownership of submerged lands to the three-mile limit. Although Maine asserts the Submerged Lands Act does not affect the present controversy, the author feels that the tests developed by the Court in interpreting the Act will be used to defeat Maine's claim. He also examines the historical basis for the colonies' claim and concludes that it provides no sound basis on which to prevail. (Craig-Florida)
W74-08538

ENVIRONMENTAL POLICIES AS A CONGRESSIONAL REQUIREMENT FOR SOCIAL EFFICACY,
Committee on Public Works (US-Senate).
R. D. Grundy.
Environmental Affairs, Vol 2, No 4, p 639-652, Spring 1973. 14 p.

Descriptors: *Legislation, *Federal Water Pollution Control Act, *Industrial wastes, *Cost-benefit analysis, *Social values, Water quality, Social impact, Pollution(Water), Effluents, River basin development, Discharge water, Water pollution treatment, Pollution abatement, Impaired water quality, Water quality, Water quality standards, Federal government, Environmental effects.

The conflict between man's desire to improve his material standard of living through increased consumption of natural resources and his concurrent desire to preserve those resources has led to a new ethic of social efficacy as a condition of human use. Declining reserves of natural resources, increased demand, and environmental concern have produced policies which will dramatically affect the country's economic and social institutions. The first signs of change were congressional action on air and water pollution, the National Environmental Policy Act (NEPA), and the creation of the Office of Technology Assessment. The Federal Water Pollution Control Act Amendments of 1972 (Act) are summarized and examined, with focus on the emphasis shift from river basin planning to effluent standards, and an examination of the goal of zero discharge. The Act's requirements of use, by 1983, of the best available technology by industrial sources to reach the goal of pollution free water by 1985 represent the balancing of social benefits and costs against economic benefits and costs. This Act, as well as the other congressional programs, reflects a new professionalism, and the criterion is social efficacy. (Craig-Florida)
W74-08539

EASEMENTS: JUDICIAL AND LEGISLATIVE PROTECTION OF THE PUBLIC'S RIGHTS IN FLORIDA'S BEACHES,
W. R. Bowdoin.
University of Florida Law Review, vol XXV, no 3, p 586-596, Spring 1973. 11 p, 69 ref, 1 append.

Descriptors: *Florida, *Easements, *Public access, *Beaches, *Public rights, *Legislation, Scenic easements, Adverse possession, Public lands, Seashores, Recreation facilities, Littoral, Riparian land, Prescriptive rights, Riparian rights, Right-of-way, Legal aspects, Coasts.

Increasing public use of coastal beach property has increased the problem of private property owners in restricting the use of beaches. Courts in coastal states have used three common law doctrins to establish public easements in private beaches to protect the interests and rights of the public. Prescription, which must be used on a tract-by-tract basis, is too time consuming to be of value to the public. Implied dedication has the advantage of a 5-year, as opposed to prescription's 20-year, requirement. The doctrine can, however, be easily defeated by affirmative action by the landowner. Custom is put forward by the article as the best judicial remedy. It can be applied uniformly to all the state's beaches, avoiding piecemeal litigation. The author proposes

Florida Open Beaches Act' to protect the Florida ublic's interests. The statute would avoid the onstitutional prohibition against taking property ithout due process of law by redefining property ghts as opposed to property ownership. Specifially, the statute would provide that all beaches, rom the mean high-water mark to the vegetation ne, are subject to an easement for use by all iembers of the public. (Craig-Florida)
W74-08540

IEW LAWS: CLEAN WATERS IN THE NEXT DECADE,
Army War Coll., Carlisle Barracks, Pa.
For primary bibliographic entry see Field 5G.
W74-08542

BOUNDARY AND LAND DEVELOPMENT REGULATION RECOMMENDATIONS FOR THE BIG CYPRESS AREA OF CRITICAL STATE CONCERN.
Florida Bureau of Land Planning, Tallahassee.
For primary bibliographic entry see Field 4A.
W74-08543

FINAL REPORT ANALYZING COASTAL AND MARINE LAW TO DEVELOP AN AUTHORITY FOR COASTAL ZONE MANAGEMENT,
Texas Law Inst. of Coastal and Marine Resources, Houston.
E. Ereli.
March 19, 1973. 13 p.

Descriptors: *Water resources development, *Water resources, *Coasts, *Project purposes, *Water conservation, *Texas, Project planning, Legislation, Inter-agency cooperation, Water demand, State governments, Air pollution, Legal aspects, Regulation, Estuaries, Land management, Water management(Applied), Land use, Accretion, Erosion, Dredging, Zoning.

This report analyzes the work of the Texas Law Institute and its efforts toward implementing a viable coastal zone management program for Texas. Preliminary legal studies by students, summarizing federal and state regulation relating to the coastal zone, included such specific topics as water supply, drainage and pollution, and regulation of activitfies affecting bays and estuaries. Detailed legal studies were performed by law professors of problems caused by both lack of regulation and duplicative regulation of certain coastal zone uses. The final report outlines the inter-governmental work done by the Institute and the manner in which information concerning the studies was distributed to the public. In evaluating the Institutes' work, University involvement in furthering the goals and aspirations of state government was found to be beneficial to both since the state benefits from a reservoir of talent and knowledge not otherwise available. (Sutton-Florida)
W74-08544

A MODEL WATER USE ACT FOR A RIPARIAN STATE--THE FLORIDA EXPERIENCE,
Florida Univ., Gainesville. School of Law.
F. E. Maloney.
Contemporary Developments in Water Law, p 1-26, 1970. 26 p, 118 ref.

Descriptors: *Riparian rights, *Prior appropriation, *Florida, *Water resources, *Legislation, Streamflow, Beneficial use, Competing uses, Water utilization, Water storage, Water shortage, Water policy, Water law, Legal aspects, Water management(Applied), Industrial water, Surgace-groundwater relationships, Regulated flow, Safe yield, Administration, Low flow, Riparian land.
Identifiers: *Administrative regulations.

The reasonable use rule for water supplies allows each riparian a certain amount of flexibility in commencing a new use or expanding an existing one. Assuming an ample supply of water, detailed statutory regulation should be unnecessary. The riparian system has been criticized because of its restriction on the use of stream water to riparian owners and its requirement that the water be used only on riparian land. There is also great uncertainty as to what constitutes a reasonable use of water for non-domestic purposes. The reasonableness of each use is determined by the needs of other riparians. Another criticism is the lack of administrative controls. The extent of a riparian's right of reasonable use can be determined only by litigation. As population growth and technological development have made greater demands on water supplies, the problem of maintaining stream flows and groundwater levels has become more important. The Florida 1957 Water Resources Law rejected a change to prior appropriation. The Commission that drafted the law found two problems: waste and unreasonable use. The 1957 law provided machinery for the control of unreasonable overuse of available supplies, and authority to capture and divert excess water. (Sperling-Florida)
W74-08545

MUNICIPAL WATER PREFERENCE STATUTES: THE TEXAS WAGSTAFF ACT,
Utah Univ., Salt Lake City. Coll. of Law.
R. W. Swenson.
Contemporary Developments in Water Law, p 27-39, 1970. 13 p, 51 ref.

Descriptors: *Water supply, *Water shortage, *Water management(Applied), *Water demand, *Water rights, *Preferences(Water rights), Water distribution(Applied), Water policy, Water law, Water requirements, Water sources, Water utilization, Eminent domain, Condemnation, Competing uses, Domestic water, Planning, Irrigation practices, Water conservation, Water resources development, Industrial water, Water reuse, Legal aspects, Legislation, Public rights, Water permits, Reservoir storage, Water allocation(Policy).

In the early part of this century, the greatest demands for water were made by farmers for irrigation. Private agencies were organized to serve the farmers' needs. However, in the last thirty years urban areas have begun to lead in the demand for water. Former federal reclamation projects for irrigation are now supplying urban areas. Private agencies and companies have been taken over by municipalities. The urban water supply problem is not new. In 1824 a reservoir in Westchester County supplied Manhattan. Networks of dams to drain rivers have also been employed to alleviate the problem. In some states municipalities have a constitutional or statutory preference over other water users which entitles them in times of scarcity to condemn prior water rights. If the preference is tied to the power of eminent domain, the city may condemn water outside its territorial limits. Another method of handling the planning problem is the conditional water decree. Any appropriator who can divert and apply the water to a beneficial use immediately may obtain a conditional decree from a court in connection with a general adjudication proceeding. The decree specifies the amount of water and purpose of the diversion. (Sperling-Florida)
W74-08546

ENVIRONMENTAL LAW--WATER POLLUTION--CONFLICT BETWEEN REFUSE ACT PERMIT PROGRAM AND NATIONAL ENVIRONMENTAL POLICY ACT,
For primary bibliographic entry see Field 5G.
W74-08550

A BILL TO PROVIDE FOR A NATIONAL PROGRAM OF DISASTER INSURANCE.
Senate Bill 1578, 93rd Cong, 1st Sess (April 13, 1973). 17 p.

Descriptors: *Federal government, *Legislation, *Insurance, *Social aspects, *Administration, Coordination, Damages, Legal aspects, Risks, Economic impact, Regulation, Budgeting, Project planning, Cost-benefit analysis, Government finance, Decision making, Reclamation, Financing, Participating funds, Disasters, Flood plain insurance, Cost sharing, Operating costs, Management.
Identifiers: *Administrative regulations.

A federal insurance program is created covering property loss and damage from disaster if insurance is not made available to the public by the insurance industry. The act details the financial participation which will be sought by the Secretary of Housing and Urban Development (Secretary) of private insurance companies. The Secretary will provide by order the general terms and conditions of insurability which will be applicable to properties eligible for disaster insurance coverage. The Secretary will also prescribe applicable premium rates. The Secretary will coordinate the administration of this act with the authority conferred on him by the National Flood Insurance Act of 1968. The sum of eight-hundred million dollars can be borrowed from the tresury. Also authorized is the creation in the tresury of a disaster insurance fund which will be available without fiscal limitation. The methods by which claims are adjusted and paid, for insured losses will be formulated by the Secretary. The dissemination of disaster insurance information, its coverage, objectives, and rates, will be accomplished by such action as the Secretary sees fit. (Sperling-Florida)
W74-08552

A BILL TO PRESERVE AND PROMOTE THE RESOURCES OF THE CONNECTICUT RIVER VALLEY.
Senate Bill No. 208, 93rd Cong, 1st Sess (January 4, 1973). 17 p.

Descriptors: *Massachusetts, *Connecticut River, *Federal government, *Rivers, *Conservation, *Scenic easements, Aesthetics, Recreation, Legal aspects, Land use, Project planning, Condemnation, Eminent domain, Administration, Decision making, Water rights, Legislation, Water resources development, Water conservation, Water quality, Water quality control, Water supply, Water utilization, Scenery.

The Connecticut River in Massachusetts possesses unusual scenic, ecological, scientific, historic, recreational, and other values. In order to provide for the conservation of this resource, a Connecticut Historic Riverway has been established. The total acreage of land and water within the revised boundaries of the unit will not exceed 13,150 acres. The Secretary of the Interior (Secretary) is authorized to acquire the lands, waters, and interests in the area, including scenic easements, by donation, purchase, exchange or condemnation. The area will be maintained in as nearly its natural state and condition as possible without further development. No action will be taken which will result in a reduction of the quality or quantity of water available to existing public and private water supply systems. The area which comprises the Private Use and Development Zone is limited to non-commercial residential development. The Secretary will issue regulations following public hearings, specifying standards for the approval of zoning ordinances. The object of the standards will be to preserve the scenic quality of the zone. (Sperling-Florida)
W74-08553

A BILL TO AMEND THE SOIL CONSERVATION AND DOMESTIC ALLOTMENT ACT.
House Bill 153, 93d Cong, 1st Sess (1973). 6 p.

Descriptors: *United States, *Legislation, *Contract administration, *Water quality control, *Farm management, Soil conservation, Land

management, Regulation, Government finance, Wildlife conservation, Land use, Soil management, Recreation, Land resources, Adoption of practices, Agricultural engineering, Crop production, Water pollution sources, Erosion control, Water conservation, Alabama, Florida, Economic aspects, Legal aspects, Mississippi, North Carolina, South Carolina, Virginia, Project planning.
Identifiers: Administrative regulations.

This is a bill to provide for a South Atlantic Basin environmental conservation program. The Secretary of the Interior is authorized to contract with landowners and operators to change cropping systems and land uses in order to control erosion. The program will also provide for soil and water conservation measures to control erosion, pollution, and sedimentation. Approved conservation plans developed in cooperation with the soil and water conservation district will form the basis for contracts. Contract administration is authorized through 1986. The basin area includes Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, and Virginia. Plans of farming operations submitted to the Secretary may also include measures for enhancing fish and wildlife recreation resources, promotion of the economic use of land, and the reduction of agricultural pollution. In the contract, the owner will agree to effectuate the plan and any violation may be cause for termination. The Secretary can install monitoring devices to measure the progress of the program. (Sperling-Florida)
W74-08554

OIL POLLUTION PROHIBITED ZONES--REGULATIONS.
Federal Register, Vol 37, No 139, p 14302, July 19, 1972. 1 p.

Descriptors: *Oil, *Oily water, *Oil pollution, *Oil spills, Water pollution, Water pollution sources, Water pollution control, Pollution abatement, Regulation, International law, Treaties, International waters, Legal aspects, Law of the sea, Coast Guard regulations, Oceans.
Identifiers: Administrative regulations.

The purpose of this amendment is to add the sea areas within 100 miles of the coast of the Libyan Arab Republic to the list of oil pollution prohibited zones. The Libyan Arab Republic has deposited an Instrument of Acceptance of the 1954 International Convention for the Prevention of Pollution of the Sea by Oil. This Instrument of Acceptance automatically makes the sea areas within 100 miles of the coast of the Libyan Arab Republic become part of the Mediterranean and Adriatic Prohibited Zone, as defined in the Convention. This amendment became effective on July 24, 1972. (Ritchie-Florida)
W74-08555

VESSELS IN FOREIGN AND DOMESTIC TRADES--POLLUTION OF COASTAL AND NAVIGABLE WATERS.
Federal Register, Vol 37, No 158, p 16486, August 15, 1972. 1 p.

Descriptors: *Oil, *Oil pollution, *Oil spills, *Oily water, *Regulation, Water pollution, Water pollution sources, Water pollution control, Pollution abatement, Coast Guard regulation, Ships, Navigable waters, Coasts, Wastes, Waste disposal, Legal aspects, Water law.
Identifiers: *Coastal waters.

When any Customs officer has reason to believe that any refuse matter is being or has been deposited in navigable waters, or that oil is being or has been discharged into or upon the coastal navigable waters of the United States in violation of the Oil Pollution Act of 1924, he shall furnish to the district director a full report of the incident. He shall include when practicable, a sample of the material discharged from the vessel in question. The district director shall forward this report to the District Engineer of the Department of the Army for his decision as to prosecution and a copy of each such report shall be furnished to the bureau. If the vessel involved is of American registry, a copy of the report shall be furnished to the District Commander of the Coast Guard district concerned. (Ritchie-Florida)
W74-08556

CONSERVATION OF MARINE LIFE--USE OF LIBERTY SHIPS BY STATES AS OFFSHORE ARTIFICIAL REEFS.
Federal Register, Vol 37, No 209, p 23120, October 28, 1972.

Descriptors: *Legislation, *Regulation, *Conservation, *Marine biology, *Marine animals, *Fish attractants, Ships, Environmental control, Reefs, Coasts, Oceans, Sea water, Coastal structures, Fish management, Fisheries, Federal government, Federal project policy, State governments, Inter-agency cooperation.

The subject legislation authorizes the Secretary of Commerce to transfer Liberty ships (otherwise designated for scrapping) from the National Defense Reserve Fleet to states wishing to sink such ships for use as offshore artificial reefs for the conservation of marine life. Copies of any applications received by the Secretary of Commerce must be forwarded for comment to the Secretaries of Interior and Defense and to all other appropriate federal officers. Accordingly, all interested federal officers are invited to identify themselves as officers to whom applications should be sent for comment, and to identify the type of information which they wish to be elicited in the applications. All communications should be sent to the Chief, Division of Reserve Fleet, Maritime Administration, Department of Commerce. (Ritchie-Florida)
W74-08557

POLLUTION PREVENTION VESSEL AND OIL TRANSFER FACILITIES.
Federal Register, Vol 37, No 246, p 28250-28261, December 21, 1972. 12 p.

Descriptors: *Water pollution control, *Regulation, *United States, *Oil wastes, *Water pollution sources, Oil wells, Oil industry, Drilling, Adoption of practices, Specifications, Administration, Navigable waters, Ships, Environmental effects, Design standards, Construction, Engineering structures, Safety factors, Aquatic habitat, Offshore platforms, Equipment, Instrumentation, Economic aspects, Waste water treatment, Legal aspects, Aquatic microbiology, Standards, Water pollution effects, Data collections, Monitoring.
Identifiers: Administrative regulations, Contiguous zone, Hazardous substances(Pollution).

The U.S. Coast Guard, under authority of the Federal Water Pollution Control Act, has issued regulations governing the design, construction, and operation of vessels operating in the navigable waters and contiguous zone of the United States. Regulations have also been issued on the design and operation of onshore and offshore facilities engaged in the transfer of oil in bulk to and from vessels. The purpose of these regulations is to reduce the probability of an accidental discharge of oil or oily wastes. More significant and continuous environmental degradation results from regular and frequent discharges than one-time spectacular accidents. The probable beneficial environmental impact is not known with certainty, and a period of regulation will provide data. No expected adverse environmental effects are contemplated. The goal of the regulations is to promote oil free water resources by removing the costs of environmental protection from the competitive arena and making them a fixed cost of operation. Studies show that oil can be harmful to marine organisms. The regulations include provisions for facility i spections, operations manuals, equipment requir ments, emergency equipment and vessel desig (Sperling-Florida)
W74-08558

POLLUTION PREVENTION INSPECTION VESSELS AND DECK AND ENGINEER O FICERS' LICENSES.
Federal Register, Vol 37, No 246, p 28261-282 December 21, 1972. 3 p.

Descriptors: *Regulation, *Federal governme *Oil pollution, *Barges, Legislation, Administ tive agencies, Water law, Water policy, Water p lution control, Federal Water Pollution Cont Act, Oil, Water pollution sources

This amendment was adopted as a result of pub comment on the regulation which first appeared the Federal Register in 1971. The amendm promulgates new regulations that requ merchant marine officers and seamen to have ditional knowledge of oil pollution and of la regulations and procedures to prevent oil pol tion. It also requires pollution prevention equ ment for vessel certification and requires m frequent hull inspection (drydocking) of ta barges in fresh water service. The bulk of amendment deals with clarification of the hull spection requirements. Both the regulation and amendment were made pursuant to the Water P lution Control Act. (Flowers-Florida)
W74-08559

STATE PROGRAM ELEMENTS NECESSA FOR PARTICIPATION IN THE NATION POLLUTANT DISCHARGE ELIMINATI SYSTEM.
Federal Register, Vol 37, No 247, p 28390-283 28395-28399, December 22, 1972. 8 p.

Descriptors: *Regulation, *Federal governme *State governments, *Permits, Legislation, A ministrative agencies, Water law, Effluen Discharge(Water), Waste water(Pollution), Tre ment, Water pollution treatment, Treatment fac ties, Federal Water Pollution Control Act, Le aspects, Water pollution, Water pollution contr Sewage treatment, Sewage disposal, Indust wastes, Water quality.

State program requirements necessary for p ticipation in the National Pollutant Discha Elimination System are defined in this regulati The Federal Water Pollution Control Act Ame ments of 1972 give the Administrator of the vironmental Protection Agency the power delegate permit authority to the states for discharge of pollutants, provided such discha meets standards set out in the Act. In order to g such power a state must submit a full and compl permit program to the Administrator for his proval. A state must have the authority to is permits not exceeding five years, must adequat notify the public and other interested groups, m abate violations of permits, and should insure the state permitting agency receives adequ notice of new introduction or substantial chan in volume or character of pollutants introdu into publicly owned treatment works. The st must also insure that industrial users of publi owned treatment works comply with pretreatm effluent standards, and must conform with cert monitoring and reporting requirements, enfor ment provisions, and requirements for fundi personnel qualifications and manpower. (Flowe Florida)
W74-08560

OIL POLLUTION PREVENTION--NON-TRA PORTATION-RELATED ONSHORE A OFFSHORE FACILITIES--PROPOSED RULE
Federal Register, Vol 38, No 138, p 19334-193 July 19, 1973. 6 p.

scriptors: *Oil pollution, *Oil spills, *Water llution sources, *Federal government, *Water llution control, *Federal Water Pollution Con- l Act, Pollutants, Water quality, Oily water, ill holes, Fuels, Industrial wastes, Oil, Oil in- stry, Oil reservoirs, Chemical wastes, Oil-water erfaces, Storage tanks, Drilling, Underground orage, Surface drainage, Administrative agen- es, Offshore platforms, Shore protection, astal structures.

e Environmental Protection Agency (EPA), der the authority of the Federal Water Pollution ntrol Act (Act), conducted a regulatory review ich established that most state oil spill preven- n and control laws and regulations emphasize tection and clean up of spills once they have oc- rred but seldom specify spill prevention mea- res. Accordingly, the EPA proposed regulations rsuant to the Act which emphasize measures to event oil spills. The regulations apply to owners d operators of sizeable non-transportation re- ed onshore and offshore facilities engaged in illing, producing, storing, processing, refining, nsferring, or consuming oil, and provide for the eparation and implementation of Spill Preven- n Control and Countermeasure Plans (SPCC ans) for each facility. SPCC Plans shall be cer- ied by a Registered Professional Engineer and all be prepared in accordance with guidelines set t in the proposed regulations. SPCC Plans are to prepared within six months and are to be imple- ented within one year, but the Regional Adminis- ator may grant an extension for the implementa- n of certain facets of the plan. Amendment of e plans is required if there is a change in the cility which affects the facility's potential for scharge of oil, or if a facility has discharged oil in rmful quantities into U.S. navigable waters. lunter-Florida)
74-08561

OLLUTION OF COASTAL AND NAVIGABLE ATERS (CFR TITLE 19, PART 4).
ederal Register, Vol 38, No 10, p 1587, January , 1973.

escriptors: *Federal government, *Wastes, *Oil llution, *Water Quality Act, Administrative encies, Regulation, Coast Guard regulations, ivers and Harbors Act, Water pollution, Oil, egislation, Navigable waters, Water pollution ntrol, Water quality, Water quality control.
lentifiers: Coastal waters.

his regulation requires Customs officers who ave reason to believe that refuse matter is being eposited into any navigable waters of the United tates in violation of the Refuse Act of 1899, or at oil is being discharged or has been discharged to the navigable or coastal waters of the United tates in violation of the Water Quality Improve- ent Act of 1970, to report such acts to the district rector. In addition, the officer should supply the ames of witnesses to the incident and, if possible, sample of the material discharged into the water. he district director is, in turn, required to furnish is information to the district commander of the oast Guard. (Flowers-Florida)
74-08562

NTERIM POLICY STATEMENT ON IMPLE- IENTATION, FEDERAL WATER POLLUTION ONTROL ACT AMENDMENTS OF 1972.
ederal Register, Vol 38, No 18, p 2679-2681, anuary 29, 1973. 3 p.

escriptors: *Federal Water Pollution Control ct, *Legislation, *Nuclear wastes, *Water pollu- on sources, *Radioactive waste disposal, adioactive wastes, Disposal, Waste disposal, Vater pollution, Water law, Nuclear powerplants, Nuclear reactors, Legal aspects, Planning, Water uality, Water quality standards, Environmental ontrol, Environmental effects.
dentifiers: National Environmental Policy ct(NEPA).

The Federal Water Pollution Control Act Amendments of 1972 (FWPCA) modified federal agencies' responsibilities and authorities under the National Environmental Policy Act of 1969 (NEPA). The Atomic Energy Commission (AEC) issued an interim statement of policy, to be effective January 29, 1973, concerning the effect of section 511 of the FWPCA upon the Commission's regulatory responsibility and authority under NEPA in licensing actions. The statement's central premise is that the AEC's authority and responsibility under NEPA remain unaffected except to the extent there is a conflict with implementing actions taken under FWPCA. The Commission would continue to exercise its NEPA authority and responsibility in the interim period, so that there would be no hiatus in federal responsibility and authority respecting environmental matters embraced by both NEPA and FWPCA. The statement provides that to the extent requirements are imposed by FWPCA the Commission will not impose different requirements under NEPA. The Commission will not consider various alternatives which would constitute a review of similar alternatives under FWPCA or upset requirements where a particular alternative was adopted pursuant to FWPCA. (Craig-Florida)
W74-08563

NATIONAL OIL AND HAZARDOUS SUBSTANCES POLLUTION CONTINGENCY PLAN.
Federal Register, Vol 38, No 155, p 21888-21893, August 13, 1973. 6 p.

Descriptors: *Federal Water Pollution Control Act, *Oil pollution, *Oil spills, *Water pollution sources, *Administrative agencies, Federal government, Oil wastes, Oily water, Water pollution control, Water quality, Water pollution, Water pollution abatement, Water pollution treatment, Waste dilution, Water Quality Act, Aeration, Aquatic environment, Aquatic life, Waterfowl, Wildlife conservation, Fish conservation.
Identifiers: Hazardous substances(Pollution).

Pursuant to the Federal Water Pollution Control Act Amendments of 1972, the Council on Environmental Quality submitted a Contingency Plan which has been included in the Code of Federal Regulations. The plan's purpose is to provide for efficient, coordinated, and effective actions to minimize damages from oil and hazardous substance discharge, including containment, dispersal, and removal. The plan seeks to promote the harmonious discharge of various federal agencies' statutory duties through the recognition of authority for action by those agencies having the most appropriate capability to act in each specific situation. The plan lists the relevant responsibilities of the federal agencies and directs that regional plans assure recognition of these responsibilities. States are invited to furnish liason to the federal Regional Response Team (RRT) and to participate in RRT emergency deliberations. Five response phases are recognized: Phase I provides for discovery of discharge and notification of the Regional Response Center, RRC, in Phase II, the On-Scene Coordinator (OSC) is to determine the propriety of actions taken by the person responsible for the discharge and is to monitor the progress of these actions; if inadequate actions are taken, the OSC advises the RRC to initiate further government action; Phase III includes collateral measures; Phase IV is cleanup, mitigation, and disposal actions; Phase V involves federal removal cost recovery and recovery for damages done to government property. (Hunter-Florida)
W74-08564

POLLUTION CONTROL--WHO PUTS THE DIRT IN THE DRINKING WATER.
Business Week, p 32H-32L, May 5, 1973. 5 p.

Descriptors: *Groundwater, *Water sources, *Water pollution, *Groundwater pollution, *Water pollution sources, Effluents, Farm wastes, Agricultural chemicals, Chemical wastes, Pollutants, Saline water intrusion, Encroachment, Water pollution effects, Color, Odor, Taste, Liquid wastes, Water pollution control, Pollution abatement, Water pollution treatment, Federal government, Research priorities, Hardness, Impaired water quality, Industrial wastes, Mine wastes, Treatment facilities, Underground storage.
Identifiers: Source monitoring.

The federal government in 1972 via the Water Pollution Control Act required the Environmental Protection Agency (EPA) to prepare a program which would halt further ground water pollution. The EPA has since awarded an $809,000 study contract to Tempo, General Electric Company's think tank, to devise a technique for monitoring the nation's groundwater supply. Since present methods of detecting groundwater pollution are expensive, Tempo will probably concentrate on 'source monitoring' techniques. One of the most serious sources which will soon be monitored is industrial injection wells; several states and the EPA have already clamped down on such wells, but roughly 300 are still operating. Industrial groundwater pollution is also caused by leakage and spills during production and storage of liquid products. The best possible solution is recycling waste water and using land fills for leftover solids. (Hunter-Florida)
W74-08565

MEMORANDUM OF UNDERSTANDING REGARDING IMPLEMENTATION OF CERTAIN COMPLEMENTARY RESPONSIBILITIES--NOTICE.
Federal Register, Vol 38, No 18, p 2713, January 29, 1973.

Descriptors: *Federal Water Pollution Control Act, *Governmental interrelations, *Federal jurisdiction, *Nuclear wastes, *Water pollution, Legislation, Waste disposal, Waste treatment, Water quality, Water quality control, Pollutants, Disposal, Nuclear powerplants, Nuclear reactors, Radioactive waste disposal, Radioactive wastes, Nuclear energy, Regulation, Inter-agency cooperation, Water pollution sources, Water pollution control, Permits, Administrative agencies.

The Environmental Protection Agency (EPA) has authority under the Federal Water Pollution Control Act Amendments of 1972 (FWPCA) over certain discharges into navigable waters of pollutants from nuclear facilities and other activities requiring a license or permit from the Atomic Energy Commission (AEC). The AEC has responsibilities and authority under the National Environmental Policy Act of 1969 (NEPA) to take action with respect to environmental impact of discharges of pollutants. This memorandum reflects an agreement between the EPA and the AEC with regard to their respective statutory authorities. The AEC will exercise its authority in accordance with the Interim Policy Statement, 10 CFR Part 50, which requires the AEC in licensing to accept decisions under certain sections of the FWPCA. The EPA agrees to expedite the issuance of effluent limitations and the processing of applications for permits under section 402 of the FWPCA for nuclear facilities. The EPA, in establishing effluent limitations, will consider not only water quality, but other factors such as cost, age of equipment and facilities, control techniques, process changes, non-water quality, environmental impact and energy requirements. (Craig-Florida)
W74-08566

OIL POLLUTION ACT AMENDMENTS OF 1973--LEGISLATIVE HISTORY.
U.S. Code Congressional and Administrative News, p 3732-3738, 1973. 7 p.

Descriptors: *Pollution abatement, *Water pollution control, *Oil wastes, *Ships, *Oily water,

Water pollution sources, Law of the sea, International waters, Oil industry, Federal government, Impaired water quality, Water law, Administrative agencies, United Nations, International law, Oil pollution, Water pollution, Oil spills.

The 1969 amendment to the 1954 International Convention for the Prevention of Pollution of the Sea by Oil is stricter than the Convention in terms of prohibiting intentional discharges of oil and oily wastes by vessels. Discharges are prohibited anywhere unless certain conditions are met. These conditions relate to discharge rate, oily mixture dilution, total quantity of oil discharged, and distance from land. A tanker is prohibited from any discharge within 50 miles of land. Beyond that distance it may only discharge while proceeding enroute so long as the discharge of oil content does not exceed 60 liters per mile, and provided that the total quantity of oil discharged on a ballast voyage does not exceed 1/15000 of the total cargo-carrying capacity of the vessel. The amendment regulates tank arrangements and tank size in order to limit the quantity of oil which can escape into the sea as the result of collision or vessel casualty. Criminal and civil penalties are provided by the amendments for violation of the standards of oil discharge. (Kelly-Florida)
W74-08567

NATIONAL SEA GRANT COLLEGE AND PROGRAM--EXTENSION.
U.S. Code Congressional and Administrative News, P.L. 93-51, 87 Stat. 129, p 1978-1982, March 28, 1973. 5 p.

Descriptors: *Water resources development, *Research and development, *Marine water, *Federal project policy, *Colleges, Research facilities, Training, Education, Sea water, Projects, Legislation, Federal budget, Foreign research, Marine geology, Marine animals, Marine biology, Marine plants, Oceans, Aquatic life, Research priorities, International waters, Foreign waters.

H.R. 5452, which amends the National Sea Grant College and Program Act of 1966, as amended, was passed by the House and was referred by the Senate to the Committee on Labor and Public Welfare and the Committee on Commerce. The committees recommended that the bill pass with an amendment. The Senate report includes a history of the Act. The basic Act authorizes grants for three kinds of resource development programs. These include programs to educate marine specialists, programs of applied research in marine resource development, and marine advisory programs. Recipients of grants are required to provide at least one-third of the total cost of projects. The Department of Commerce is charged with administering the Act. The bill provides an authorization of $30 million for 1974, $40 million for 1975, and $50 million for 1976. The bill also authorizes the Secretary of Commerce to reduce the matching requirement in certain cases. The recommended amendment to the bill authorizes up to $200,000 for a study to be conducted through the National Sea Grant College system of effective means of co-operatively sharing the results of marine research with other nations. (Hunter-Florida)
W74-08568

POLLUTION AND OBSTRUCTION OF WATERS.
N.J. Stat. Ann., ch. 23:5-28 (Supp 1973).

Descriptors: *New Jersey, *Legislation, *Water pollution control, *Oil wastes, *Water pollution sources, Surface waters, Oil industry, Fresh water, Aquatic animals, Wildlife conservation, Water quality control, Tidal waters; Administration, Decision making, Regulation, Specifications, Pesticide toxicity, Public health, Safety, Chemical wastes, Waste water treatment, Sewage disposal, Waste disposal, Water conservation.
Identifiers: *Administrative regulations, Hazardous substances(Pollution).

No person shall place petroleum products, debris, hazardous, deleterious, destructive or poisonous substances anyplace where it can find its way into the state's fresh or tidal waters. The aim of this prohibition is to abate the pollution and obstruction of waters. The use of chemicals for mosquito or pest control by the state or by any person on agricultural, horticultural, or with livestock is not prohibited if it is done in a manner approved by the State Department of Environmental Protection. This exception also applies to discharges from the facilities for the treatment or the disposal of sewage or other wastes which are likewise approved by the department. The department will formulate rules and regulations to govern such discharges. In the case of pollution of waters by any substance injurious to fish, birds or mammals, it is not necessary to show that the discharge caused any death. The penalty for the violation of this statute is three thousand dollars for each offense. If the violation is of a continuing nature, each day during which it continues shall constitute an additional offense. The department is authorized to settle any claim for a penalty in an amount which would be equitable. (Sperling-Florida)
W74-08569

JOINT FLOOD CONTROL COMMISSION.
N.J. Stat. Ann., ch. 40:14-16 to 40:14-24 (Supp 1973).

Descriptors: *New Jersey, *Legislation, *Flood protection, *Flood damage, *Administration, State governments, Federal government, Floods, Local governments, Decision making, Budget, Regulation, Public health, Safety, Administrative agencies, Coordination, Cost sharing, Legal aspects, Project planning, Standards, Water resources development, Salaries, Land management, Land ownership, Adoption of practices, Water management(Applied).
Identifiers: Administrative regulations.

A Joint Flood Control Commission is established. Such commissions will be composed of two or more municipalities which will work toward the prevention and alleviation of flooding and flood conditions. The statute prescribes the method of the establishment and gives examples of basic terms which will be necessary in the creation of the commission. The statute specifies the members, the method of appointment, their terms, and compensation. The commissions are authorized to accept and solicit funds from local, state, and federal governments. The commission is given all the power which is necessary and proper to do acts necessary to fulfill the purpose of the statute. The only qualification on this power, besides fund limitations, is that any work be done in a comprehensive manner, and where flood control work is undertaken, that it be done in accordance with applicable law in a manner approved by the State Department of Environmental Protection. Data will be collected, studied, and analyzed on flooding, past floods, and the causes of floods in the area. The acquisition of lands within the floodway and low-lying areas will be encouraged. (Sperling-Florida)
W74-08570

WATER AND SEWERAGE DISPOSAL AGENCIES,
N. J. Stat Ann, ch 40:14B-49 (Supp 1973).

Descriptors: *New Jersey, *Legislation, *Water supply, *Water pollution control, *Contracts, *Administrative agencies, Waste water disposal, Water quality, Water conservation, Water resources, Water management(Applied), Water allocation(Policy), Water pollution sources, Waste water treatment, Budgeting, Adoption of practices, State governments, Municipalities, Regulation, Standards, Water resources development, Public health, Administration, Decision making, Contracts, Contract administration, Administrative regulations

Any municipal authority or sewerage authority, in order to foster the relief of waters from pollution or threatened pollution, may enter into contracts which relate to the collection, treatment, and disposal of sewage originating in the municipality. Any municipal authority or sewerage authority is likewise empowered to sell and supply water for fostering the provision and distribution of an adequate supply of water within the territorial area of the governmental unit. Such authority also includes the power to enter into contracts. Methods of payment to the municipality for such services by the governmental unit purchasing those services are specified. Every contract will only be entered into pursuant to a resolution adopted by the governing body of the municipality. The contract can be made with or without consideration, and for a specified or unlimited time. Where a municipality has created municipal utilities authority, powers granted to the authority by statute are exclusive, except insofar as a municipality is specifically empowered to cooperate with such authority. (Sperling-Florida)
W74-08571

FLOOD HAZARD AREAS.
N J Stat Ann, ch 58:16A-50 thru 58:16A-66 (Supp 1973).

Descriptors: *New Jersey, *Legislation, *Administrative agencies, *Flood protection, *Public health, Safety, Regulation, State governments, Adoption of practices, Decision making, Coordination, Flood damage, Flooding, Flood plain zoning, Social aspects, Legal aspects, Specifications, Municipalities, Water quality control, Conservation, Land use, Land management, Water management(Applied), Land classification, Zoning.
Identifiers: Administrative regulations.

In the interest of public health and safety, the New Jersey Division of Water Resources is authorized to delineate and mark flood hazard areas, to adopt land use regulations for the floodway, and to disseminate information on floods and flood damage. It may also adopt and amend regulations concerning the use of land in designated floodways in order to preserve flood carrying capacity. Waiver of these regulations is available to alleviate hardship. The New Jersey Department of Environmental Protection will promulgate minimum standards for land use in flood fringe areas to minimize threats to the public welfare. Within twelve months after the promulgation of standards by this department, the affected municipality must likewise develop rules and regulations. Before any rule or regulation is adopted, there must be notice and public hearings. Lands regulated by the Wetlands Act are not affected by this statute. A violation of this act or any regulation will be subject to a penalty of $2,500 for each offense. (Sperling-Florida)
W74-08572

STATE V BISHOP (ACTION FOR PUBLIC NUISANCE AND TREPASS IN FILLING AREA BELOW HIGH WATER MARK OF BAY).
348 N.Y.S. 2d 990 (Sup Ct 1973).

Descriptors: *Bays, *Tidal marshes, *Adjudication procedure, *Water rights, *Equitable apportionment, Remedies, Legislation, Judicial decisions, *New York, Legal aspects, Boundary disputes, Water law, Water pollution, Marshes, Wetlands, Navigable waters, Land fills.

The State of New York alleged that defendent, by filling his property above and below the high water mark, committed a trespass, in that the area below the high water mark was owned in trust by the

town of Southampton. The State also contended that through his activities of filling the land, the defendent maintained an intolerable public nuisance and caused pollution of state waters. The Court held that the defendent was not guilty of trespass, nor of creating and maintaining a public nuisance, and that he had not polluted state waters. The Court decided eight separate issues in reaching its decision, including the authority of a court to determine title in such a suit, the rights of the State in bringing the action, and whether the State had proved its numerous allegations. The Court concluded that legal considerations pertaining to 'land under water' do not apply to marsh lands. In holding that defendant's land was marsh land and not 'land under water', conveyances and allotments made defendant's title valid, as the state government is permitted to convey shore lands which are navigable only as a matter of law. (Sutton-Florida)
W74-08573

MARINE FISHERIES.
N Y Environmental Conservation Law, secs 13-0301 thru 13-0371 (1972).

Descriptors: *New York, *Legislation, *Commercial fishing, *Aquatic life, *Water pollution control, Crustaceans, Atlantic menhaden, Oysters, Commercial fish, Marine fish, Dams, Lobsters, Aquiculture, Regulation, State governments, Adoption of practices, Administrative agencies, Administration, Permits, Legal aspects, Public health, Safety, Sewage, Effluents, Industrial wastes, Waste water disposal, Water quality control, Environmental sanitation.
Identifiers: *Administrative regulations, Coastal waters.

New York may lease state owned lands under water for the cultivation of shellfish except when such lands are within five hundred feet of the high water mark. The granting of leases is conditioned on a written application and payment of fees. The statute imposes a one dollar tax per acre on all land held under leases. All shellfish lands will be periodically inspected to ascertain the sanitary condition. The statute delineates when a diggers permit is necessary for the commercial taking of shellfish. Permits are also required of shippers and growers. The statute also delineates rules dealing with specific shellfish such as clames, oysters, scallops, crabs, and lobsters. Licenses are also required for boats which capture fish for food or fertilizer. Methods of catching fish are regulated. The use of beam trawls and otter trawls are prohibited in certain waters. Sludge, acid, or refuse from oil works, sugar houses, sewage, or any other substance injurious to shellfish is prohibited from being discharged into the waters of the state. The purpose of this provision is to protect shellfish from any adverse effects on flavor, odor, color, or on the public health. (Sperling-Florida)
W74-08574

MINING ACT OF 1971.
N C Gen Stat, secs 74-46 thru 74-68 (1971).

Descriptors: *North Carolina, *Permits, *Mine wastes, *Mining engineering, *Land reclamation, Water reuse, Public health, Safety, Legislation, State governments, Administration, Water pollution sources, Mine drainage, Administrative agencies, Adoption of practices, Decision making, Environmental sanitation, Specifications, Economic aspects, Project planning, Cost allocation, Reclamation, Waste water treatments, Channelization, Bank erosion, Stream improvement.
Identifiers: *Administrative regulations.

Proper reclamation of mined land is necessary to prevent undesireable land and water conditions. These conditions would be detrimental to the general health, safety, and property of the state's citizens. No mining will be allowed in the state unless there are reasonable provisions for the protection of the surrounding environment and for reclamation of the land affected by mining. Before any operator engages in mining, a permit must first be obtained from the Department of Conservation and Development. No permit will be effective until the operator has deposited an acceptable performance bond. With the application for a permit there must be included a proposed reclamation plan. The plan must include proposed practices to protect surface resources, specifications for restoration of the surface suitable for the proposed use of the land, and the proposed method of accomplishment. Also in the plan must be the manner and type of revegetation, the method of prevention and elimination of hazardous conditions to animal or fish life, the method of compliance with water pollution laws, and the methods of disposal of mining refuse. Each plan will state the methods of restoration or establishment of stream channels and banks to minimize erosion. (Sperling-Florida)
W74-08575

DRAINAGE--MISCELLANEOUS PROVISIONS; PENALTIES.
Ill Ann State, ch 42, secs 12-7, 12-8, 12-9, 12-10, 12-19 (Smith-Hurd Supp 1973).

Descriptors: *Drainage, *Illinois, *Legislations, *Penalties(Legal), *Drains, Levees, Drainage systems, Drainage area, Drainage districts, Pumping plants, Structures, Water pollution, Water pollution control, Wastes, Waste disposal, Obstruction to flow, Inspection, Inter-agency cooperation, Legal aspects, Local governments, State governments.

It is a misdemeanor to obstruct, injure or destroy any drain, levee, drainage structure or pumping plant. The dumping of trash, refuse or debris into an open drain shall be treated and considered as obstructing a drain. The pollution of the water of any drain of any drainage district shall be considered an injury to such drain. Anyone who wilfully cuts or breaches any private, mutual or district levee is guilty of a felony. In addition to the criminal penalties, anyone who wilfully or negligently obstructs, injures or destroys a drain, drainage structure, levee or pumping plant is liable for the cost of repairing or reconstructing the same and for any damage to lands, crops or other property. Anyone who wilfully prohibits the commissioners of a district from going upon lands for the purpose of examining the work of the district is guilty of a misdemeanor. Anyone who wilfully prohibits or delays the construction or repair of any drain through the land of others is guilty of a misdemeanor. Commissions of a district shall cooperate in the exchange of information pertaining to drainage with the commissioners of other districts and with local, state and federal agencies. (Ritchie-Florida)
W74-08576

WATER POLLUTION CONTROL FACILITIES--TAX EXEMPTION.
La Acts 1973, ch 69, sec 1, to be codified as. La Rev State 47:1977.

Descriptors: *Pollution abatement, *Control systems, *Louisiana, *Assessments, *Legislation, Water pollution control, Automation, Instrumentation, Governments, Mechanical control, Taxes, Value, Evaluation, Property values.

Pollution control facilities are defined and the assessment value of such facilities is the actual net value that could be realized at a fair voluntary sale taking depreciation and condition into account. The Board of Commerce and Industry is authorized to adopt rules and regulations for approval of such devices and the administration of this section. (Whisler-Florida)
W74-08577

SINCLAIR OIL CO. V. DELACROIX CORP. (DETERMINATION OF MINERAL RIGHTS ALLOCABLE TO WATER BOTTOMS.
285 So 2d 845-54 (La Ct App 1973).

Descriptors: *Water law, *Water rights, *Adjudication procedure, *Regulation, *Ownership of beds, Legal aspects, Water resources, Water policy, Fish management, Legislation, Judicial decisions, Navigation, Water regulation, Competition, River, Mineralogy.

This appeal rejects claims by the State of Louisiana to mineral production royalities allocable to certain water bottoms. The basic issue was whether the State had divested itself of title to the water bottoms in question. The State's theory was based on a two-fold proposition. Since the waters were navigable, they must remain in the public domain, and transferrance of title was not possible. Also, as oyster production was possible, certain Oyster Statutes of 1902 would prohibit a valid title transfer. The claimants insisted the statutes of limitations would bar questions concerning the transfer, and in any event the waters were, and had always been, non-navigable. From all the evidence presented, the Court found the waters to be non-navigable. Being bound by earlier state Supreme Court rulings, it was also held that the statute of limitations would bar the case since a valid chain of title was found. Had the water been found to be navigable, the title to the mineral rights could not have been conveyed. As a valid chain of title was found, the Court found it unnecessary to determine whether oyster cultivation was possible. (Sutton-Florida)
W74-08578

AIR AND WATER POLLUTION CONTROL PERMIT BOARD.
Miss Code Ann, sec 49-17-29 (Supp 1973).

Descriptors: *Mississippi, *Legislation, *Water pollution control, *Permits, *Administrative agencies, Water pollution, Air pollution, State governments, Water permits, Waste disposal, Irrigation.
Identifiers: Nuisance(Legal aspects).

A permit board to review application for, issue, modify, revoke, or deny permits required by the Mississippi Air and Water Pollution Control Act is created. The composition of the board is described. It shall be unlawful to cause pollution of the air or water or to discharge waste to lower the quality of the air or water below standards established by the board and such action shall constitute a public nuisance. The statute further provides a procedure for those denied a permit and allows the permit board to promulgate rules and regulations necessary to carry out the act. (Whisler-Florida)
W74-08579

OPERATION OF MINES.
Pa Stat Ann, secs 691.315 thru 691.316 (1970).

Descriptors: *Pennsylvania, *Administrative agencies, *Mine wastes, *Permits, Mining engineering, Water pollution sources, State governments, Legislation, Regulation, Mine drainage, Safety, Public health, Aesthetics, Legal aspects, Cost allocation, Adoption of practices, Land use, Economics, Land tenure, Local governments, Land subsidence, Natural resources, Mineral industry, Conservation, Penalties(Legal).
Identifiers: *Administrative regulations, *Nuisance(Legal aspects).

This statute prohibits any person or municipality for putting any mine discharge into the state's waters without authorization. This authorization is a permit from the Department of Environmental Protection. A permit is also needed to operate the mine. The prohibited discharge includes those discharges after mining operations have ceased. The statute makes a discharge, or the operation of

a mine, without a permit or contrary to the conditions of a permit, a nuisance. Whenever there is an application for a permit, the municipality within which the operation will occur will be notified. A bond to assure compliance may be required of permit holders. In addition, no polluting discharge may occur after mining operations have ceased. Liability will continue until the department determines that there is no further risk of pollution discharge. Whenever the Sanitary Water Board finds that pollution is or may result from a condition on the land, it can order the landowner or occupier to correct it, or take corrective action itself. The costs of this correction may be assessed in the manner of a civil penalty. (Sperling-Florida)
W74-08580

COASTAL ZONE MANAGEMENT ACT OF 1972.
33 U.S.C., secs 1101 thru 1124 (1970), as amended, Pub L No 92-583, secs 301 thru 315 (October 27, 1972).

Descriptors: *Legislation, *Coasts, *Land management, *Grants, Environmental effects, Federal government, Management, Beaches, Shores, Coastal plains, Coastal marshes, Seashores, Shore protection, Tides, Inter-agency cooperation, Estuaries, Projects.
Identifiers: *Coastal waters, *Coastal Zone Management Act of 1972, Estuarine sanctuaries.

This Act establishes a national program for the management, beneficial use, protection, and development of the land and water resources of the Nation's coastal zones. Essentially it authorizes the Secretary of Commerce (Secretary) to make annual grants to any coastal state to develop a management program for the land and water resources of its coastal zone, as well as administrative grants for the part of the costs of administering the state's federally approved management program. Approval of such programs by the Secretary depends upon compliance with rules and regulations promulgated by the Secretary, coordination with local, area-wide and interstate plans and continuing coordination, public notice, approval by the governor, as well as conserving specific areas. The Secretary is also required to consult and cooperate with other federal agencies. Funding for the development of estuarine sanctuaries is provided. (Whisler-Florida)
W74-08581

IN RE CHINESE MARITIME TRUST, LTD. (LIMITATION ON LIABILITY FOR SUNKEN VESSEL).
478 F.2d 1357-1362 (2d Cir. 1973). 6 p, 5 ref.

Descriptors: *Panama Canal, *Water pollution, *Oil pollution, *Oil spills, *Navigable waters, Regulations, Law of the sea, Judicial decisions, Federal jurisdiction.
Identifiers: Navigation obstructions.

Owner of a sunken vessel advised the Panama Canal Company that it had abandoned the vessel to its insurance underwriter who did not intend to undertake removal of the vessel. The Canal Company commenced removal efforts. The vessel owner, faced with large cargo claims and claims for wreck removal expenses, commenced a proceeding for limitation of the owner's liability to its interest in the vessel and her pending freight, pursuant to the Shipowner's Limited Liability Act. The Canal Company also claimed that expenditures to clean up oil pollution resulting from leakage from the sunken vessel gave rise to a claim under the Oil Pollution Act. The court held that confronted with a statutory and regulatory duty to remove vessel which had sunk in navigable waters, the owner could not contend that failure to remove and consequent expense of removal were without its privity or knowledge, which was a condition precedent to its invocation of statute limiting its liability. Accordingly, the claim against owner for expenses incurred in removal was not limitable, and the owner could properly be made subject of an in personam suit to recover such expenses. The claim under the Oil Pollution Act was found not properly before the court (Sears-Florida)
W74-08657

THE DEEP SEABED HARD MINERAL RESOURCES ACT--A NEGATIVE VIEW,
Louisiana State Univ., Baton Rouge
H. G. Knight.
San Diego Law Review, Vol 10, No 3, p 446-466, May 1973. 35 ref, 1 append.

Descriptors: *Law of the Sea, *International law, *Mineral industry, *Marine geology, Administration, Water resources, Organizations, Federal government, Political constraints, Mining engineering, United Nations, Jurisdiction, Competing uses, Oceans, Foreign countries.

While the Deep Seabed Hard Mineral Resources Act is good, it should not be adopted at this time. The Act doesn't serve the resource management interests of the United States and adoption should be put off, at least, until after the Third United Nations Conference on the Law of the Sea. The postscript states that adoption was put off until after the Conference, in hopes of securing international agreements on the subject. Arguments against present enactment are threefold: (1) it is inconsistent with this nation's present oceans policy; (2) it will probably have an adverse effect on current negotiations; (3) it contravenes international expectations evidenced in the principles resolutions of the General Assembly. (Sutton-Florida)
W74-08658

INLAND LAKES.
Fla. Laws, ch. 147, sec. 1-7 (1973).

Descriptors: *Lakes, *Erosion, *Water pollution control, *Legislation, *Florida, Law enforcement, Water law, Pollution abatement, Regulations, Legal aspects, Waste disposal.

This Florida statute relates to inland lakes of less than one hundred fifty (150) acres. The Act defines certain nuisances relating to water pollution and shore erosion and provides a procedure for land owners to petition the Board of County Commissioners to abate such water pollution and shore erosion. The Act also authorizes the boards to enact ordinances to abate such nuisances and provides for penalties. (Sutton-Florida)
W74-08659

DIFFICULTIES AHEAD FOR OREGON REGARDING ESTUARY REGULATIONS, CONTROL AND PROTECTION,
Oregon State Dept. of Environmental Quality, Portland.
For primary bibliographic entry see Field 2L.
W74-08670

6F. Nonstructural Alternatives

THE USE OF QUESTIONNAIRES IN COLLECTING INFORMATION FOR URBAN FLOOD CONTROL PLANNING,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
L. D. James, D. D. Crawford, J. S. Everman, J. B. Hildreth, and J. L. Paul.
Available from the National Technical Information Service as PB-232 423; $7.50 in paper copy, $1.45 in microfiche. Report No ERC-0274, February 1974. 313 p, 2 fig, 54 tab, 4 append. OWRR C-2064(3359)(2). 14-31-0001-3359.

Descriptors: *Non-structural alternatives, *Flood plain zoning, Flood plains, Building codes, Flood plain insurance, *Floodproofing, Warning systems, *Social aspects, Social values, Recreation, Taxes, *Regulation, Law enforcement, Forecasting, *Economic feasibility, Planning, Identifiers, *Non-structural design.

Flood damages are substantially reduced as individuals evacuate flood fight act rapidly to repair damages prepare in advance to make their flood fighting more effective, employ small scale structural measures or modify buildings or layouts to reduce damageability. Individuals operating on their own, however, underemploy these measures. Local government must often intervene to promote their greater use through such means as flood warnings dissemination of hazard information, taxes on flood plain occupants provision of expert advice on self protection, regulations governing flood plain land use and building practices, financial assistance for implementing individual measures, or purchase and conservation of open space. Different means have differing degrees of success, and a given means can be expected to be more successful in one community than in another. This is because communities vary in flood plain geometry, flood management policies, and the characteristics of flood plain occupants. Information on the local situation is thus essential to a well-formulated nonstructural flood control program. A questionnaire for surveying flood plain occupants and a method for employing the resulting project-specific information in the formulation of a program of nonstructural flood control measures are developed. An approximate method based on information obtained from less expensive sources is presented for cases in which it is not possible to use questionnaires.
W74-08151

THE METROPOLITAN TORONTO AND REGION WATERFRONT PLAN, 1972-1976.
Metropolitan Toronto and Region Conservation Authority, Downsview (Ontario).
For primary bibliographic entry see Field 6B
W74-08489

FLOOD PLAIN INFORMATION; GRANTS CREEK - TOWN CREEK, CITY OF SALISBURY, NORTH CAROLINA.
Army Engineer District, Charleston, S.C.
For primary bibliographic entry see Field 4A.
W74-08490

FLOOD PLAIN INFORMATION; PETERS CREEK AND LICK RUN, ROANOKE, VIRGINIA.
For primary bibliographic entry see Field 4A.
W74-08491

DEFINITION OF CRITICAL COASTAL AREAS AND APPROACHES TO STANDARDS FOR MANAGEMENT,
South Carolina Wildlife and Marine Resources Dept., Charleston.
For primary bibliographic entry see Field 2L.
W74-08532

A BILL TO PROVIDE FOR A NATIONAL PROGRAM OF DISASTER INSURANCE.
For primary bibliographic entry see Field 6E.
W74-08552

6G. Ecologic Impact Of Water Development

PROCEEDINGS: FIRST WETLANDS CONFERENCE, JUNE 20, 1973,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 2L.
W74-08157

HE ECOLOGICAL ROLE OF INLAND WET-ANDS,
onnecticut Coll., New London. Dept. of Botany.
or primary bibliographic entry see Field 2L.
/74-08164

NSECTS (CHRYSOPS FLIES) IN CONNEC-ICUT SALT MARSHES,
onnecticut Agricultural Experiment Station, lew Haven.
or primary bibliographic entry see Field 2L.
/74-08166

WORLDWIDE DIRECTORY OF STREAM COLOGISTS,
lichigan State Univ., Hickory Corners. W. K. ellogg Biological Station.
or primary bibliographic entry see Field 10C.
/74-08235

NVIRONMENTAL INFORMATION SOURCES ENGINEERING AND INDUSTRIAL APPLICA-IONS: A SELECTED ANNOTATED BIBLIOG-APHY.
lassachusetts Inst. of Tech., Boston. James ladison Barker Engineering Library.
or primary bibliographic entry see Field 10C.
/74-08401

NVIRONMENTAL IMPACT STATEMENTS.
atatronic Systems Corp., Panorama City, Calif.
vailable from Nat. Tech. Info. Serv., Springfield, a. 22151, as PB-220 959, for $3.00 paper copy; 1.45 microfiche. January 1973. 6 p.

escriptors: *Environmental effects, Administrative agencies, *Planning, Environ-ental control, Federal government, Legislation, overnmental interrelations, Land use, Water pol-ution, Jurisdiction, Natural resources, Project easibility, Regulation, Project planning.
dentifiers: *Environmental impact statements.

n environmental impact statement (EIS) is equired in advance of every major federal action, ecommendation or report on legislation that may ignificantly affect the quality of the human en-ironment. Each EIS must assess in detail the otential environmental impact of a proposed ac-on, and all federal agencies are required to repare statements for matters under their ju-isdiction. Each EIS must contain any adverse en-ironmental effects that cannot be avoided as well s alternatives to the proposed action that might void some or all of the adverse environmental ef-ects. An EIS must be prepared and circulated for omment at least 90 days before the proposed ac-ion. (Whisler-Florida)
/74-08517

PORT EVERGLADES HARBOR, BROWARD COUNTY, FLORIDA (FINAL ENVIRONMEN-TAL STATEMENT).
rmy Engineer District, Jacksonville, Fla.
or primary bibliographic entry see Field 8A.
/74-08518

SPUR CHANNEL TO ASTORIA WATER-FRONT, EAST RIVER, NEW YORK (FINAL EN-VIRONMENTAL STATEMENT).
rmy Engineer District,New York.
or primary bibliographic entry see Field 8A.
/74-08519

OPERATION AND MAINTENANCE OF NEW BEDFORD HURRICANE BARRIER (FINAL EN-VIRONMENTAL STATEMENT).
lew England Div. Corps of Engineers, Waltham, lass.
or primary bibliographic entry see Field 8D.
/74-08520

LOWER RIO GRANDE FLOOD CONTROL PROJECT, TEXAS.
International Boundary and Water Commission, El Paso, Tex.
For primary bibliographic entry see Field 8A.
W74-08521

WATER RESOURCES COUNCIL REPORT ON THE PEARL RIVER COMPREHENSIVE BASIN STUDY MISSISSIPPI AND LOUISIANA.
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 4A.
W74-08522

THE IMPACT OF GROWTH ON THE ENVIRONMENT.
Hearings--Subcomm on Air and Water Pollution, Comm on Public Works, U.S. Senate, 93rd Cong, 1st Sess, April 2, 3, 1973. 158 p, 8 fig, 4 tab, 203 ref.

Descriptors: *Environment, *Environmental effects, *Growth rates, *Population, *Planning, Legislation, Water pollution, Air pollution, Water pollution control, Pollution abatement, Community development, Social aspects, Legal aspects, Natural resources, Federal government, Federal project policy, Land use, Zoning, Land development, Land management, Non-structural alternatives.

The Senate Committee on Public Works, through its Subcommittee on Air and Water Pollution, has held hearings over the past decade which have illuminated harsh facts concerning man's abuse of the environment. These hearings have formed the basis for congressional enactment of laws to control air, water and land pollution and to protect critical natural resources. It is now apparent, however, that the pollution control laws form only one element of a nation growth policy. It is necessary to learn what kinds of growth and what rates of growth cause adverse environmental results, and to also learn how to predict the adverse impact of growth on the environment. It is also necessary to learn what kinds of growth are acceptable substitutes for other, more environmentally harmful kinds of growth. Legislation is required to regulate growth itself rather than the adverse by-products of growth in order to avoid drastic regulatory measures. These hearings received testimony from various witnesses regarding the problems of growth and its impact upon the environment. (Ritchie-Florida)
W74-08523

STATE OF WASHINGTON, 1973 ANNUAL REPORT, NATURAL RESOURCES AND RECREATION AGENCIES.
For primary bibliographic entry see Field 6E.
W74-08536

ENVIRONMENTAL POLICIES AS A CONGRESSIONAL REQUIREMENT FOR SOCIAL EFFICACY,
Committee on Public Works (US-Senate).
For primary bibliographic entry see Field 6E.
W74-08539

ENVIRONMENTAL HAZARDS OF LARGE-SCALE DEVELOPMENTS,
Geological Survey, Raleigh, N.C.
R. L. Nace.
Available.from Dept of Geography University of Victoria, British Columbia, Canada. Price $4.00 for book. In: Priorities in Water Management, Leversedge, F.M., editor; Proceedings of 22nd International Geographical Union Congress, August 1-8, 1972. Canada: Victoria University Dept of Geographical Series, Vol 8, p 3-18, 1974. 2 plate, 1 tab, 18 ref. p 3-18, 1974. 2 plate, 1 tab, 18 ref.

Descriptors: Water resources development, *Environmental effects, Earthquakes, Ecology, Reservoirs, Climates, Diversion, *Hazards, *Land use.
Identifiers: *Environmental hazards.

Most water-development projects have been conceived and implemented with little or no thought of ecological consequences. Changes in land use and changes in the patterns of water flow and use are among the more critical environmental modifications. When a single factor in the balance is disturbed or removed, it sets up a whole series of interactions. Entire populations of organisms may be eliminated or harmed. When several factors are disturbed, the effects often are so far reaching that they can hardly be evaluated after they occur, let alone be predicted. Our modifications of the environment have been so great that we no longer know where, or if, we fit in it. Loading of the earth's crust with dams and reservoirs causes earthquakes. Owing to the high specific heat of water and its high latent heat of vaporization, manipulations of water inevitably affect thermal regimes. The net effect of diversions would be to alter both the heat and vapor balances of large areas. Changed weather and climate in large areas would have repercussions in surrounding regions and probably in the whole northern hemisphere, if not the whole planet. (Knapp-USGS)
W74-08601

COASTAL ECOSYSTEMS. ECOLOGICAL CONSIDERATIONS FOR MANAGEMENT OF THE COASTAL ZONE,
Conservation Foundation, Washington, D.C.
For primary bibliographic entry see Field 2L.
W74-08642

FINAL ENVIRONMENTAL STATEMENT, WEST TERRE HAUTE LEVEE, WABASH RIVER, INDIANA, WABASH RIVER BASIN.
Corps of Engineers, Louisville, Ky.
For primary bibliographic entry see Field 8D.
W74-08660

7. RESOURCES DATA

7A. Network Design

A PLAN FOR THE IMPROVEMENT OF THE LOW FLOW DATA NETWORK IN ALABAMA,
Geological Survey, University, Ala.
E. C. Hayes.
Water for Alabama Report Series, Alabama Development Office, May 1973. 27 p, 2 fig, 1 plate, 1 tab, 12 ref. Contract WRP-73-3.

Descriptors: *Low flow, *Network design, *Stream gages, *Data collections, *Alabama, Gaging stations, Streamflow forecasting, Hydrologic data, Instrumentation, Water measurement.

A systematic work plan was undertaken to improve the low-flow data network of Alabama. A key factor in the improved network will be the relation of low flows to the factors that control them. A major objective of the plan is the development of an improved technique for estimating the low-flow characteristics of ungaged streams. A comprehensive compilation and analysis of low-flow data for streams in Alabama will precede the design of the new network. This and related data developed in the design will support more precise and consistent estimates of low flows at ungaged sites as well as updated and more comprehensive publications relating to the low flows of streams in the State. (Knapp-USGS)
W74-08175

7B. Data Acquition

IMPROVING THE ACCURACY OF POINT-GAUGE MEASUREMENT IN HIGH-VELOCITY FLOWS (AMELIORATION DE LA PRECISION DE LA POINTE DE MESURE DANS LES ECOULEMENTS RAPIDS),
Indian Inst. of Tech., Madras. Hydraulic Engineering Lab.
R. Jayaraman, and V. Sethuraman.
Journal of Hydraulics Research, Vol 11, No 4, p 317-323, 1973. 2 fig, 1 ref.

Descriptors: *Instrumentation, *Measurement, Gauges, Flow, Water levels, Depth.
Identifiers: *India, High velocity flow.

A new instrument was developed to improve the accuracy of point-gauge measurement in high-velocity flows. The Gauge Contact-Time Indicator can be used with any point gauge to improve the accuracy of depth measurement. The instrument indicates the percentage of time in which there is contact between the water level probe and the pulsating water surface. Since the instrument shows a 6 sec moving mean indication, the readings are fairly steady even in the presence of low-frequency pulsations. The unit, which is self-contained and portable, is built inside an aluminum chassis and is powered by four pen light cells. The instrument eliminates the personal error inherent in point guage measurement in high velocity flows. With this instrument, all observers can get readings within + or - 0.01 cm. (Merritt-FIRL)
W74-08195

INSTRUMENTATION IN FULL SCALE SELF-AERATED FLOWS (APPAREILS DE MESURE DES CONCENTRATIONS ET DES VITESSES DANS UN COURANT MIXTE D'AIR ET D'EAU EN GRANDEUR NATURE),
Karlsruhe Univ. (West Germany). Institut fuer Hydromechanik.
For primary bibliographic entry see Field 8B.
W74-08196

THE POTENTIAL APPLICATION OF SATELLITES IN RIVER REGULATION,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 4A.
W74-08206

THE CALIBRATION AND USE OF A CONICAL HOT FILM ANEMOMETER PROBE IN RECIRCULATING WATER FLOW,
International Business Machines Corp., Charlotte, N.C.
For primary bibliographic entry see Field 2E.
W74-08222

DIRECT MEASUREMENT OF WATER MOVEMENT IN THE ZONE OF AERATION,
California Univ., Davis. Coll. of Agricultural and Environmental Sciences.
For primary bibliographic entry see Field 2G.
W74-08256

IRRIGATION NUMBER--A NEW TECHNIQUE TO EVALUATE IRRIGATION ADVANCE DISTANCE,
Indian Inst. of Tech., Kharagpur. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W74-08266

AUTOMATED FLOW-RECORDING SYSTEM FOR FIELD DRAINAGE MONITORING--DIRECT DATA COMPILATION OF SURFACE AND SUBSURFACE DRAIN FLOW,
Agricultural Research Service, South Burlington, Vt.
For primary bibliographic entry see Field 4A.
W74-08267

REFLECTANCE DISCRIMINATION OF COTTON AND CORN AT FOUR GROWTH STAGES,
Agricultural Research Service, Weslaco, Tex.
For primary bibliographic entry see Field 3F.
W74-08269

DETERMINATION OF WATER INTAKE RATE OF ADVANCE,
Pant Coll of Technology Pantnagar (India)
For primary bibliographic entry see Field 3F.
W74-08275

A NEW APPROACH TO SOIL TESTING: II. IONIC EQUILIBRIA INVOLVING H, K, CA, MG, MN, FE, CU, ZN, NA, P, AND S,
Pennsylvania Agricultural Experiment Station, University Park.
For primary bibliographic entry see Field 2G.
W74-08281

SATELLITE VIEWS OF HURRICANE CAMILLE,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 2B.
W74-08291

MONITORING FLOOD DAMAGE WITH SATELLITE IMAGERY,
South Dakota State Univ., Brookings. Remote Sensing Inst.
For primary bibliographic entry see Field 4A.
W74-08294

A DETAILED PROCEDURE FOR THE USE OF SMALL-SCALE PHOTOGRAPHY IN LAND USE CLASSIFICATION,
National Aeronautics and Space Administration, Houston, Tex. Lyndon B. Johnson Space Center.
For primary bibliographic entry see Field 4A.
W74-08299

SUSPENDED SOLIDS ANALYSIS USING ERTS-A DATA,
Pennsylvania Univ., Philadelphia. Moore School of Electrical Engineering.
For primary bibliographic entry see Field 2J.
W74-08301

LIMNOLOGICAL STUDIES AND REMOTE SENSING OF THE UPPER TRUCKEE RIVER SEDIMENT PLUME IN LAKE TAHOE, CALIFORNIA-NEVADA,
California Univ., Davis. Inst. of Ecology.
For primary bibliographic entry see Field 2J.
W74-08302

A PROGRAMMED SAMPLER FOR RUNOFF AND BEDLOADS,
Agricultural Research Service, Lincoln, Neb.
For primary bibliographic entry see Field 5A.
W74-08361

A VESSEL FOR COLLECTING SUBSURFACE WATER SAMPLES FROM GEOTHERMAL DRILLHOLES,
Department of Scientific and Industrial Research, Wairakei (New Zealand). Chemistry Div.
For primary bibliographic entry see Field 4B.
W74-08366

MEASUREMENT OF DYE CONCENTRATIONS BY PHOTOGRAPHY,
California Univ., Berkeley. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W74-08376

A SIMPLY CONSTRUCTED AND ADJUSTABLE MERCURY VAPOR CELL MOUNT,
Geological Survey, Menlo Park, Calif.
J. W. Ball, and E. A. Jenne.
Bulletin of Environmental Contamination and Toxicology, Vol 7, No 6, p 369-370, 1972. 1 fig.

Descriptors: *Spectrophotometry, *Spectrometers, *Mercury, Equipment, Chemical analysis, Analytical techniques.
Identifiers: *Mercury vapor cell.

Glass mercury-vapor cells are frequently used in an atomic-absorption spectrometer. A satisfactory and inexpensive self-contained holder for the mercury-vapor cell which protects the cell but is readily adjustable and demountable from the burner holder and the mercury cell itself can be made from polyethylene and flexible polyvinylchloride tubing. (Knapp-USGS)
W74-08379

CLARKS FORK YELLOWSTONE RIVER REMOTE SENSING STUDY,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W74-08386

THE USE OF ERTS-1 FOR RELAYING HYDROLOGIC DATA IN THE DELAWARE RIVER BASIN,
Geological Survey, Harrisburg, Pa.
R. W. Paulson.
Journal of the American Water Works Association, Vol 66, No 5, p 301-305, May 1974. 8 fig, tab.

Descriptors: *Telemetry, *Remote sensing, *Satellites(Artificial), Data collections, Hydrologic data, *Delaware River, Delaware River Basin Commission, Stream gages, Monitoring, Water resources.
Identifiers: ERTS.

The Earth Resources Technology Satellite (ERTS-1) is the first satellite dedicated to testing system of earth-resources-data acquisition. The satellite is being used by several hundred US and foreign investigators to test improved methods for remotely monitoring earth resources from space. Two of the systems, the Return Beam Vidicon (RBV) and the Multispectral Scanner (MSS), provide repetitive imagery, in several spectral bands, of the earth surface. The Data Collection System (DCS) relays telemetered data from ground-based radios, called Data Collection Platforms (DCP), to NASA ground-communication sites. Twenty DCP's are being installed and interfaced with water resources stations in the Delaware River Basin. These stations, which include stream-gaging stations, groundwater observation wells, and water quality monitors, are a subset of a larger number of field instruments operated by the USGS in the almost 13,000-squ mi basin. One of the prime objectives of the Delaware River basin data-relay experiment is to determine whether standard operational USGS water-resources instrumentation can be interfaced successfully with the DCS and the data made to flow operationally to data users. (Knapp-USGS)
W74-08583

7C. Evaluation, Processing and Publication

LOW-FLOW CHARACTERISTICS OF KENTUCKY STREAMS,
Geological Survey, Washington, D.C.
R. V. Swisshelm, Jr.
Open-File report, 1974, 1 sheet, 1 map.

Descriptors: *Low-flow frequency, Low flow, *Kentucky, Hydrologic data, *Maps, *Data collections, Streamflow forecasting.

Low-flow data are given for streams throughout Kentucky. Where more than 10 years of record are available, the 7-day annual low flows are used to define a frequency curve. The discharge at 10-year recurrence interval from that curve is the 7-day Q10. This report presents the 7-day Q10 discharge at 85 continuous-record stations and at 49 partial-record stations. These values are shown on a map along with the station number and the drainage area. (Knapp-USGS)
W74-08173

RAINFALL FREQUENCY ATLAS FOR MISSOURI,
National Weather Service, Columbia, Mo.
W. M. Wisner.
Available from NTIS, Springfield, Va. 22151, as COM-73-11760. Price $3.00 printed copy; $1.45 microfiche. Missouri University Atmospheric Science Department Extension Division Report 1973. 15 p, 7 fig, 5 ref, 2 append.

Descriptors: *Rainfall, *Missouri, *Frequency analysis, Meteorological data, *Maps, Statistics, Variability.

An analysis of precipitation records for Missouri provides information on how often extremely large amounts of rainfall can be expected. Estimates of the frequency of heavy rainfall were determined by using 50 years of daily precipitation data from 29 stations in or near Missouri. For each year, the greatest amount of precipitation in 1-, 2-, 4-, 7- and 10-day periods was determined. Then, through statistical analysis, the values shown on the included maps were derived. The maps show the actual value computed for each station and the pattern for equal expected values. Seasonal variations are also shown. Guides for estimating return periods or durations not presented on the maps are also given. (Knapp-USGS)
W74-08174

A PLAN FOR THE IMPROVEMENT OF THE LOW FLOW DATA NETWORK IN ALABAMA,
Geological Survey, University, Ala.
For primary bibliographic entry see Field 7A.
W74-08175

SURVEY OF THE SEASONAL SNOW COVER IN ALASKA,
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 2C.
W74-08179

ROAD LOG AND GUIDE--GEOLOGY AND HYDROLOGY FOR PLANNING, ANCHORAGE AREA.
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 4A.
W74-08180

SURFACE-WATER AVAILABILITY, COLBERT COUNTY, ALABAMA.
Geological Survey, Tuscaloosa, Ala.
For primary bibliographic entry see Field 4A.
W74-08187

WATER AVAILABILITY, COOSA COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, Ala.
For primary bibliographic entry see Field 4A.
W74-08188

SURFACE-WATER AVAILABILITY, LIMESTONE COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, Ala.
For primary bibliographic entry see Field 4A.
W74-08189

SURFACE-WATER AVAILABILITY, ETOWAH COUNTY, ALABAMA,
Geological Survey, Tuscaloosa, Ala.
For primary bibliographic entry see Field 4A.
W74-08190

AVERAGE WEEKLY RAINFALL AND PROBABILITIES DURING THE PLANTING-GROWING-HARVESTING PERIOD IN SOUTH CAROLINA,
National Oceanic and Atmospheric Administration, Clemson, S.C. National Weather Service.
For primary bibliographic entry see Field 2B.
W74-08295

RECORDS OF WATER WELLS, SPRINGS, OIL- AND GAS-TEST HOLES, AND CHEMICAL ANALYSES OF WATER FOR THE MADISON LIMESTONE AND EQUIVALENT ROCKS IN THE POWDER RIVER BASIN AND ADJACENT AREAS, NORTHEASTERN WYOMING,
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 4B.
W74-08296

A DETAILED PROCEDURE FOR THE USE OF SMALL-SCALE PHOTOGRAPHY IN LAND USE CLASSIFICATION,
National Aeronautics and Space Administration, Houston, Tex. Lyndon B. Johnson Space Center.
For primary bibliographic entry see Field 4A.
W74-08299

SIMULATION OF WATER QUALITY IN TARAWERA RIVER,
Auckland Univ. (New Zealand). School of Engineering.
For primary bibliographic entry see Field 5B.
W74-08308

FLOODS IN PUNALUU-HAUULA AREA, OAHU, HAWAII,
Geological Survey, Washington, D.C.
T. M. Ushijima, and C. J. Ewart.
For sale by USGS, Washington, DC 20242 - Price $0.75. Hydrologic Investigations Atlas HA-473, 1973. 1 sheet, 5 fig, 1 map, 7 ref.

Descriptors: *Floods, *Hawaii, Beaches, Profiles, Clogging, Barriers, Coasts, Berms, Rainfall-runoff relationships.
Identifiers: Punaluu(Hawaii), Hauula(Hawaii), *Oahu(Hawaii).

The part of Punaluu-Hauula area, Oahu, Hawaii, that is subject to flooding lies behind a natural beach berm that runs parallel to the coastline. This berm is from 6 to 9 feet above mean sea level. Houses and Highway 83 are located on the berm where development is at a maximum. The area west of the berm is a lowland, altitude between 1 and 7 feet, where cane growth is predominant. Several streams and ditches drain the approximately 15 square-mile project area. The flow from this area discharges to the ocean through many bridges and culverts. Shifting sand and debris clog these outlets frequently. The flood of February 4, 1965, was caused by a combination of moderately high runoff from the Koolau Range, heavy precipitation on the lowland area, and clogged outlets. Because the flood was caused by at least three factors, there is no single relation of flooding to peak stage or to total daily flow at the gaging station. A section of the area showing factors contributing to flooding in the lowland is shown. Information may be used in evaluating effects of flooding on the economic development of lowlands of the Punaluu-Hauula area, in designing improvements to solve existing flood problems, and in formulating effective flood-plain regulations to minimize future flood damage. (Knapp-USGS)
W74-08310

COMPUTER SIMULATION OF CROP PRODUCTION - POTENTIAL AND HAZARDS,
North Carolina State Univ., Raleigh. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W74-08331

GROUNDWATER LEVELS IN NEBRASKA, 1973,
Geological Survey, Lincoln, Nebr.
For primary bibliographic entry see Field 4B.
W74-08367

WATER-LEVEL RECORDS FOR THE NORTHERN HIGH PLAINS OF COLORADO, 1970-74,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4B.
W74-08381

DIGITAL-MODEL STUDY OF GROUNDWATER HYDROLOGY, COLUMBIA BASIN IRRIGATION PROJECT AREA, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2F.
W74-08382

FLOODS IN THE VICINITY OF CRETE, NEBRASKA,
Geological Survey, Washington, D.C.
F. B. Shaffer, and K. J. Brown.
Hydrologic Investigations Atlas HA-503, 1974. 1 sheet, 5 fig, 1 map, 1 photo.

Descriptors: *Floods, *Nebraska, Profiles, Flood recurrence interval, Flood frequency, Rivers, *Maps.
Identifiers: *Crete(Neb), Big Blue River(Neb).

The maximum known extent of flooding since the city of Crete, Nebraska, was established is shown on a map scaled 1:24,000. The boundaries of the inundated areas shown along the Big Blue River above the mouth of the West Fork are those for the 1967 flood, boundaries along both the West Fork and the Big Blue River from the mouth of the West Fork south to Crete are those for the 1950 flood, and boundaries along the Big Blue River south of Crete are those for both the 1950 and 1967 floods. The storms causing the two floods were not centered over the same part of the Big Blue River drainage basin: that for the 1950 flood centered over York, Neb., which is about 37 miles west-northwest of Crete and in the drainage basin of the West Fork, and that for the 1967 flood centered over Seward, which is on the Big Blue River about 21 miles upstream from Crete. Areas inundated by floods of record include considerable agricultural land along the West Fork and the Big Blue River, residential and commercial properties in the lower lying parts of Crete, and the Crete sewage disposal plant. The recurrence intervals of peak discharges (adjusted to present channel conditions) for the 1950, 1951, and 1967 floods at the Crete gaging station are about 15, 12, and 11 years, respectively. Graphs indicate the probability that a flood of specified peak discharge or peak stage will occur at Crete in this or any future year. The profile of the water surface of the highest flood of record and the profile of low flow of the West Fork and the Big Blue River are shown. (Brown-IPC)
W74-08444

HYDROLOGICAL ACTIVITIES IN SINGAPORE,
Singapore Dept. of Public Works. Drainage and Marine Branch.

In: Water Resources, Environment and National Development-aVolume II: Selected Papers; Proceedings of Regional Workshop by Science Council of Singapore and National Academy of Sciences of the USA, Singapore, March 13-17, 1972: Science Council of Singapore, p 44-60, 1972. 10 fig, 34 ref.

Descriptors: *Data collections, *Hydrologic data, Stream gages, Meteorological data, Streamflow, Rainfall, Water resources development.
Identifiers: *Singapore.

Hydrological records available in Singapore are discussed. Proposed works which are either under implementation or at the planning state are also included. Publication and reports dealing with Singapore hydrology are listed. Three main departments, namely the Meteorological Service, the Water Department and the Public Works Department are involved in hydrological works. The longest continuous rainfall record is that collected at the MacRitchie Reservoir from 1878 to date. The longest streamflow record available is the monthly inflows into the MacRitchie Reservoir. (See also W74-08454) (Knapp-USGS)
W74-08457

THE USE OF ERTS-1 FOR RELAYING HYDROLOGIC DATA IN THE DELAWARE RIVER BASIN,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 7B.
W74-08583

FLOODS IN ALABAMA--MAGNITUDE AND FREQUENCY BASED ON DATA THROUGH SEPTEMBER 30, 1971,
Geological Survey, Tuscaloosa, Ala.
For primary bibliographic entry see Field 2E.
W74-08587

DIGITAL SIMULATION OF THE EFFECTS OF URBANIZATION ON RUNOFF IN THE UPPER SANTA ANA VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 4C.
W74-08598

APPLICATION OF ERTS-1 IMAGERY TO THE STUDY OF CARIBOU MOVEMENTS AND WINTER DISPERSAL IN RELATION TO PREVAILING SNOWCOVER,
Alaska Univ., College.
For primary bibliographic entry see Field 2C.
W74-08602

WATEQ, A COMPUTER PROGRAM FOR CALCULATING CHEMICAL EQUILIBRIA OF NATURAL WATERS,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2K.
W74-08606

TRENDS AND VARIABILITY OF YEARLY MEAN SEA LEVEL 1893-1972,
National Ocean Survey, Rockville, Md.
For primary bibliographic entry see Field 2B.
W74-08643

VERTICAL DISTRIBUTION OF FALLOUT CESIUM-137 IN CULTIVATED SOILS,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 5B.
W74-08644

RADIOLOGICAL SURVEY OF NEW LONDON HARBOR, THAMES RIVER, CONN., AND ENVIRONS,
Office of Radiation Programs, Washington, D.C.
For primary bibliographic entry see Field 5B
W74-08645

ENVIRONMENTAL RADIOACTIVITY IN ILLINOIS, 1970,
Office of Radiation Programs, Washington, D.C Field Operations Div
For primary bibliographic entry see Field 5B
W74-08646

STATE ENVIRONMENTAL RADIOACTIVITY SURVEILLANCE PROGRAMS, 1972,
Office of Radiation Programs, Washington, D.C.
For primary bibliographic entry see Field 5B.
W74-08647

SUMMARY OF ENVIRONMENTAL MONITORING AT PHILADELPHIA, 1958-1971,
Philadelphia Public Health Dept., Pa. Div. of Occupational and Radiological Health.
For primary bibliographic entry see Field 5B.
W74-08648

TRITIUM BURDENS IN TWO ARCTIC VILLAGES,
National Environmental Research Center, Las Vegas, Nev.
For primary bibliographic entry see Field 5B.
W74-08649

TRITIUM SURVEILLANCE SYSTEM, OCTOBER-DECEMBER 1972.
Office of Radiation Programs, Las Vegas, Nev.
For primary bibliographic entry see Field 5B.
W74-08650

WATER SURVEILLANCE PROGRAMS, NOVEMBER 1972.
National Environmental Research Center, Las Vegas, Nev.
For primary bibliographic entry see Field 5B.
W74-08651

WATER SURVEILLANCE PROGRAMS, FEBRUARY 1973 AND 1972, SPECIAL ANALYSES.
National Environmental Research Center, Las Vegas, Nev.
For primary bibliographic entry see Field 5B.
W74-08652

RADIOACTIVITY IN WASHINGTON SURFACE WATER JULY 1970-JUNE 1971.
Washington State Dept. of Social and Health Services, Olympia.
For primary bibliographic entry see Field 5B.
W74-08653

RADIOACTIVITY IN NEW YORK STATE SURFACE WATER, JULY-DECEMBER 1971.
New York State Dept. of Environmental Conservation, Albany. Bureau of Radiological Pollution Control.
For primary bibliographic entry see Field 5B.
W74-08654

WATER SURVEILLANCE PROGRAMS, APRIL-MAY 1973.
National Environmental Research Center, Las Vegas, Nev.
For primary bibliographic entry see Field 5B.
W74-08655

TRITIUM SURVEILLANCE SYSTEM, APRIL-JUNE 1973.
National Environmental Research Center, Las Vegas, Nev.
For primary bibliographic entry see Field 5B.
W74-08656

WATER ATLAS OF THE UNITED STATES.
J. J. Geraghty, D. W. Miller, F. Van der Leeden, and F. L. Troise
Water Information Center, Port Washington, New York, 2nd enlarged edition, 1973. 122 plates

Descriptors: *Water resources, *United States, *Maps, *Data collections, Water types, Water consumption, Engineering structures, Fish, Meteorology, Precipitation(Atmospheric), Geographical regions, Geographical units, Hydrogeology, Hydrographs, Hydrology, Runoff, Flow rates, Streamflow, Water properties.

The 122 maps of the USA, including Alaska and Hawaii, in this data compilation provide visual overviews with appropriate explanations of the nation's distribution of water resources, water types (ground, surface, saline, navigable, polluted, etc.), water usage (by agriculture, public supplies, industrial demand, etc.), water characteristics (such as dissolved solids contents, temperatures, hardness, mercury and other trace metal contents, etc.), aquatic biology (fish populations, fishkills, etc.), hydraulic engineering structures (dams, reservoirs, power plants, etc.), and related meteorological and physiographic information, such as annual precipitation, runoff, and river flows. (See also W69-09004) (Brown-IPC)
W74-08668

8. ENGINEERING WORKS

8A. Structures

METHODS VARY ON MWD PIPELINES.
Western Construction, Vol 49, No 3, p 25-26, March, 1974. 1 fig.
Identifiers: *Los Angeles(Calif).

Four contracts underway in Los Angeles County on the Metropolitan Water District's West Valley and Calabasas Feeders for installing water transmission pipe ranging in size from 54 to 103 inches in diameter are described. The contractor must follow a comprehensive set of safety procedures which are aimed at curbing the public hazards associated with open trench work. (Merritt-FIRL)
W74-08193

GRANGEMOUTH TUNNEL SEWER.
K. Henry.
Tunnels and Tunnelling, Vol 6, No 1, p 25, 29, January-February, 1974. 4 fig.

Descriptors: *Tunnels, Sewers, Drainage systems, *Domestic wastes, Industrial wastes, *Storm water, Pumping, Construction.
Identifiers: *Great Britain(Grangemouth).

The plans and construction of the Grangemouth tunnel sewer are described. The tunnel was constructed to form part of the Grangemouth Town Council's multimillion dollar project for the modernization and expansion of the drainage system of the town. Combined flows of domestic sewage, industrial effluent, and stormwater are conveyed by the tunnel 1.60 km across the town center to a pumping station on the south bank of the River Carron. Separate sets of raw sewage and stormwater screws lift the flow nearly 10 m to pass through mechanical screens. After screening, stormwater is discharged straight into the River Carron and raw sewage is pumped by centrifugal pumps a further 1.60 km downstream to the site of a sewage purification works shortly to be constructed. (Merritt-FIRL)
W74-08197

'HE RIVER ITCHEN SCHEME OF THE PORT-MOUTH WATER COMPANY.
Vater and Water Engineering, Vol 77, No 934, p 81-485, December 1973. 1 fig.

Descriptors: *Treatment facilities, *Equipment, Design criteria, Pumping plants, Sewers, Reser-oir storage, Capital costs, Potable water, Water upply, Construction, Rivers.
dentifiers: *Great Britain(Portsmouth).

Details are given of the new River Itchen Abstrac-ion Scheme inaugurated in October 1973 and lesigned to augment the potable water supplies by 0 mgd initially. The first stage works includes a iver uptake, low lift pumping station, treatment vorks, high lift pumping station, 8.5 miles of 40-nch main, and a 6 million gallon service reservoir. The second stage works includes 2.5 miles of 36-nch main, a 10 million gallon service reservoir, nd further lengths of 20-inch and 36-inch connect-ng mains. (Sandoski-FIRL)
W74-08216

RECONSTRUCTING AN EGG-SHAPED SEWER.
Surveyor, Vol 43, No 4258, p 24-26, January 18, 1974. 8 fig.

Descriptors: *Sewers, *Water supply, *Construction, Tunnel.
Identifiers: *Great Britain(Bradford), Becks.

The reconstruction of the Bowling Beck and the trunk sewer on Nelson St. in the City of Bradford s described. The major part of the city lies in a bowl with only a single outlet to the valley of the River Aire. This means that the sewers as well as the natural becks and watercourses all pass through the center of the city. The redevelopment of the central area has necessitated many diver-sions and reconstructions of the drainage system. The neck construction consisted of about 110 lin yd of 10 ft by 7 ft 6 in in situ RC culvert at the downstream end as an extension to the culvert constructed in 1963. Upstream of this culvert some 500 lin yd of segmental tunnel were driven south where a similar 10 ft by 7 ft RC culvert was con-structed, 80 lin yd in length, to pick up the west branch of the Bowling Beck. (Merritt-FIRL)
W74-08249

NEW ROLLER GATE IMPROVES THE RIVER WALK.
Public Works, Vol 105, No 4, p 90, April, 1974. 1 fig, 6 ref.

Descriptors: *Water control, *Hydraulic struc-tures, Rivers, Flow control, Roller gates, *Flood control, *Texas.
Identifiers: *San Antonio(Tex.)

The new water control structure which replaced a dam at the downstream of the River Walk, a loop of the San Antonio River in downtown San An-tonio, Tex., is described. It provides better flow control and increases the navigable length of the waterway. The two phase project involved the ad-dition of a new water control gate between the bypass channel of the River Walk and the main channel of the San Antonio River, plus relocation of an existing tainter gate further downstream on the river proper. When water in the main channel of the San Antonio River reaches higher levels, the top section is lowered to prevent floodwaters from entering the River Walk loop. (Merritt-FIRL)
W74-08250

SMALL TUNNELS, LARGE POTENTIALS,
C. Gosselin.
Civil Engineering, p 34-35, March 1974. 3 fig.

Descriptors: *Tunneling, *Tunneling machines, *Automation.
Identifiers: *Minitunnels, *Small diameter tunnel-ing, Lasers, Pneumatic transportation.

A significant development coming recently from England has been the introduction of low cost, small diameter tunneling, particularly the minitun-nel, a strong contender for the existing open trench market. Such tunnels lend themselves to high speed mechanization, which may reflect lower costs by eliminating trench digging. Laser and automated tunneling will be fully exploited in the future. Pneumatic transportation of assorted materials is discussed. (Prague-FIRL)
W74-08358

PINCH VALVES TAKE HOLD ON THE INDUS-TRY,
Red Valve Co., Inc., Carnegie, Pa.
L. Schneider.
Water and Sewage Works, Vol 121, No 3, p 50, 51, 60, March 1974. 4 fig.

Descriptors: *Engineering structures, *Sewers, *Valves, Flow control, Design, Sewerage.
Identifiers: *Pinch valves.

Pinch valves are being used with increasing frequency in sewer systems because of their design simplicity. Pinch valves cannot be jammed by debris, eliminate the need for periodic main-tenance or lubrication, and are available in a great variety of design--pneumatic pinch, mechanical pinch, combination valve, and of materials that in-clude many elastomers. Pinch valves often come with a service life of ten years or more. (Murphy-FIRL)
W74-08363

DESIGN AND PERFORMANCE CRITERIA FOR SETTLING TANKS FOR THE REMOVAL OF PHYSICAL-CHEMICAL FLOCS,
Toronto Univ. (Ontario). Inst. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5D.
W74-08396

HOW SAFE ARE SEWERS FOR CONSTRUC-TION AND MAINTENANCE CREWS,
Howard, Needles, Tammen and Bergendoff, Inc., Indianapolis, Ind.
For primary bibliographic entry see Field 5G.
W74-08440

A COFFERDAM DESIGN OPTIMIZATION,
Delaware Univ., Newark. Dept. of Civil Engineer-ing; and Bell Telephone Labs., Murray Hill, N.J.
F. Neghabat, and R. M. Stark.
In: Systems Planning and Design: Case Studies in Modeling, Optimization, and Evaluation (Ed. by R. de Neufville and D.H. Marks), Prentice Hall, Inc., Englewood Cliffs, New Jersey, p 190-201 (Chapter 14), 1974. 3 fig, 1 tab, 20 equ, 8 ref.

Descriptors: *Cofferdams, *Structural design, *Flood control, *Construction costs, Optimiza-tion, Height, Water pressure, Equations, Systems analysis, Mathematical models, Economics, Con-straints, Water levels, Risks.
Identifiers: *Geometric programming, *Nonlinear programming, Design values, Slippage, Interlock stress, Expected cost, Technological constraints.

Cofferdams function in a random environment characterized by fluctuations in surrounding water levels. Increasing the cofferdam's height diminishes chances of flooding but increases cost of construction. Design height, therefore, is an ap-propriate balance between the costs of construc-tion and of potential floods. Economic considera-tions are integrated into an expected cost objective subject to technological constraints. Geometric programming is used to derive design values of the height, main and connecting cell diameters, and the cycle length in an example problem. The for-mulation pertains to circular cellular cofferdams (commonly used for deepwater and large projects) that rest on rock and have no inside berms. The ex-pected cost objective function components are: costs of fill, steel sheet piles, and risk of flooding. Constraints, formulated here for slippage and in-terlock stress, must be satisfied to preclude failures. The cofferdam is important for research into the optimization of structural design: Its failure modes are distinct, its life is transient, and its failure rarely results in loss of life, and the ap-propriate structural analyses are tractable. The ex-pected-cost objective function and associated con-straints explicitly account for relevant economic and technological considerations and permit the extensive sensitivity analyses required. Geometric programming provides insights into the optimal al-location of resources among the component costs. (See also W74-08506) (Bell-Cornell)
W74-08511

PORT EVERGLADES HARBOR, BROWARD COUNTY, FLORIDA (FINAL ENVIRONMEN-TAL STATEMENT).
Army Engineer District, Jacksonville, Fla.
Available from Nat. Tech. Infor. Serv., Spring-field, Va. 22151, as EIS-FL-73-1408-F, for $5.00 paper copy; $1.45 microfiche. August 27, 1973. 56 p, 23 append.

Descriptors: *Harbors, *Dredging, *Channel im-provement, *Project planning, *Environmental ef-fects, *Florida, Federal government, Excavation, Civil engineering, Backfill, Soil mechanics, Jet-ties, Navigation, Port authorities, Cost-benefit analysis, Turbidity, Construction, Structures.
Identifiers: *Environmental impact statement, *Boward Co.(Fla.).

This final environmental impact statement deals with the improvement of a project harbor by deepening and modifying harbor dimensions in order to handle larger ships. The recommended improvement would provide for a channel depth of 42 feet in the entrance channel and main turning basin plus an additional 3 feet for wave allowance in the ocean entrance, widening the 300-foot width section of the entrance channel to 450 feet, remov-ing part of the north jetty, extending the main turn-ing basin to the southeast, widening Pier 7 channel to 400 feet with a 36-foot depth and maintenance of Berth 18 channel to a 36-foot depth. Some dredged material, if suitable, will be utilized for beach replenishment and some will be used to create an artificial reef. Unused material will be placed on diked upland areas. Adverse effects should be minimal with a temporary increase of water turbidity during construction and a higher pollution potential due to the increased traffic of larger vessels. The basic alternative is no action, but the use of offshore mooring facilities and varied design dimensions were considered during the planning process. (Sutton-Florida)
W74-08518

SPUR CHANNEL TO ASTORIA WATER-FRONT, EAST RIVER, NEW YORK (FINAL EN-VIRONMENTAL STATEMENT).
Army Engineer District, New York.
Available from Nat. Tech. Info. Serv., Springfield, Va. 22151, as EIS-NY-73-1132-F, for $4.75 paper copy; $1.45 microfiche. January 3, 1973. 45 p, 4 tab, 12 append, 1 fig.

Descriptors: Water resources development, *Excavation, *Federal project policy, *Project purposes, *Economic feasibility, Project planning, *New York, Cost-benefit analysis, Environmental effects, Decision making, Land use, Methodology, Water resources, Dredging, soil mechanics, Navigable waters, Water pollution.
Identifiers: *Envornmental impact statement, *East River(N.Y.).

This final environmental impact statement is con-cerned with the improvement of navigation from the East River Channel, New York, to the Astoria waterfront. The proposed project will deepen the existing spur channel from 30 to 35 feet in earth

and to 37 feet in rock at mean low water for a width of 400 feet. The project will also deepen the turning basin to the same depths. The excavated materials will be disposed of in an approved dumping ground. The project's feasibility is based on the increased economy of transporting residual and distillate fuel oils from other ports to the Astoria waterfront. Also, this excavation of approximately 850,000 cubic yards of bottom material should provide greater safety in navigation which will in turn further reduce discharges of pollutants into the water through accidents. Patterns of land use and pollution are not expected to change. Disturbance to fish from turbidity and possible gas liberation should be relatively minor. The adverse impacts on water quality should also be minor as well as temproary. Several alternatives were considered, including other transportation modes, maintaining the status quo and the construction of another unloading terminal in deeper waters of the river. (Sutton-Florida)
W74-08519

LOWER RIO GRANDE FLOOD CONTROL PROJECT, TEXAS.
International Boundary and Water Commission, El Paso, Tex.
Available from the National Technical Information Service as EIS-TX-73-1730-F, $5.75 in paper copy; $1.45 in microfiche. October 4, 1973. 71 p, 1 map.

Descriptors: *Internation law, *International waters, *Rio Grande River, *Texas, *Flood control, *Flood protection, *Mexico, Floodways, Flood routing, Flood damage, Project planning, Federal Government, Diversion structures, Dams, Flood plains, Levees, Watershed management, Turbidity, Land use, Water utilization.
Identifiers: *Environment impact statement, *Rio Grande River(Tex.).

The proposed work is designed to reduce the flood damage potential in the area of the Lower Rio Grande Flood Control Project. The action will provide a greater degree of protection to United States lands and will assure diversion of the United States' one-half share of excess Rio Grande floodwaters, in accordance with an agreement with Mexico. The modifications consist of raising levees where necessary, removing floodway restrictions, constructing a new Hackney Inlet to divert floodwaters upstream into a new section of what will be the United States Floodway, closing the Mission floodway and the construction of Retamal Dam. Increasing levee heights will require commitment of 112 acres of existing rights-of-way. The project will remove 111 acres from cultivation and change 42 acres of brushland to grassland. There will be minor temporary interference with transportation during construction, as well as a neglibible effect on fish from turbidity following rains. Various combinations of new and existing floodways were considered. However, this plan has the least environmental impact and is the most economical. (Sutton-Florida)
W74-08521

OUTLET WORKS, WARM SPRINGS DAM, DRY CREEK, RUSSIAN RIVER BASIN, SONOMA COUNTY, CALIFORNIA,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
J. H. Ables, Jr., and G. A. Pickering.
Army Engineer Waterways Experiment Station Technical Report H-73-3. February 1973. 41 p, 6 fig, 7 photo, 11 plate, 3 tab.

Descriptors: *Outlet works, *Hydraulic models, Open channel flow, Pipe flow, Tunnels, Critical flow, Unsteady flow, Non-uniform flow, Hydraulics, *California.

Tests were conducted on a 1:25-scale model of the outlet works for Warm Springs Dam California to determine stilling basin performance and flow conditions in the outlet channel. Uncertainties existed as to the performance of the stilling basin, designed for full pipe flow, with the conduit flowing partially full since the curvature in the conduit could result in unequal distribution of flow at the outlet portal. The model reproduced the control structure, the entire length of the downstream conduit, the energy dissipator with fish channel, exit channel, and a portion of dry Creek. At partial conduit discharges, distribution of flow at the outlet portal was not sufficiently unbalanced by the curve in the conduit to affect stilling basin action. However, minor revisions were made to the stilling basins for more efficient energy dissipation. At intermediate discharges, moving pockets of air were entrapped in the downstream portion of the conduit. These pockets of air resulted in slug flow at the outlet portal, which created surges that carried through the primary and secondary basin into the exit channel. Changes were made in the design of the conduit to eliminate the slug flow conditions. The riprap requirements in the exit channel downstream from the energy dissipator were determined. (Knapp-USGS)
W74-08584

8B. Hydraulics

TURBULENCE CHARACTERISTICS IN A SMOOTH OPEN CHANNEL OF CIRCULAR CROSS-SECTION (CARACTERISTIQUES DE LA TURBULENCE AU SEIN D'UN ECOULEMENT A SURFACE LIBRE EN CONDUITE LISSE DE SECTION CIRCULAIRE,
Newcastle-upon-Tyne Univ. (England).
C. Nalluri, and P. Novak.
Journal of Hydraulics Research, Vol 11, No 4, p 343-368, 1973. 10 fig, 1 tab, 24 ref.

Descriptors: *Turbulence, *Open channel flow, *Depth, Flow, *Cross-sections, Numerical analysis, Investigations.
Identifiers: *Great Britain, France.

Results of recent research dealing with determination of turbulence intensities and energy spectra in water flowing in a smooth open channel of circular cross section are presented. In varying the depth in a channel of circular cross-section a wide spectrum of shapes and types of flows is encountered. This variation is also clearly reproduced in the distribution of the turbulence intensities and the shape of the normalized plots. The value of the intensities reflect the variation in channel shape particularly at some distance from the wall and the free water surface. At bigger depths the crowning effect of the channel cross section causes an appreciable increase of turbulence levels towards the free surface. A detailed comparison of turbulence intensities with those recorded by other investigations in circular pipe flow or rectangular open channel flow shows some agreement for a varying range of depths depending on the type of normalization and plots used and confirms that in a channel of circular cross section the flow changes from two to three dimensional as the depth increased. The measurements of the turbulence along 30 degree radial axis are comparable with those measured along the vertical axis. This applied also to a lesser degree to measurements along a displaced vertical. (Merrit-FIRL)
W74-08192

INSTRUMENTATION IN FULL SCALE SELF-AERATED FLOWS (APPAREILS DE MESURE DES CONCENTRATIONS ET DES VITESSES DANS UN COURANT MIXTE D'AIR ET D'EAU EN GRANDEUR NATURE),
Karlsruhe Univ. (West Germany). Institut fuer Hydromechanik.
R. J. Keller.
Journal of Hydraulics Research, Vol 11, No 4, p 325-341, 1973. 8 fig, 1 ref.

Descriptors: *Open channel flow, *Velocity, *Air circulation, Flow measurement, Instrumentation, Analytical techniques.
Identifiers: Germany

The development of field instruments which measure accurately air concentrations and velocities at points in the flow of open channels is described. The development included the design of a field unit by means of which depth profiles of air concentration and velocity could be obtained at various locations in the channel. After extensive use of the instruments, it is concluded that the methods used to measure air concentration and stagnation pressure were satisfactory. Furthermore, except near the flow surface, the errors associated with the computer values of time average air concentration, stagnation pressure, and velocity were small. However, measured values of air concentration near the fluctuating surface and computed values of velocity very near the flow surface could not be relied on. (Merritt-FIRL)
W74-08196

THE FRICTION FACTORS OF OSCILLATING PIPE FLOWS,
Okayama Univ. (Japan). Dept. of Mechanical Engineering.
K. Hirose, and M. Nobunaka.
Memoirs of the School of Engineering, Okayama University, Vol 8, No 2, p 44-51, December, 1973. 10 fig, 3 ref.

Descriptors: *Investigations, *Pipe flow, *Reynolds number, *Roughness(Hydraulic), *Turbulent flow, Steady flow, Mathematical studies.

The penduluation of a water column in a special vertical U-tube which was about a 2-meter long horizontal straight foot pipe is utilized as an oscillating pipe flow. Experimental results indicate that the momentary friction factors in the accelerating state are smaller and in the decelerating state are larger than that in steady state for each Reynolds number. (Sandoski-FIRL)
W74-08259

PROBLEMS AND SCS SPECIFICATIONS FOR LOW HEAD PVC PIPELINES,
Soil Conservation Service, Bozeman, Mont.
C. L. Walter.
Paper No 72-758 presented at Winter Meeting of the American Society of Agricultural Engineers, December 11-15, 1972, Chicago, Illinois. 23 p, 1 fig, 3 tab, 2 ref.

Descriptors: *Pipelines, *Plastic pipes, Plasticity, deformation, Hydraulic structures, Construction, Deformation, Failures, Specifications, *Standards.

Survey conducted of low head PVC pipeline installations and further evaluation of the systems that failed point out the importance of following every requirement specified in the design and installation of these systems. Properties of low head plastic pipe are discussed, and SCS Standards and Specifications for its use are included. (Skogerboe-Colorado State)
W74-08278

UNIFORM IRRIGATION WITH LOW-PRESSURE TRICKLE SYSTEMS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 3F.
W74-08323

THE DEVELOPMENT OF MEANDERS IN NATURAL RIVER-CHANNELS,
Simon Fraser Univ., Burnaby (British Columbia). Dept. of Geography.
For primary bibliographic entry see Field 2E.
W74-08357

ISCHARGE AND TRAVEL TIME FOR ROUND-WATER CONDUITS,
niversity of Southern California, Los Angeles. ept. of Civil Engineering.
S. Butler, and D. L. Gundlach.
ournal of the Irrigation and Drainage Division, merican Society of Civil Engineers, Vol 100, No I1, Paper 10393, p 17-29, March 1974. 11 fig, 1 b, 4 ref, append.

escriptors: *Groundwater movement, Discharge(Water), *Travel time, Mathematical odels, Aquifers, Water yield, Permeability, orous media, Irrigation water, Percolation, Conduits.

system of mathematical and graphical rocedures gives solution for the steady-flow scharge and travel time for nonuniform confined roundwater conduits in which any or all of the llowing characteristics vary from point to point: ermeability, porosity, and cross-sectional area. he methods use solutions of mathematical odels based on the Darcy equation and the equa- on of continuity. Modified procedures give rela- vely simple solutions with some loss in accuracy. Knapp-USGS)
/74-08383

YDRODYNAMICS OF SURFACE IRRIGA- ION-ADVANCE PHASE,
alifornia Univ., Davis. Dept. of Water Science nd Civil Engineering.
G. Sakkas, and T. Strelkoff.
ournal of the Irrigation and Drainage Division, merican Society of Civil Engineers, Vol 100, No R1, Paper 10422, p 31-48, March 1974. 8 fig, 19 ef, append. UC Water Resources Project W-259.

escriptors: *Seepage, *Open channel flow, Furrow irrigation, *Surface irrigation, Numerical nalysis, Infiltration, Hydrodynamics.

he Saint-Venant equations governing gradually aried, unsteady flow in an open channel with eepage may be put into characteristic form and olved numerically in finite steps along the irregu- ar network formed by the characteristic lines sing a simple predictor-corrector scheme. Infil- ration into the soil is assumed to depend solely pon contact time between water and soil. In re- ions of substantial curvature of the characteristic ines, step size is reduced to preserve accuracy. Near the very front of the advancing stream, here the forward and backward characteristics urve extremely sharply and merge with their en- velope, the wave-front trajectory, the numerical pproximations to the characteristic equations reak down and are replaced by the assumption hat water velocity is independent of the distance oordinate and equals front-propagation speed. (Knapp-USGS)
W74-08384

SEDIMENT ROUTING IN IRRIGATION CANAL SYSTEMS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W74-08385

FLOW CHARACTERISTICS OF SLOPING CHANNEL JUMPS,
Alberta Univ., Edmonton. Dept. of Civil Engineer- ng.
N. Rajaratnam, and V. Murahari.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY6, Paper 10594, p 731-740, June 1974. 9 fig, 1 tab, 16 ref, append.

Descriptors: *Hydraulic jump, *Model studies, Shear stress, *Open channel flow, Drops(Structures), *Supercritical flow, Critical flow, Turbulent flow.

The mean flow characteristics of hydraulic jumps were studied in sloping rectangular channels with slopes of 2%-25%. The supercritical Froude number was the range of 5 to approx 8. It was found that the mean velocity profiles could be analyzed using the theoretical model of plane turbulent wall jets. The bed shear stresses are comparatively larger than in the corresponding level channel jumps. (Knapp-USGS)
W74-08387

MECHANISM FOR STREAMFLOW MEANDERING,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
M. C. Quick.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY6, Paper 10587, p 741-753, June 1974. 6 fig, 10 ref. append.

Descriptors: *Meanders, *Sediment transport, *Vortices, *Channel morphology, Turbulent flow, *Open channel flow, Alluvial channels, Sedimentation.

Meandering is explained in terms of the fluid mechanics of vortex flow and entrainment of the movable boundary. The bed material and the surrounding geology permit or prohibit this meander mechanism and have a major reactive role so that some meander parameters are largely a function of bed material characteristics. The existence of such a fluid mechanics mechanism explains why meanders are observed not only in erodible bed rivers but also in flow across ice, in the motion of some ocean currents, and perhaps in the atmospheric flows such as the jet stream, where entrainment of the surrounding fluid replaces the entrainment of silt. The angular deflection of the stream is given by the ratio of stream wise vortex strength to free stream velocity, a ratio which should be independent of river size. Sediment transport rate is very much a function of meander shape which in turn causes the production of streamwise vorticity. The sediment transport equations now in use are based on uniform mean velocities and resulting tractive stresses. The mechanisms suggested in this paper imply that the same mean velocity may produce very different sediment transport rates depending on the degree of development of the meander pattern. Meanders are the result of flows which exist for long periods of time and characteristically are highly organized products of long duration events. Floods, on the other hand, are short-duration high-energy events which try to superimpose a new pattern. These superimposed new patterns result in cutoffs and a disorganization of the meander pattern which is slowly corrected during the ensuing periods of flow. (Knapp-USGS)
W74-08388

TRANSVERSE DISPERSION IN OCILLATORY CHANNEL FLOW,
British Columbis Univ., Vancouver. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W74-08389

ENHANCED DISPERSION IN DRAG REDUCING OPEN CHANNEL FLOW,
Clemson Univ., S.C. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W74-08390

OBSERVATIONS ON HYDRAULIC JUMPS AT ROUNDED STEP,
Memorial Univ. of Newfoundland, St. Johns. Dept. of Engineering and Applied Science.
J. J. Sharp.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY6, Paper 10592, p 787-795, June 1974. 7 fig, 4 ref, append.

Descriptors: *Hydraulic jump, *Drops(Structures), Critical flow, Turbulent flow, Vortices, Open channel flow, Tailwater, Waves(Water).

The formation of a hydraulic jump at an abrupt step was compared to that at a step with rounded edge. The large standing wave associated with the abrupt step does not form when the step is rounded, and downstream waves can be suppressed. The range of tailwater depths over which the jump is located at the step shows only slight dissimilarities with similar measurements taken at abrupt steps. There is little difference in maximum bed velocities, but reversal of bed flow does not occur downstream of the rounded step. (Knapp-USGS)
W74-08391

TO ESTABLISH VIABLE METHODS OF MAINTAINING WASTE TREATMENT FACILITY EFFICIENCIES WITH REFERENCE TO FLOW VARIATIONS.
Maclaren (James F.) Ltd., Willowdale (Ontario).
For primary bibliographic entry see Field 5D.
W74-08398

OUTLET WORKS, WARM SPRINGS DAM, DRY CREEK, RUSSIAN RIVER BASIN, SONOMA COUNTY, CALIFORNIA,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 8A.
W74-08584

SELECTIVE WITHDRAWAL FROM MAN-MADE LAKES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 4A.
W74-08585

GALVESTON BAY HURRICANE SURGE STUDY: REPORT 1. EFFECTS OF PROPOSED BARRIERS ON HURRICANE SURGE HEIGHTS--APPENDIX A, CALIBRATION TESTS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
R. A. Sager, and E. C. McNair, Jr.
Available from NTIS, Springfield, Va 22151 as AD-759 119, price $3.00 printed copy; $1.45 in microfiche. Army Engineer Waterways Experiment Station Technical Report H-69-12, March 1973. 21 plate, 7 photo, 8 tab.

Descriptors: *Hydraulic models, *Bays, *Flood protection, *Surges, *Hurricane, *Texas, Waves(Water), Model studies, Coastal engineering.
Identifiers: *Galveston Bay(Tex).

The effectiveness of possible hurricane protection systems for the Galveston Bay, Texas, complex, was tested using hydraulic models. Results of tests to define head losses associated with key portions of the complex are presented to serve as input to a mathematical model of the Galveston Bay area. Tests defined the head losses for normal tides and hurricane surge conditions for the Galveston Harbor Entrance and the barrier beaches associated with Galveston Bay. Model structures allow the effectiveness of two barrier plans (Alpha and Gamma) to be evaluated in a distorted-scale model (1:100 vertically and 1:3000 horizontally). Model structures of a 400-ft-wide by -55 ft msl navigation opening for each plan and a gated opening with the top of the gate at +5 ft msl were developed. (Knapp-USGS)
W74-08586

8C. Hydraulic Machinery

DEFINITION OF REVERSE OSMOSIS PUMP REQUIREMENTS FOR SPACE VEHICLE REQUIREMENTS,
McDonnell Douglas Astronautics Co., West, Huntington Beach, Calif.
M. S. Bonura, and G. W. Wells.
Available from the National Technical Information Service as PB-223 745; $10.75 in paper copy, $1.45 in microfiche. Office of Saline Water, Report INT-OSW-RDPR-73-892. June 1973. 174 p, 45 fig, 13 tab, 11 ref. OSW Contract 14-30-3062.

Descriptors: *Reverse osmosis, *Pumps, *Pump testings, Centrifugal pumps, *Pumping, Costs.
Identifiers: Reciprocating pumps, Gear pumps, Vane pumps, *Reverse osmosis pumps, Flight pump specifications, Pump design, Pump performance.

This report covers the investigation of high-pressure reverse osmosis (RO) pumps for space vehicle application. The vendor pump survey and pump evaluation tasks are described. Four selected RO pumps were ordered and evaluated during a 30-day test under spacecraft wash water recovery system conditions. Of the four candidate pumps, only two successfully completed the required 30 days (720 hours) of operation. A description of the test stand and the data from the pump evaluation test are included. The test data include pump power requirements, efficiency and other design parameters. The test data were used to develop recommendations for a flight-type prototype RO pump and a design specification for a high-pressure RO pump for space vehicle application. Also included are rough order of magnitude (ROM) costs for the development of a flight type RO pump. (OSW)
W74-08340

DESIGN AND CONSTRUCTION OF A LARGE BRACKISH WATER DESALINATION MODULE,
Dow Chemical Co., Walnut Creek, Calif.
For primary bibliographic entry see Field 3A.
W74-08343

8D. Soil Mechanics

OPERATION AND MAINTENANCE OF NEW BEDFORD HURRICANE BARRIER (FINAL ENVIRONMENTAL STATEMENT).
New England Div. Corps of Engineers, Waltham, Mass.
Available from the National Technical Information Service as EIS-MA-73-1353-F, $4.00 in paper copy, $1.45 in microfiche. September 1972. 23 p, 3 map, 1 chart, 7 append.

Descriptors: *Harbors, *Massachusetts, *Dikes, *Barriers, *Flood protection, *Hurricanes, Shore protection, Boats, Engineering structures, Intake gates, Slide gates, Environmental effects, Flooding, Flood control, Cost-benefit analysis, Decision making, Water pollution sources, Pumping, Boating, Swimming, Recreation, Social needs, Beaches, Boat-launching ramps, Levees, Earth dams, Earthworks.
Identifiers: *Environmental impact statement, New Bedford(Conn), Buzzards Bay, Coastal waters.

The beneficial environmental impacts of the New Bedford hurricane barrier will be to provide protection for commercial, industrial, and residential areas from tidal flooding during major coastal storms and hurricanes. It will also serve as a protective facility for harbor-based and transient vessels. The adverse environmental effects include rodent control and air jetting which causes temporary turbidity. The only alternatives to the project are to discontinue the operation or maintenance of particular feature or to discontinue the whole project. The harbor barrier and dike is 9,100 feet long. The barrier consists of an earth and rock fill section with stone armor protection. The barier has two navigation openings which can be closed during storms. The environmental impact statement includes several maps which show the barrier and its constitutent parts, includning navigation gates, conduit gates, intake gates, sewer gates, street gates, and pumping stations. Harvesting of marine resources in the harbor area is virtually non-existent due to gross water pollution. The barrier provides recreation in the form of two boat launching ramps and two public beaches. (Sperling-Florida)
W74-08520

FINAL ENVIRONMENTAL STATEMENT, WEST TERRE HAUTE LEVEE, WABASH RIVER, INDIANA, WABASH RIVER BASIN.
Corps of Engineers, Louisville, Ky.
Available from the National Technical Information Service as EIS-IN-73-1666-F, $3.75 in paper copy, $1.45 in microfiche. February 23, 1973. 28 p, 1 map.

Descriptors: *Flood protection, *Flood damage, *Levees, Watershed management, Flood control, *Indiana, Environmental effects, Non-structural alternatives, Flood routing, Federal government, Local governments, Legislation, Cost-benefit analysis, Project planning, Floodways, Retaining walls, Levees, Earthworks, Flood plain zoning.
Identifiers: *Environmental impact statement, *Terre Haute(Ind).

This proposed work will provide local flood protection for the West Terre Haute, Indiana area. The project is an urban levee that will consist of constructing an earth levee, a concrete wall, a railroad fill slope blanket, a raised street, one pumping plant and other necessary appurtenances. The land required totals about 60 acres and about 440 acres are protected by the levee against floods having an average recurrent frequency of once in each 100-year period. Construction of the levee and floodwall was 99% complete as of January 1973 and the overall project is about 90% completed. Approximately 60 acres of land is now removed from tax rolls, but these losses can be recouped in the project benefits which will accrue. Some landscape views will be blocked by the project and increased development in the protected area could be adverse if not controlled. Alternatives considered included alternate alignments, nonstructural methods of flood damage reduction and flood proofing. (Sutton-Florida)
W74-08660

8G. Materials

DEVELOPMENT OF A PRODUCTION TECHNIQUE FOR POROUS STAINLESS STEEL TUBES,
Universal Oil Products Co., Dearborn Heights, Mich. Wolverine Tube Div.
T. J. Allen.
Available from the National Technical Information Service as PB-229 729/AS, $6.75 in paper copy, $1.45 in microfiche. Office of Saline Water, Report INT-OSW-74-928, March 1974. 67 p, 24 fig, 12 tab. OSW Contract 14-30-2843.

Descriptors: *Desalination, *Reverse osmosis, *Membranes processes, Pilot plants, *Tubes, *Corrosion.
Identifiers: Membrane supports, Corrosion evaluation, Cost estimates, Porous tubes, *Steel tubing.

A summary is presented of work performed in developing a production process for seamless porous stainless steel tubing as used for membrane supports in reverse osmosis systems. A process for compacting stainless steel powder in an annular mild steel shell was developed. A prototype quantity of tubing was fabricated to demonstrate process reproducibility and to provide samples for product characterization and evaluation of corrosion resistance. A manufacturing cost estimate was prepared for large scale production of the product. Seamless porous stainless steel tubing is fabricated by loading stainless steel powder into an annular mild steel shell, compacting the powder using a combination of tube drawing and tube reducing, sintering the compacted composite, and chemically removing the mild steel shell. The process as developed yields a product having good dimensional tolerances, burst strengths exceeding 4000 psi, pore sizes in the range 2-6 microns, and permeabilities in excess of 100 GSFD at 50 psi. The product appears to exhibit good corrosion resistance under reverse osmosis desalination conditions. It is estimated that the product would cost $1.85/foot (or approximately $14/ft sq) in quantities in the range of one-five million feet of 0.50 in interior diameter tubing per year. (OSW)
W74-08503

8I. Fisheries Engineering

OPTIMUM ESCAPEMENT STUDIES OF CHIGNIK SOCKEYE SALMON,
Washington Univ., Seattle. Fisheries Research Inst.
W. H. Parr, Jr., and R. L. Burgner.
Available from NTIS, Springfield, Va. 22151 as COM-73-11179, Price $3.00 printed copy; $1.45 microfiche. Completion Report for July 1969 to June 1970 to National Marine Fisheries Service, November 1970. 17 p, 4 fig, 6 tab, 10 ref.

Descriptors: *Salmon, *Alaska, *Fisheries, *Fish diets, Food chains, Juveniles, Fish populations, Fish hatcheries, Predation, *Sockeye salmon.
Identifiers: Coho salmon.

Studies were directed primarily toward gaining an understanding of the interactions affecting sockeye salmon production in the lake nursery area. Beach seining, surface trawling and echo sounding were conducted for determination of the growth, abundance, distribution, and mortality rate of juvenile sockeye salmon and associated species. The study of food supply and food habits of the juvenile sockeye salmon and resident fishes was continued for a third year so that competition between species under different population densities could be determined. Efforts were made to further understand the effects of predation by Dolly Varden and coho salmon on juvenile sockeye salmon. Assistance was given to the Alaska Department of Fish and Game in collections of statistics on the adult salmon runs. Methods used to forecast the magnitude and age composition of the 1970 run were evaluated. (Knapp-USGS)
W74-08176

GENERALIZATION OF SPAWNING AND REARING DISCHARGES FOR SEVERAL PACIFIC SALMON SPECIES IN WESTERN WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2I.
W74-08370

1971 PUGET SOUND FALL CHINOOK SALMON TAGGING STUDY,
Washington State Dept. of Fisheries, Olympia. Management and Research Div.
G. I. Fiscus, and E. D. Jewell.
Available from NTIS, Springfield, Va. 22151 as COM-73-11593 Price $5.00 printed copy; $1.45 microfiche. Washington State Department of Fisheries Contract Report to NOAA, National Marine Fisheries Service, March 1973. 52 p, 12 fig, 13 tab, 6 ref. NOAA Contract N208-0054-72(N).

Descriptors: *Salmon, *Chinook salmon, *Commercial fish, Fish management, Fish migration, Fisheries.

Fall Chinook Salmon were tagged in marine waters of inner Puget Sound between Discovery Bay and Seattle from July 18 to August 13, 1971. A total of 200 tags (42.1% of the number released) were recovered or sighted and of these, 90 tags (45.0% of the number recovered) came directly from hatchery trapping facilities. Nine specific stocks in the tagging areas were partially determined. The absence of tag recoveries outside of Puget Sound waters indicated fall chinook stocks to be entirely of Puget Sound origin. Three watersheds contributed a major portion of the total chinook population. These were Hood Canal, Lake Washington, and the Duwamish-Green River stocks. (Knapp-USGS)
W74-08452

MARINE FISHERIES.
For primary bibliographic entry see Field 6E.
W74-08574

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

NINTH ANNUAL REPORT, FISCAL YEAR 1973,.
Auburn Univ., Ala. Water Resources Research Inst.
For primary bibliographic entry see Field 9D.
W74-08232

9C. Research Facilities

ENVIRONMENTAL RESEARCH IN 1973--ANNUAL REPORT.
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 5G.
W74-08309

9D. Grants, Contracts, and Research Act Allotments

NINTH ANNUAL REPORT, FISCAL YEAR 1973,.
Auburn Univ., Ala. Water Resources Research Inst.
Available from the National Technical Information Service as PB-232 526 $6.75 in paper copy, $1.45 in microfiche. 1973. 65 p, 3 tab. OWRR A-999-ALA(2).

Descriptors: *Water resources research act, *Alabama, *Universities, Colleges, Water resources development, Water pollution, *Water Resources Institute, Training, Grants, Projects.

The Ninth Annual Report of Alabama's Water Resources Research Institute at Auburn University describes research and other activities underway during Fiscal Year 1973 (July 1, 1972 through June 30, 1973) and identifies the application of research results for the solution of water resources problems. Alabama's water problems chiefly are in areas of water quality management and protection and water resources planning; these and closely related problem areas receive emphasis in the program of the Water Resources Research Institute. (Knapp-USGS)
W74-08232

NATIONAL SEA GRANT COLLEGE AND PROGRAM--EXTENSION.
For primary bibliographic entry see Field 6E.
W74-08568

10. SCIENTIFIC AND TECHNICAL INFORMATION

10A. Acquisition And Processing

USER'S GUIDE TO NODC'S DATA SERVICES.
National Oceanographic Data Center, Washington, D.C.
Available from Sup Doc GPO, Washington, D.C. 20402, Price $1.00 domestic postpaid. Key to Oceanographic Records Documentation No 1, February 1973. 72 p, 17 append.

Descriptors: *Information exchange, *Documentation, *Oceanography, *Data collections, Hydrologic data, Data storage and retrieval.
Identifiers: *Oceanographic data.

Key to Oceanographic Records Documentation No. 1, User's Guide to NODC's Data Services, February 1973, supersedes NODC Publication G-15, User's Guide for NODC's Data Processing Systems, 1969, of the former NODC General Series. The Guide is prepared to help users of NODC's services formulate requests for data and related information. It describes data bases and formats in which data can be obtained, contains examples of data listings, summaries, and displays, and explains entries and codes used in printout formats. (Knapp-USGS)
W74-08311

10B. Reference and Retrieval

USER'S GUIDE TO NODC'S DATA SERVICES.
National Oceanographic Data Center, Washington, D.C.
For primary bibliographic entry see Field 10A.
W74-08311

DIGEST OF THE 1972 CATALOG OF INFORMATION ON WATER DATA,
Geological Survey, Reston, Va. Office of Water Data Coordination.
For primary bibliographic entry see Field 10D.
W74-08600

10C. Secondary Publication And Distribution

PRELIMINARY SYSTEM DEVELOPMENT--CHEMICAL HAZARDS RESPONSE INFORMATION SYSTEM (CHRIS), APPENDIX VII--SUPPORTING INFORMATION.
Little (Arthur D.) Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5B.
W74-08181

A BIBLIOGRAPHY ON THE POLLUTION ASPECTS OF COKE OVENS,
British Steel Corp., (Sheffield) (England). Strip Mills Div.
For primary bibliographic entry see Field 5B.
W74-08183

A WORLDWIDE DIRECTORY OF STREAM ECOLOGISTS,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
K. W. Cummins.
Available from the National Technical Information Service as PB-232 420 $3.75 in paper copy, $1.45 in microfiche. Michigan Institute of Water Research, E. Lansing, Technical Report No 28, February 1973. 67 p. OWRR B-019-MICH(3). Contract AT(11-1)-2002.

Descriptors: *Ecology, *Streams, *Personnel, Scientific personnel, Ecosystems, Aquatic habitats, Environment, Research and development.
Identifiers: *Stream ecologists, *Directories(Personnel).

This directory lists workers actively engaged in stream research. The intent of the directory is to increase communication between individuals working on stream problems. (Knapp-USGS)
W74-08235

ENVIRONMENTAL INFORMATION SOURCES -- ENGINEERING AND INDUSTRIAL APPLICATIONS: A SELECTED ANNOTATED BIBLIOGRAPHY.
Massachusetts Inst. of Tech., Boston. James Madison Barker Engineering Library.
Special Libraries Association, New York, N.Y., 1972. C. Schildhaver, compiler. 45 p.

Descriptors: *Bibliographies, *Reviews, *Documentation, *Publications, *Information exchange, *Data collections, *Environment, Environmental control, Pollution abatement, Ecology, Technical societies, Libraries.
Identifiers: Directories.

This compilation was prepared for a continuing-education seminar held during the 63rd Annual Conference of SLA, June 4-8, 1972 in Boston. It lists and briefly describes various publications and agencies providing information on pollution and ecological problems. It includes abstracting-indexing and current-awareness services, bibliographies and catalogs, directories, yearbooks and guides, encyclopedias, dictionaries, atlases, handbooks and manuals, journals, newsletters, symposia and continuing serials, and miscellaneous information services. Addresses, prices, and scopes of each are indicated. (Brown-IPC)
W74-08401

A GUIDE TO NATURAL RESOURCE INFORMATION OF GEORGIA.
Georgia Dept. of Natural Resources, Atlanta.
1973. 481 p, 14 fig.

Descriptors: *Natural resources, *Bibliographies, *Information retrieval, *Water resources, *Georgia, Environment, *Abstracts, Publications, Libraries, Technical writing, *Land resources, Resource mix, Resources, Resources development, Resources allocation.
Identifiers: Annotated bibliography, *Air resources.

This annotated bibliography, compiled as the the first step of Georgia's plan to assess and manage its water, land, and air resources, contains 3080 entries and is designed to improve access to necessary documents for these needs. Entries are grouped by authorizing agency on local, state, regional, and federal levels and are assigned index numbers for easy access. An index tabulates selected subject fields for each county and for the state. Contacts for information, an information exchange, fee schedule, organizational boundary map, county location maps, and a listing of federal depository libraries in Georgia are given. The volume is useful to agencies desiring Georgia state environmental information, to planners, and to technicians. Technical terminology is avoided to facilitate general use. (Grden-North Carolina)
W74-08487

WATER: A COMPREHENSIVE TREATISE. VOLUME 1. PHYSICS AND PHYSICAL CHEMISTRY OF WATER.
For primary bibliographic entry see Field 1A.
W74-08665

WATER: A COMPREHENSIVE TREATISE. VOLUME 2. WATER IN CRYSTALLINE HYDRATES: AQUEOUS SOLUTIONS OF SIMPLE NONELECTROLYTES.
For primary bibliographic entry see Field 1B.
W74-08666

WATER: A COMPREHENSIVE TREATISE. VOLUME 3. AQUEOUS SOLUTIONS OF SIMPLE ELECTROLYTES.
For primary bibliographic entry see Field 1B.
W74-08667

10D. Specialized Information Center Services

PRELIMINARY SYSTEM DEVELOPMENT--CHEMICAL HAZARDS RESPONSE INFORMATION SYSTEM (CHRIS), APPENDIX VII--SUPPORTING INFORMATION.
Little (Arthur D.) Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5B.
W74-08181

DIGEST OF THE 1972 CATALOG OF INFORMATION ON WATER DATA,
Geological Survey, Reston, Va. Office of Water Data Coordination.
F. H. Pauszek.
Available from NTIS, Springfield, Va. 22151, PB-232 080/AS Price $4.00 printed copy; $1.45 microfiche. Water-Resources Investigations 63-73, December 1973. 83 p, 20 fig, 22 tab.

Descriptors: *Data collections, *Information exchange, *Hydrologic data, *Documentation, Projects, Surface waters, Water quality, Groundwater, Gaging stations, *Information retrieval.
Identifiers: *Catalog on Information on Water Data.

The Catalog of Information on Water Data is a file of information about water-data acquisition activities. The 1972 edition of the Catalog consists of 21 separate volumes, one for each of the water resources regions. Each volume contains information on water-data acquisition activities conducted by Federal and non-Federal agencies on stage and flow of surface waters and springs, and water quality of surface waters and groundwaters. This report is a digest of information appearing in the 1972 edition of the Catalog. Items covered are: Who is reporting, what is reported, what is the scope of activities, and what are the periods of record. It also includes information on active groundwater stations reported in the 1968 edition of the Catalog and areal investigations and miscellaneous water-data activities reported in the 1970 edition. (Knapp-USGS)
W74-08600

10F. Preparation Of Reviews

WATER: A COMPREHENSIVE TREATISE. VOLUME 1. PHYSICS AND PHYSICAL CHEMISTRY OF WATER.
For primary bibliographic entry see Field 01A.
W74-08665

WATER: A COMPREHENSIVE TREATISE. VOLUME 2. WATER IN CRYSTALLINE HYDRATES: AQUEOUS SOLUTIONS OF SIMPLE NONELECTROLYTES.
For primary bibliographic entry see Field 01B.
W74-08666

WATER: A COMPREHENSIVE TREATISE. VOLUME 3. AQUEOUS SOLUTIONS OF SIMPLE ELECTROLYTES.
For primary bibliographic entry see Field 01B.
W74-08667

SUBJECT INDEX

ABSORPTION
Absorption of Mercuric Cation by Tannins in Agricultural Residues,
W74-08314 5G

The Accumulation of Organic and Inorganic Mercury Compounds by the Eastern Oyster (Crassostrea virginica),
W74-08346 5C

Cadmium Uptake and Time Dependent Alterations in Tissue Levels in the White Catfish Ictalurus catus (Pisces: Ictaluridae),
W74-08348 5C

ABSTRACTS
A Guide to Natural Resource Information of Georgia.
W74-08487 10C

ACANTHAMOEBA
Free-Living Amoebae Isolated from Waters Frequented by People in the Vicinity of Poznan: Poland: Experimental Studies in Mice on the Pathogenicity of the Isolates,
W74-08687 5C

ACID MINE DRAINAGE
Application of Reverse Osmosis to Acid Mine Drainage Treatment,
W74-08155 5D

ACID MINE WATER
Evaluation of Ion Exchange Processes for Treatment of Mine Drainage Waters,
W74-08341 5D

ACIDS (AIR BORNE)
Air-Borne Acid,
W74-08689 5A

ACTIVATED CARBON
An Evaluation of the Adsorptive Properties of Fly Ash and Bark-Derived Activated Char,
W74-08435 5D

ACTIVATED SLUDGE
Letchworth Water Pollution Control Works,
W74-08260 5D

Process Kinetics for Denitrification,
W74-08320 5D

Integration of Physico-Chemical and Biological Waste-Water Treatment Processes,
W74-08399 5D

Examples of the Use of the 'Seclar' Decanter in Treating Paper Industry Effluents (Exemples d'application du decanteur 'Seclar' au traitement d'effluents de l'industrie papetiere),
W74-08419 5D

Activated Sludge Disposal in a Subarctic Environment,
W74-08443 5E

Biological, Physical and Chemical Treatment of Wood Soaking Vat Wastewater,
W74-08449 5D

ACTIVE DIFFUSER SYSTEM
Oxygenation System for Accelerated Sewage Treatment,
W74-08207 5D

ADJUDICATION PROCEDURE
State V Bishop (Action for Public Nuisance and Trespass in Filling Area Below High Water Mark of Bay).
W74-08573 6E

Sinclair Oil Co. V. Delacroix Corp. (Determination of Mineral Rights Allocable to Water Bottoms.
W74-08578 6E

ADMINISTRATION
Effluent Charges on Air and Water pollution,
W74-08524 5G

A Bill to Provide for a National Program of Disaster Insurance.
W74-08552 6E

Joint Flood Control Commission.
W74-08570 6E

ADMINISTRATIVE AGENCIES
Environmental Impact Statements.
W74-08517 6G

Navigation and Navigable Waters--Flood Control Regulations.
W74-08551 4A

National Oil and Hazardous Substances Pollution Contingency Plan.
W74-08564 6E

Water and Sewerage Disposal Agencies,
W74-08571 6E

Flood Hazard Areas.
W74-08572 6E

Air and Water Pollution Control Permit Board.
W74-08579 6E

Operation of Mines.
W74-08580 6E

ADMINISTRATIVE DECISIONS
Rippon Squashes Central Waste Treatment Precedent,
W74-08213 5E

ADMINISTRATIVE REGULATIONS
Effluent Charges on Air and Water pollution,
W74-08524 5G

A Model Water Use Act for a Riparian State--The Florida Experience,
W74-08545 6E

A Bill to Provide for a National Program of Disaster Insurance.
W74-08552 6E

Pollution and Obstruction of Waters.
W74-08569 6E

Marine Fisheries.
W74-08574 6E

Mining Act of 1971.
W74-08575 6E

Operation of Mines.
W74-08580 6E

ADOPTION OF PRACTICES
Effluent Charges on Air and Water pollution,
W74-08524 5G

ADSORPTION
Surface Water Pollution Contract Studies: Adsorption of Complex Organic Molecules by Suspended Clay,
W74-08239 5B

Adsorption Studies at Solid-Solution Interfaces,
W74-08240 5B

Effect of Exchange Cations on Adsorption of Lysozyme and Ovalbumin by Smectite,
W74-08241 5B

Effect of Salt Content of Equilibrium-Solution on Formation and Stability of Smectite-Protein Complexes,
W74-08242 5B

The Measurement of the Heat of Reaction Between Proteins and Montmorillonite by Microcalorimetry,
W74-08243 5B

Advanced Waste Treatment Process Selection, Part Two,
W74-08245 5D

Purification of Sulfite Mill Effluents from Lignosulfonates (Ochistka promstokov sulfitno-tsellyuloznogo proizvodstva ot lignosul'fonatov),
W74-08412 5D

An Evaluation of the Adsorptive Properties of Fly Ash and Bark-Derived Activated Char,
W74-08435 5D

AERATED LAGOONS
Nutrient Control in Sewage Lagoons.
W74-08395 5D

AERATION
Integration of Physico-Chemical and Biological Waste-Water Treatment Processes,
W74-08399 5D

Aeration of Effluents in Aeration Tanks (Aeratsiya stochnykh vod v aerotenkakhvytesnitelyakh),
W74-08413 5D

AERIAL PHOTOGRAPHY
Satellite Views of Hurricane Camille,
W74-08291 2B

A Detailed Procedure for the Use of Small-Scale Photography in Land Use Classification,
W74-08299 4A

Limnological Studies and Remote Sensing of the Upper Truckee River Sediment Plume in Lake Tahoe, California-Nevada,
W74-08302 2J

Measurement of Dye Concentrations by Photography,
W74-08376 2E

AEROBIC CONDITIONS
Effects of Straw, Calcium Chloride, and Submergence on a Sodic Soil,
W74-08274 2G

AEROSOLS
Considerations in Application of Microorganisms to the Environment for Degradation of Petroleum Products,
W74-08618 5B

AGRICULTURAL CHEMICALS
Agricultural Chemicals in Relation to Environmental Quality: Chemical Fertilizers, Present and Future,
W74-08325 5B

AGRICULTURAL POLLUTION CONTROL
Project of the Agricultural and Marine Pollution Control Section, March 1973,
W74-08237 5G

AGRICULTURAL RUNOFF
Modleing of Land Runoff Effects on Dissolved Oxygen,
W74-08316 5B

Concentrations of Nitrogen, Phosphorus, Potassium, and Total Soluble Salts in Soil Solution Samples from Fertilized and Unfertilized Histosols,
W74-08319 5B

AIR CIRCULATION
Instrumentation in Full Scale Self-Aerated Flows (Appareils de Mesure Des Concentrations et Des Vitesses Dans un Courant Mixte d'air Et D'Eau en Grandeur Nature),
W74-08196 8B

AIR POLLUTION
A Bibliography on the Pollution Aspects of Coke Ovens,
W74-08183 5B

Salinity-Ozone Interactions on Pinto Bean: Integrated Response to Ozone Concentration and Duration,
W74-08330 3C

Concepts of Pollution and Its Control,
W74-08422 5G

Sludge Incineration and Afterburning,
W74-08441 5D

Environmental Radioactivity in Illinois, 1970,
W74-08646 5B

Air-Borne Acid,
W74-08689 5A

Residence Time of Sulfurous Air Pollutants from a Local Source During Precipitation,
W74-08690 5A

AIR POLLUTION EFFECTS
Salinity-Ozone Interactions on Pinto Bean: Integrated Response to Ozone Concentration and Duration,
W74-08330 3C

AIR RESOURCES
A Guide to Natural Resource Information of Georgia.
W74-08487 10C

ALABAMA
A Plan for the Improvement of the Low Flow Data Network in Alabama,
W74-08175 7A

Surface-Water Availability, Colbert County, Alabama.
W74-08187 4A

Water Availability, Coosa County, Alabama,
W74-08188 4A

Surface-Water Availability, Limestone County, Alabama,
W74-08189 4A

Surface-Water Availability, Etowah County, Alabama,
W74-08190 4A

Ninth Annual Report, Fiscal Year 1973,.
W74-08232 9D

Floods in Alabama--Magnitude and Frequency Based on Data Through September 30, 1971,
W74-08587 2E

ALASKA
Optimum Escapement Studies of Chignik Sockeye Salmon,
W74-08176 8I

Survey of the Seasonal Snow Cover in Alaska.
W74-08179 2C

Road Log and Guide--Geology and Hydrology for Planning, Anchorage Area
W74-08180 4A

Modeling Snowmelt Runoff in an Arctic Coastal Plain,
W74-08233 2C

Ground Water Quality Effects on Domestic Water Utilization,
W74-08287 5B

Aquatic Organisms from Selected Sites Along the Proposed Trans-Alaska Pipeline Corridor, September 1970 to September 1972,
W74-08369 2I

Activated Sludge Disposal in a Subarctic Environment,
W74-08443 5E

Geology and Water Resources of the Girdwood-Alyeska Area, Alaska,
W74-08595 4B

Hydrocarbon Biodegradation in Alaskan Waters,
W74-08627 5B

Tritium Burdens in Two Arctic Villages,
W74-08649 5B

ALDRIN
Simple Apparatus for On-Site Continuous Liquid-Liquid Extraction of Organic Compounds from Natural Waters,
W74-08414 5A

ALGAE
Applications of Growth and Sorption Algal Assays,
W74-08154 5C

ALKALI SOILS
Effects of Straw, Calcium Chloride, and Submergence on a Sodic Soil,
W74-08274 2G

ALKALINITY
Determination of the Alkalinity of Mill Effluents (Opredelenie shchelochnosti stochnykh vod),
W74-08411 5A

Development of Blue-Green Algal Blooms in Non-Alkaline Waters,
W74-08478 5C

ALKANES
The Relative Changes in n-Alkane Composition in Surface Water Slicks,
W74-08633 5B

ALLEGHENY RIVER BASIN (NY)
Ground-Water Resources, Allegheny River Basin and Part of The Lake Erie Basin, New York,
W74-08380 2F

ALLUVIAL CHANNELS
Sedimentology and Bar Formation in the Upper Kicking Horse River, A Braided Outwash Stream,
W74-08297 2J

ALLUVIUM
Groundwater Investigations in Singapore
W74-08455 4B

ALTERNATIVE PLANNING
Systems Analysis of Large Scale Public Facilities: New York City's Water Supply Network as a Case Study.
W74-08507 3D

Analysis of Water Reuse Alternatives in an Integrated Urban and Agricultural Area
W74-08510 5D

ALUMINUM SULFATE
Nutrient Control in Sewage Lagoons
W74-08395 5D

Design and Performance Criteria for Settling Tanks for the Removal of Physical-Chemical Flocs.
W74-08396 5D

Integration of Physico-Chemical and Biological Waste-Water Treatment Processes.
W74-08399 5D

AMINO ACID
The Effect of Soil Moisture on the Free Amino Acid Level in Winter Wheat. (In Russian).
W74-08541 3F

AMINO ACIDS
Heterotrophic Potential for Amino Acid Uptake in a Naturally Eutrophic Lake.
W74-08678 5C

AMOEBAE
Free-Living Amoebae Isolated from Waters Frequented by People in the Vicinity of Poznan: Poland: Experimental Studies in Mice on the Pathogenicity of the Isolates.
W74-08687 5C

ANAEROBIC CONDITIONS
Effects of Straw, Calcium Chloride, and Submergence on a Sodic Soil,
W74-08274 2G

Cellulosic Deposits in Benthal Environments: Occurrence, Evolution, and Decomposition,
W74-08423 5B

ANAEROBIC DIGESTION
Anaerobic Biological Stabilization of Sanitary Landfill Leachate,
W74-08448 5D

Biological, Physical and Chemical Treatment of Wood Soaking Vat Wastewater,
W74-08449 5D

ANAEROBIC FILTERS
Anaerobic Biological Stabilization of Sanitary Landfill Leachate,
W74-08448 5D

ANALYTICAL TECHNIQUES
Applications of Growth and Sorption Algal Assays,
W74-08154 5C

The Use of the Dilution Water Effect as a Water Quality Criterion,
W74-08356 5A

Quantitative Measurements of Inorganic Mercury and Organomercurials in Water and Biological Media by Gas-Liquid Chromatography,
W74-08415 5A

Determination of Nitrate in Water with a New Construction of Ion-Selective Electrode,
W74-08420 5A

Phosphorus in Waste Water.
W74-08438 5A

Potentiostatic Coulometric Determination of Vanadium, Vanadium-Manganese and Vanadium-Iron Mixtures and the Influence of Chromium on the Process,
W74-08674 5A

ANCHORAGE (ALASKA)
Road Log and Guide--Geology and Hydrology for Planning, Anchorage Area.
W74-08180 4A

ANEMOMETERS
The Calibration and Use of a Conical Hot Film Anemometer Probe in Recirculating Water Flow,
W74-08222 2E

ANIMAL PATHOLOGY
Neurological Changes in Cats Following Long-Term Diet of Mercury Contaminated Tuna,
W74-08200 5C

ANIMAL PHYSIOLOGY
The Brackish Water Clam Rangia Cuneata as Indicator of Ecological Effects of Salinity Changes in Coastal Waters,
W74-08676 5C

ANTIETAM CREEK (MD)
Hydrogeology of Antietam Creek Basin,
W74-08607 2F

ANTINOMYCETES
The Counting of Aerobic Actinomycetes in Water Samples (Denombrement des Actinomycetes Aerobies De L'eau),
W74-08220 5A

APPALACHIAN MOUNTAIN REGION
Adverse Effects of Coal Mining on Federal Reservoir Projects.
W74-08528 5G

APPLICATION METHODS
Bituminous Coal - A Substitute for Anthracite Filter Media in Two-Layer Filtration of Water,
W74-08350 5F

APPLICATIONS SYSTEMS
Uniform Irrigation with Low-Pressure Trickle Systems,
W74-08323 3F

AQUATIC ANIMALS
Aquatic Organisms from Selected Sites Along the Proposed Trans-Alaska Pipeline Corridor, September 1970 to September 1972,
W74-08369 2I

AQUATIC LIFE
Aquatic Organisms from Selected Sites Along the Proposed Trans-Alaska Pipeline Corridor, September 1970 to September 1972,
W74-08369 2I

Marine Fisheries.
W74-08574 6E

AQUATIC ORGANISMS
The Toxicity of Sulphate Pulp Bleaching Effluents,
W74-08403 5C

AQUATIC PLANTS
Applications of Growth and Sorption Algal Assays,
W74-08154 5C

Microbiological Comparison Between a Few Aquatic Mediums, (In French),
W74-08669 5C

AQUEOUS SOLUTIONS
Water: A Comprehensive Treatise. Volume 2. Water in Crystalline Hydrates: Aqueous Solutions of Simple Nonelectrolytes.
W74-08666 1B

Water: A Comprehensive Treatise. Volume 3. Aqueous Solutions of Simple Electrolytes.
W74-08667 1B

AQUIFER
Optimization of the Assimilative Waste Capacity of the Unsaturated and Saturated Zones of an Unconfined Aquifer System,
W74-08152 5B

AQUIFERS
Interstate and International Aquifers,
W74-08276 6E

Records of Water Wells, Springs, Oil- and Gas-Test Holes, and Chemical Analyses of Water for the Madison Limestone and Equivalent Rocks in the Powder River Basin and Adjacent Areas, Northeastern Wyoming,
W74-08296 4B

ARCTIC
Modeling Snowmelt Runoff in an Arctic Coastal Plain,
W74-08233 2C

AREA REDEVELOPMENT
Riverfront Development: The Politics of Master Planning,
W74-08495 3D

ARGENTINA (PAMPEAN REGION)
Utilization Patterns of the Deep Water by a Weeping Lovegrass Crop (Eragrostis curvula Nees), in a Regosol Soil of the Pampean Semiarid Region, (In Spanish),
W74-08682 2I

ARGO-CLIMATIC CONDITIONS
Soil Potassium Forms in Relation to Agroclimatic Conditions in Maharashtra,
W74-08378 2G

ARIZONA
Brackish Water Desalting, Testing and Evaluation Procedures with Mobile Test Facility,
W74-08335 3A

ARKANSAS
Residues of Mirex and Other Chlorinated Pesticides in Commercially Raised Catfish,
W74-08347 5C

AROMATIC HYDROCARBONS
Microbial Degradation of Aromatic Hydrocarbons,
W74-08614 5B

ARTESIAN AQUIFERS
Feasibility Study on Desalting Brackish Water from the Mt. Simon Aquifer in Northeastern Illinois.
W74-08499 3A

ARTIC
Application of ERTS-1 Imagery to the Study of Caribou Movements and Winter Dispersal in Relation to Prevailing Snowcover,
W74-08602 2C

ASIA
Water Resources, Environment and National Development--Volume I: Summary of Proceedings, and Volume II: Selected Papers.
W74-08454 5G

ASSAY
Summary of Environmental Monitoring at Philadelphia, 1958-1971,
W74-08648 5B

ASSESSMENTS
Water Pollution Control Facilities--Tax Exemption.
W74-08577 6E

Biological Methods for the Assessment of Water Quality. A Symposium Presented at the Seventy-Fifth Annual Meeting, June 26-29, 1972.
W74-08675 5A

ATLANTIC COASTAL REGION
Range Extensions of Corbicula manilensis (Philippi) in the Atlantic Drainage of the United States,
W74-08685 2I

ATTITUDES
The Citizen and Water Management: An Atlas of Water Attitudes in Southern Minnesota.
W74-08288 6B

AUSTRALIA
Automatic Process Control of Sewage Treatment Works,
W74-08212 5D

AUTOMATIC CONTROL
Automatic Process Control of Sewage Treatment Works,
W74-08212 5D

Automation Comes to L.A.,
W74-08225 5D

Automatic Waste Sludge Sampler,
W74-08442 5A

AUTOMATION
Automated Method for Ortho-, Ortho-plus Hydrolyzable and Total Phosphate in Surface and Wastewaters,
W74-08208 5A

The Automatic Filter Press FPAKM (Die Auotomatische Filterpress FPAKM),
W74-08217 5D

Small Tunnels, Large Potentials,
W74-08358 8A

BACTERIA
Microbial Degradation of Oil and Hydrocarbons in Continuous Culture,
W74-08615 5B

Utilization of Crude Oil Hydrocarbons by Mixed Cultures of Marine Bacteria,
W74-08616 5B

Microbial Decomposition Patterns Using Crude Oil,
W74-08617 5B

BACTERIA

Considerations in Application of Microorganisms to the Environment for Degradation of Petroleum Products,
W74-08618 5B

Marine Hydrocarbonoclastic Bacteria: Types and Range of Oil Degradation,
W74-08623 5B

Biodegradation of Oil in Seawater: Limiting Factors and Artificial Stimulation,
W74-08624 5B

Bacterial Degradation of Mineral Oils at Low Temperatures,
W74-08625 5B

Microbial Ecology and the Problem of Petroleum Degradation in Chesapeake Bay,
W74-08628 5B

Production and Characterization of Emulsifying Factors from Hydrocarbonoclastic Yeast and Bacteria,
W74-08632 5B

Microbiological Comparison Between a Few Aquatic Mediums, (In French),
W74-08669 5C

BACTERIA (HETEROTROPHIC)

Changes in the Heterotrophic Bacteria of Volta Lake, 1968-1971,
W74-08434 5C

BACTERIAL CELLS

Changes of the Number of Bacterial Cells of Different Morphological Groups in the Water and Bottom Deposits of the Khakon Reservoir as a Function of the Intensity of Development of Blue-Green Algae, (In Ukrainian),
W74-08505 5C

BACTERIAL SEEDING

Effects of Some Commercial Oil Herders, Dispersants and Bacterial Inocula on Biodegradation of Oil in Seawater,
W74-08640 5C

BACTERIOPHAGE

Virus Removal by Diatomaceous-Earth Filtration - Part 1,
W74-08215 5F

BANK STABILIZATION

Erosion Control and Bank Stabilization in Metropolitan Toronto--10 Year Programme and 5 Year Project.
W74-08488 4D

BARATARIA BAY (LA)

The Relative Changes in n-Alkane Composition in Surface Water Slicks,
W74-08633 5B

BARGES

Economics of Inland Water Transport,
W74-08508 4A

Pollution Prevention Inspection of Vessels and Deck and Engineer Officers' Licenses.
W74-08559 6E

BARRIERS

Determination of Oil Loss Rates from a High Seas Oil Containment Barrier,
W74-08290 5G

Operation and Maintenance of New Bedford Hurricane Barrier (Final Environmental Statement).
W74-08520 8D

BASIC DATA COLLECTIONS

Groundwater Levels in Nebraska, 1973.
W74-08367 4B

Water-Level Records for the Northern High Plains of Colorado, 1970-74,
W74-08381 4B

BAYOU LAFOURCHE (LA

A Parametric Study of Water Resource Variables in a Delta Region of South Louisiana...Bayou Lafourche Volume I - Technical Discussion, Volume II - Appendices,
W74-08289 5B

BAYS

State V Bishop (Action for Public Nuisance and Trepass in Filling Area Below High Water Mark of Bay).
W74-08573 6E

Galveston Bay Hurricane Surge Study: Report 1. Effects of Proposed Barriers on Hurricane Surge Heights--Appendix A, Calibration Tests,
W74-08586 8B

Richardson Bay Effluent Dilution Study--A Working Paper.
W74-08604 5B

BEACHES

Easements: Judicial and Legislative Protection of the Public's Rights in Florida's Beaches,
W74-08540 6E

Alkane Degradation in Beach Sands,
W74-08629 5B

BEANS

Crop Cooling with Sprinklers,
W74-08271 3F

Salinity-Ozone Interactions on Pinto Bean: Integrated Response to Ozone Concentration and Duration,
W74-08330 3C

BEATTON RIVER (B

The Development of Meanders in Natural River-Channels,
W74-08357 2E

BED LOAD

A Programmed Sampler for Runoff and Bedloads,
W74-08361 5A

BEDS

Submerged and Submersible Lands of Oregon.
W74-08516 6E

BENTHOS

Cellulosic Deposits in Benthal Environments: Occurrence, Evolution, and Decomposition,
W74-08423 5B

BIBLIOGRAPHIES

A Bibliography on the Pollution Aspects of Coke Ovens,
W74-08183 5B

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W74-08401 10C

A Guide to Natural Resource Information of Georgia.
W74-08487 10C

Water: A Comprehensive Treatise. Volume 1. Physics and Physical Chemistry of Water.
W74-08665 1A

Water: A Comprehensive Treatise. Volume 2. Water in Crystalline Hydrates Aqueous Solutions of Simple Nonelectrolytes
W74-08666 1B

Water: A Comprehensive Treatise. Volume 3. Aqueous Solutions of Simple Electrolytes
W74-08667 1B

BIG CYPRESS (FLA)

Boundary and Land Development Regulation Recommendations for the Big Cypress Area of Critical State Concern
W74-08543 4A

BIG WALNUT CREEK (IND

Multiobjective Redesign of the Big Walnut Project,
W74-08515 4A

BIOASSAY

A Bioassay of Toxicity Using Protozoa in the Study of Aquatic Environment Pollution and Its Prevention,
W74-08221 5A

Toxicity Control of Industrial Wastewaters and Pesticide-Polluted Waters in Vietnam,
W74-08480 5C

Biological Methods for the Assessment of Water Quality. A Symposium Presented at the Seventy-Fifth Annual Meeting, June 26-29, 1972.
W74-08675 5A

BIOCHEMICAL OXYGEN DEMAND

The Chemical Treatment of Municipal Waste Water (Zur Chemischen Behandlung von Staedtischen Abwassern),
W74-08199 5D

Pulp, Paper, and Board in the Environment -- Part 9. Pollution Abatement in the Finnish Pulp and Paper Industry.
W74-08406 5G

An Evaluation of the Adsorptive Properties of Fly Ash and Bark-Derived Activated Char.
W74-08435 5D

The Share Taken by Nitrification Processes in the Biochemical Oxygen Demand (BOD) in the Water of the River Elbe, (In German),
W74-08695 5A

BIOCHEMICAL OXYGEN DEMAND TEST

Determination of the Activity of Nitrifying Bacteria in Surface Waters by a Modified Bod-Test, (In German),
W74-08694 5B

BIODEGRADATION

Bacterial Degradation of Cyclohexane Participation of a Co-Oxidation Reaction,
W74-08244 5B

The Surprise Factor in Marine Pollution Studies,
W74-08252 5B

Waste Water Problems of the Textile Industry. Part I. Oxygen Demand of Printing Paste Thickeners. (Problemi inerenti le acque di scarico nell'industria tessile. Io. La domanda di ossigeno di addensanti da stampa),
W74-08421 5B

Cellulosic Deposits in Benthal Environments: Occurrence, Evolution, and Decomposition,
W74-08423 5B

The Microbial Degradation of Oil Pollutants,
W74-08609 5B

Microbial-Facilitated Degradation of Oil: A Prospectus,
W74-08610 5B

Microbial Degradation of Oil: Present Status, Problems, and Perspectives,
W74-08611 5B

A Threnody Concerning the Biodegradation of Oil in Natural Waters,
W74-08612 5B

Hydrocarbon Utilization by Cladosporium resinae,
W74-08613 5B

Microbial Degradation of Aromatic Hydrocarbons,
W74-08614 5B

Microbial Degradation of Oil and Hydrocarbons in Continuous Culture,
W74-08615 5B

Microbial Decomposition Patterns Using Crude Oil,
W74-08617 5B

Considerations in Application of Microorganisms to the Environment for Degradation of Petroleum Products,
W74-08618 5B

Studies on the Degradation of Petroleum by Filamentous Fungi,
W74-08619 5B

Microbial Degradation of Crude Oil and the Various Hydrocarbon Derivatives,
W74-08620 5B

Microbes and Petroleum: Perspectives and Implications,
W74-08621 5B

Distribution and Abundance of Oil-Oxidizing Bacteria in the North Sea,
W74-08622 5B

Marine Hydrocarbonoclastic Bacteria: Types and Range of Oil Degradation,
W74-08623 5B

Biodegradation of Oil in Seawater: Limiting Factors and Artificial Stimulation,
W74-08624 5B

Bacterial Degradation of Mineral Oils at Low Temperatures,
W74-08625 5B

Bacterial Degradation of Petroleum Materials in Low Temperature Marine Environments,
W74-08626 5B

Hydrocarbon Biodegradation in Alaskan Waters,
W74-08627 5B

The Relative Changes in n-Alkane Composition in Surface Water Slicks,
W74-08633 5B

Inhibition of Bacterial Chemoreception by Hydrocarbons,
W74-08638 5C

Degradation of Crude Oil by Yeasts and its Effects on Lesbistes reticulatus,
W74-08639 5C

Effects of Some Commercial Oil Herders, Dispersants and Bacterial Inocula on Biodegradation of Oil in Seawater,
W74-08640 5C

Bacterial Seeding to Enhance Biodegradation of Oil Slicks,
W74-08641 5B

BIOINDICATORS

A Parametric Study of Water Resource Variables in a Delta Region of South Louisiana...Bayou Lafourche Volume I - Technical Discussion, Volume II - Appendices,
W74-08289 5B

Biological Methods for the Assessment of Water Quality. A Symposium Presented at the Seventy-Fifth Annual Meeting, June 26-29, 1972.
W74-08675 5A

The Brackish Water Clam Rangia Cuneata as Indicator of Ecological Effects of Salinity Changes in Coastal Waters,
W74-08676 5C

BIOLOGICAL TREATMENT

Process Kinetics for Denitrification,
W74-08320 5D

Examples of the Use of the 'Seclar' Decanter in Treating Paper Industry Effluents (Exemples d'application du decanteur 'Seclar' au traitement d'effluents de l'industrie papetiere),
W74-08419 5D

Biological, Physical and Chemical Treatment of Wood Soaking Vat Wastewater,
W74-08449 5D

BIOSYNTHESIS

Microbial Degradation of Oil: Present Status, Problems, and Perspectives,
W74-08611 5B

Hydrocarbon Utilization by Cladosporium resinae,
W74-08613 5B

BITUMINOUS MATERIALS

Bituminous Coal - A Substitute for Anthracite Filter Media in Two-Layer Filtration of Water,
W74-08350 5F

BLEACHING WASTES

The Toxicity of Sulphate Pulp Bleaching Effluents,
W74-08403 5C

An Evaluation of the Adsorptive Properties of Fly Ash and Bark-Derived Activated Char,
W74-08435 5D

BOTTOM DEPOSITS

Changes of the Number of Bacterial Cells of Different Morphological Groups in the Water and Bottom Deposits of the Khakon Reservoir as a Function of the Intensity of Development of Blue-Green Algae, (In Ukrainian),
W74-08505 5C

BOTTOM SEDIMENTS

Mineralogy of Surface Sediments from the Panama Basin, Eastern Equatorial Pacific,
W74-08298 2J

Simulation of Water Quality in Tarawera River,
W74-08308 5B

Measurement of Baseline Levels of Enteric Bacterial Activity in River Water,
W74-08635 5B

BOWARD CO

Port Everglades Harbor, Broward County, Florida (Final Environmental Statement).
W74-08518 8A

BRACHISH WATER

Feasibility Study on Desalting Brackish Water from the Mt. Simon Aquifer in Northeastern Illinois.
W74-08499 3A

BRACKISH WATER

Brackish Water Desalting, Testing and Evaluation Procedures with Mobile Test Facility,
W74-08335 3A

Design and Construction of a Large Brackish Water Desalination Module,
W74-08343 3A

Field Test Evaluation of the High Temperature Electrodialysis Process at Webster, S.D.,
W74-08345 3A

BRAIDING

Sedimentology and Bar Formation in the Upper Kicking Horse River, A Braided Outwash Stream,
W74-08297 2J

BRINES

Quality of Surface Water in the Vicinity of Oil Exploration Sites, Big Cypress Area, South Florida,
W74-08596 5A

BRINES DISPOSAL

Brine Concentration by Electrodialysis, Phase I,
W74-08500 3A

BROWN TROUT

Studies of the Helminth Fauna of Norway, XXVI: The Distribution of Cyathocephalus Truncatus (Pallas) in the Intestine of Brown Trout (Salmo Trutta L.),
W74-08699 2I

BUBBLES

Permeability of High Ash Papermill Sludge,
W74-08425 5D

BULGARIA

Operation of Pilot Plant Equipment for Purification of Effluents from the Stefan Kiradzhiev Pulp and Paper Mill in Novi Krichim (Syzlavane rezhim na rabota na poluproizvodstvena prechistvatelna stantsiya za promishleni otpadychni v odi ot KTsKh 'Stefan Kiradzhiev' gr. Novi Krichim),
W74-08417 5D

BURNING

New Methods to Dispose of Used Metalworking Emulsions, (Neue Verfahren Zur Beseitigung Gebraughter Metall-Bearbeitungs-Emulsionen),
W74-08247 5D

BYPRODUCTS

Utilization of Industrial Wastes and Waste By-Products for Phosphorus Removal: An Inventory and Assessment,
W74-08394 5D

CADMIUM

Cadmium Uptake and Time Dependent Alterations in Tissue Levels in the White Catfish Ictalurus catus (Pisces: Ictaluridae),
W74-08348 5C

CALCITE
Carbonate Compensation Depth: Relation to Carbonate Solubility in Ocean Waters,
W74-08582 2K

CALCIUM CHLORIDE
Effects of Straw, Calcium Chloride, and Submergence on a Sodic Soil,
W74-08274 2G

CALCIUM SULFATE
Application of Reverse Osmosis to Acid Mine Drainage Treatment,
W74-08155 5D

CALIBRATIONS
The Calibration and Use of a Conical Hot Film Anemometer Probe in Recirculating Water Flow,
W74-08222 2E

CALIFORNIA
Optimization of the Assimilative Waste Capacity of the Unsaturated and Saturated Zones of an Unconfined Aquifer System,
W74-08152 5B

Probabilistic Models in the Design and Operation of a Multi-Purpose Reservoir System,
W74-08153 4A

Best Effluent the Goal,
W74-08214 5D

Automation Comes to L.A.,
W74-08225 5D

Determination of Oil Loss Rates from a High Seas Oil Containment Barrier,
W74-08290 5G

Limnological Studies and Remote Sensing of the Upper Truckee River Sediment Plume in Lake Tahoe, California-Nevada,
W74-08302 2J

Reverse Osmosis Membrane Filters for Seawater Pretreatment,
W74-08334 3A

Development of High-Pressure Spiral Membrane Elements for Seawater Desalination,
W74-08336 3A

Outlet Works, Warm Springs Dam, Dry Creek, Russian River Basin, Sonoma County, California,
W74-08584 8A

Digital Simulation of the Effects of Urbanization on Runoff in the Upper Santa Ana Valley, California,
W74-08598 4C

Richardson Bay Effluent Dilution Study--A Working Paper.
W74-08604 5B

Alkane Degradation in Beach Sands,
W74-08629 5B

Hydrocarbons of Suspected Pollutant Origin in Aquatic Organisms of San Francisco Bay: Methods and Preliminary Results,
W74-08630 5B

CALORIMETRY
The Measurement of the Heat of Reaction Between Proteins and Montmorillonite by Microcalorimetry,
W74-08243 5B

CANADA
Sedimentology and Bar Formation in the Upper Kicking Horse River, A Braided Outwash Stream,
W74-08297 2J

Movement of Nitrate Nitrogen in Some Grassland Soils of Southern Alberta,
W74-08329 5B

The Development of Meanders in Natural River-Channels,
W74-08357 2E

Utilization of Industrial Wastes and Waste By-Products for Phosphorus Removal: An Inventory and Assessment,
W74-08394 5D

Erosion Control and Bank Stabilization in Metropolitan Toronto--10 Year Programme and 5 Year Project.
W74-08488 4D

Determination of the Discharge Policy for Existing Reservoir Networks,
W74-08513 4A

CAPE FEAR RIVER BASIN (N
An Appraisal of the Groundwater Resources of the Upper Cape Fear River Basin, North Carolina,
W74-08605 4B

CAPITAL COSTS
Economic Optimization of the Avco Crystallization Process,
W74-08337 3A

CARBOHYDRATES
Waste Water Problems of the Textile Industry. Part I. Oxygen Demand of Printing Paste Thickeners. (Problemi inerenti le acque di scarico nell'industria tessile. Io. La domanda di ossigeno di addensanti da stampa),
W74-08421 5B

CARIBOU
Application of ERTS-1 Imagery to the Study of Caribou Movements and Winter Dispersal in Relation to Prevailing Snowcover,
W74-08602 2C

CARP
The Toxicity of Sulphate Pulp Bleaching Effluents,
W74-08403 5C

CATALOG ON INFORMATION ON WATER DATA
Digest of the 1972 Catalog of Information on Water Data,
W74-08600 10D

CATFISHES
Residues of Mirex and Other Chlorinated Pesticides in Commercially Raised Catfish,
W74-08347 5C

Cadmium Uptake and Time Dependent Alterations in Tissue Levels in the White Catfish Ictalurus catus (Pisces: Ictaluridae),
W74-08348 5C

CATION ADSORPTION
Absorption of Mercuric Cation by Tannins in Agricultural Residues,
W74-08314 5G

CATION EXCHANGE
Effect of Phosphate Salts as Saturating Solutions in Cation-Exchange Capacity Determinations.
W74-08285 2G

CATIONS
Retention and Release of Applied Molybdenum to Soils Under Permanent Water Logged Condition.
W74-08209 2G

CELLULAR STRUCTURE (FISH GILLS)
Some Acute Effects of Low Boiling Petroleum Fractions on the Cellular Structure of Fish Gills Under Field Conditions.
W74-08637 5C

CELLULOSE
Waste Water Problems of the Textile Industry Part I Oxygen Demand of Printing Paste Thickeners (Problemi inerenti le acque di scarico nell'industria tessile Io La domanda di ossigeno di addensanti da stampa),
W74-08421 5B

Cellulosic Deposits in Benthal Environments Occurrence, Evolution, and Decomposition.
W74-08423 5B

CENTER PIVOT SPRINKLERS
Center Pivot Problems.
W74-08283 3F

CENTRIFUGATION
Centrifugal Dewatering of Secondary Waste Sludges,
W74-08431 5D

CESIUM
Estimation and Evaluation of Radioactive Contamination Through a Food Web in an Aquatic Ecosystem (1), An Application of the Compartment Model to Transfer of Radioactive Substances Through a Food Chain,
W74-08365 5B

Vertical Distribution of Fallout Cesium-137 in Cultivated Soils,
W74-08644 5B

Tritium Burdens in Two Arctic Villages,
W74-08649 5B

CHALK STREAMS (ENGLAND)
Preliminary Papers for UNESCO-IBP Symposium on Productivity Problems of Freshwaters.
W74-08673 5C

CHANNEL IMPROVEMENT
The Control of Pollution From Hydrographic Modifications.
W74-08186 5G

Port Everglades Harbor, Broward County, Florida (Final Environmental Statement).
W74-08518 8A

CHANNEL MIGRATION
The Development of Meanders in Natural River-Channels,
W74-08357 2E

CHANNEL MORPHOLOGY
Some Rates of Geomorphological Processes,
W74-08304 2J

Mechanism for Streamflow Meandering,
W74-08388 8B

CHANNELS
The Development of Meanders in Natural River-Channels,
W74-08357 2E

CHEDABUCTO BAY (R
Bacterial Degradation of Petroleum Materials in Low Temperature Marine Environments,
W74-08626 5B

CHEMCONTROL
Chemical Dosage Control for Phosphorus Removal.
W74-08400 5D

CHEMICAL ANALYSIS
Determination of Nitrate in Water with a New Construction of Ion-Selective Electrode,
W74-08420 5A

Phosphorus in Waste Water.
W74-08438 5A

CHEMICAL POTENTIAL
Thermodynamics of Soil Water: IV. Chemical Potential of Soil Water,
W74-08191 2G

CHEMICAL PRECIPITATION
The Chemical Treatment of Municipal Waste Water (Zur Chemischen Behandlung von Staedtischen Abwassern),
W74-08199 5D

Chemical Dosage Control for Phosphorus Removal.
W74-08400 5D

Purification of Sulfite Mill Effluents from Lignosulfonates (Ochistka promstokov sulfitno-tsellyuloznogo proizvodstva ot lignosul'fonatov),
W74-08412 5D

CHEMICAL SPILL RESPONSE
Preliminary System Development--Chemical Hazards Response Information System (CHRIS), Appendix VII--Supporting Information.
W74-08181 5B

CHEMICAL TREATMENT
The Chemical Treatment of Municipal Waste Water (Zur Chemischen Behandlung von Staedtischen Abwassern),
W74-08199 5D

CHEMICAL WASTES
Preliminary System Development--Chemical Hazards Response Information System (CHRIS), Appendix VII--Supporting Information.
W74-08181 5B

Rippon Squashes Central Waste Treatment Precedent,
W74-08213 5E

CHEMICALS
Advanced Waste Treatment Process Selection, Part Two,
W74-08245 5D

CHEMORECEPTION
Inhibition of Bacterial Chemoreception by Hydrocarbons,
W74-08638 5C

CHEMOTAXIS
Inhibition of Bacterial Chemoreception by Hydrocarbons,
W74-08638 5C

CHESAPEAKE BAY
Microbial Ecology and the Problem of Petroleum Degradation in Chesapeake Bay,
W74-08628 5B

CHILE
Food Niche of Graus Nigra Philippi (Osteichthyes, Labridae),
W74-08526 2I

CHINOOK SALMON
1971 Puget Sound Fall Chinook Salmon Tagging Study,
W74-08452 8I

CHLORELLA
Chemical Composition and Molecular Weight Distribution of Dissolved Organic Matter Produced by Bacterial Degradation of Green Algae,
W74-08494 5C

CHLORINATED HYDROCARBON PESTICIDES
Simple Apparatus for On-Site Continuous Liquid-Liquid Extraction of Organic Compounds from Natural Waters,
W74-08414 5A

Estuarine Microbes and Organochlorine Pesticides (A Brief Review),
W74-08634 5B

CHLORINATION
The Role of Disinfection in the Optimum Environment,
W74-08205 5F

Disinfection of Water Using Chlorine Dioxide,
W74-08253 5D

CHLORINE DIOXIDE
Disinfection of Water Using Chlorine Dioxide,
W74-08253 5D

CHLOROPHYTA
Chemical Composition and Molecular Weight Distribution of Dissolved Organic Matter Produced by Bacterial Degradation of Green Algae,
W74-08494 5C

CHOLESTEROL
The Effect of Mineral Waters of the Kvasy Spa on Some Indices of Cholesterol and Sialic Acid Metabolism, (In Russian),
W74-08686 5C

CHORINITY
Distribution of Fluoride in Waters of Tokyo Bay,
W74-08549 5B

CHROMATOGRAPHY
Quantitative Measurements of Inorganic Mercury and Organomercurials in Water and Biological Media by Gas-Liquid Chromatography,
W74-08415 5A

Determination of Total Hydrocarbons in Sea Water at the Microgram Level with a Flow Calorimeter,
W74-08430 5A

CLADOSPORIUM RESINAE
Hydrocarbon Utilization by Cladosporium resinae,
W74-08613 5B

CLARKS FORK YELLOWSTONE RIVER (WYO-MONT)
Clarks Fork Yellowstone River Remote Sensing Study,
W74-08386 2J

CLASSIFICATION
Erosion Control and Bank Stabilization in Metropolitan Toronto--10 Year Programme and 5 Year Project.
W74-08488 4D

CLAY MINERALS
Surface Water Pollution Contract Studies: Adsorption of Complex Organic Molecules by Suspended Clay,
W74-08239 5B

Adsorption Studies at Solid-Solution Interfaces,
W74-08240 5B

Effect of Exchange Cations on Adsorption of Lysozyme and Ovalbumin by Smectite,
W74-08241 5B

Effect of Salt Content of Equilibrium-Solution on Formation and Stability of Smectite-Protein Complexes,
W74-08242 5B

The Measurement of the Heat of Reaction Between Proteins and Montmorillonite by Microcalorimetry,
W74-08243 5B

Mineralogy of Surface Sediments from the Panama Basin, Eastern Equatorial Pacific,
W74-08298 2J

CLAYS
Available Water in Some Great Groups of Mozambique Soils,
W74-08313 2G

CLEANING
Countercurrent Washing Turns the Tide Against Rising Effluent Costs,
W74-08228 5D

CLEAR-CUTTING
Hydrologic Effects of Patch Cutting of Lodgepole Pine,
W74-08603 4C

CLORINATED HYDROCARBON PESTICIDES
Residues of Mirex and Other Chlorinated Pesticides in Commercially Raised Catfish,
W74-08347 5C

COAGULATION
Electrophoresis and Coagulation Studies of Some Florida Phosphate Slimes,
W74-08591 5D

COAL GASIFICATION
Analyses of Tars, Chars, Gases, and Water Found in Effluents from the Synthane Process,
W74-08592 5A

COAL MINE WASTES
A Bibliography on the Pollution Aspects of Coke Ovens,
W74-08183 5B

Adverse Effects of Coal Mining on Federal Reservoir Projects.
W74-08528 5G

Control of Mine Drainage from Coal Mine Mineral Wastes: Phase II. Pollution Abatement and Monitoring,
W74-08661 5G

COAL MINES
Adverse Effects of Coal Mining on Federal Reservoir Projects.
W74-08528 5G

COALS
Adverse Effects of Coal Mining on Federal Reservoir Projects.
W74-08528 5G

Analyses of Tars, Chars, Gases, and Water Found in Effluents from the Synthane Process,
W74-08592 5A

COASTAL BERMUDAGRASS
Recycling and Recovery of Nitrogen, Phosphorus, and Potassium by Coastal Bermudagrass: I. Effect of Sources and Rates of Nitrogen Under a Clipping System,
W74-08327 5B

Recycling and Recovery of Nitrogen, Phosphorus, and Potassium by Coastal Bermudagrass: II. Under Grazing Conditions with Two Stocking Rates,
W74-08328 5B

COASTAL ECOSYSTEMS
Coastal Ecosystems. Ecological Considerations for Management of the Coastal Zone,
W74-08642 2L

COASTAL ENGINEERING
Definition of Critical Coastal Areas and Approaches to Standards for Management,
W74-08532 2L

COASTAL MARSHES
Definition of Critical Coastal Areas and Approaches to Standards for Management,
W74-08532 2L

COASTAL PLAINS
Modeling Snowmelt Runoff in an Arctic Coastal Plain,
W74-08233 2C

Water from the Coastal Plain Aquifers in the Washington, D.C., Metropolitan Area,
W74-08597 4B

COASTAL WATERS
Vessels in Foreign and Domestic Trades--Pollution of Coastal and Navigable Waters.
W74-08556 6E

Coastal Zone Management Act of 1972.
W74-08581 6E

COASTAL ZONE MANAGEMENT
Definition of Critical Coastal Areas and Approaches to Standards for Management,
W74-08532 2L

COASTAL ZONE MANAGEMENT ACT OF 1972
Coastal Zone Management Act of 1972.
W74-08581 6E

COASTS
Evaporation from Bare Soil in a Coastal Environment,
W74-08305 2D

Definition of Critical Coastal Areas and Approaches to Standards for Management,
W74-08532 2L

What are Powers of Local Governmental Authorities Under Florida Law to Dispose of Derelict and Abandoned Vessels Found in or Near Local Navigable Waters,
W74-08533 6E

Municipal Powers Under Florida Law with Respect to Protection of Environmentally Endangered Riparian Land,
W74-08534 6E

Louisiana Moves Toward Coastal Zone Management
W74-08537 6E

Final Report Analyzing Coastal and Marine Law to Develop an Authority for Coastal Zone Management,
W74-08544 6E

Coastal Zone Management Act of 1972.
W74-08581 6E

COFFERDAMS
A Cofferdam Design Optimization,
W74-08511 8A

COKE OVENS
A Bibliography on the Pollution Aspects of Coke Ovens,
W74-08183 5B

COLBERT COUNTY (ALA)
Surface-Water Availability, Colbert County, Alabama.
W74-08187 4A

COLD REGIONS
Ground Water Quality Effects on Domestic Water Utilization,
W74-08287 5B

Activated Sludge Disposal in a Subarctic Environment,
W74-08443 5E

COLIFORMS
Changes in the Heterotrophic Bacteria of Volta Lake, 1968-1971,
W74-08434 5C

COLLEGES
National Sea Grant College and Program--Extension.
W74-08568 6E

COLORADO
Water-Level Records for the Northern High Plains of Colorado, 1970-74,
W74-08381 4B

Report on the Second Session of the Conference in the Matter of Pollution of the South Platte River Basin.
W74-08530 5G

Hydrologic Effects of Patch Cutting of Lodgepole Pine,
W74-08603 4C

COLORADO RIVER (TEX)
Woody Phreatophytes Along the Colorado River From Southeast Runnels County to the Headwaters in Borden County, Texas,
W74-08371 3B

COLORIMETRY
Automated Method for Ortho-, Ortho-plus Hydrolyzable and Total Phosphate in Surface and Wastewaters,
W74-08208 5A

Phosphorus in Waste Water.
W74-08438 5A

COLUMBIA RIVER BASIN
Digital-Model Study of Ground-Water Hydrology, Columbia Basin Irrigation Project Area, Washington,
W74-08382 2F

COMBINED SEWERS
Relief Concept Concerning Mixed Sewers (Entlastungs-Konzeptionen im Mischsystem).
W74-08246 5D

COMMERCIAL FISH
1971 Puget Sound Fall Chinook Salmon Tagging Study.
W74-08452 8I

COMMERCIAL FISHING
Marine Fisheries
W74-08574 6E

COMPREHENSIVE PLANNING
Multiobjective Analysis in Water Resource Planning.
W74-08514 4A

Progress Evaluation Meeting in the Matter of Pollution of the Interstate Waters of the Missouri River, Omaha, Nebraska Area (Nebraska-Iowa-Missouri-Kansas)
W74-08529 5G

Difficulties Ahead for Oregon Regarding Estuary Regulations, Control and Protection.
W74-08670 2L

COMPUTER MODELS
A Computer Model for Predicting Nitrate and Other Solutes of Agricultural Drain Water.
W74-08280 5B

Modeling of Land Runoff Effects on Dissolved Oxygen,
W74-08316 5B

Computer Simulation of Crop Production - Potential and Hazards.
W74-08331 3F

Systems Analysis of Large-Scale Public Facilities: New York City's Water Supply Network as a Case Study,
W74-08507 3D

COMPUTER PROGRAMS
The Combined Use of Optimization and Simulation Models in River Basin Planning.,
W74-08512 4A

WATEQ, A Computer Program for Calculating Chemical Equilibria of Natural Waters,
W74-08606 2K

CONDUCTIVITY
Determination of the Alkalinity of Mill Effluents (Opredelenie shchelochnosti stochnykh vod),
W74-08411 5A

CONDUITS
Discharge and Travel Time for Ground-Water Conduits,
W74-08383 8B

CONFERENCES
Panel Review and Commentary,
W74-08172 6E

Water Resources, Environment and National Development--Volume I: Summary of Proceedings, and Volume II: Selected Papers.
W74-08454 5G

CONGRESSIONAL HEARINGS
National Water Commission Report,
W74-08527 6B

CONNECTICUT
Proceedings: First Wetlands Conference, June 20, 1973,
W74-08157 2L

The Connecticut Tidal Wetlands Survey,
W74-08158 6E

The Connecticut Tidal Wetlands Survey,
W74-08159 6E

Inland Wetland Soils,
W74-08160 2G

Wetland Geology,
W74-08161 2L

Inland Wetlands and Ground Water in Eastern Connecticut,
W74-08162 2F

Wetland Hydrology,
W74-08163 2L

The Ecological Role of Inland Wetlands,
W74-08164 2L

Ecological History of Wetlands,
W74-08165 2L

Insects (Chrysops Flies) in Connecticut Salt Marshes,
W74-08166 2L

Legal Aspects of Wetlands Protection--Limits of the Police Power,
W74-08167 6E

Inland Wetlands from the Administrators Viewpoint--Based on Experiences with Connecticut's Inland Wetlands and Water Courses Act,
W74-08168 6E

The Soil Conservation and Its Role in Wetland Management for Connecticut,
W74-08169 6E

Federal Policy Towards Wetlands,
W74-08170 5G

Industrial Aspects of Wetland Uses,
W74-08171 6E

Panel Review and Commentary,
W74-08172 6E

CONNECTICUT RIVER
A Bill to Preserve and Promote the Resources of the Connecticut River Valley.
W74-08553 6E

CONSERVATION
A Bill to Preserve and Promote the Resources of the Connecticut River Valley.
W74-08553 6E

Conservation of Marine Life--Use of Liberty Ships by States as Offshore Artificial Reefs.
W74-08557 6E

Coastal Ecosystems. Ecological Considerations for Management of the Coastal Zone,
W74-08642 2L

CONSTRUCTION
Reconstructing an Egg-Shaped Sewer.
W74-08249 8A

Municipal Powers Under Flirida Law with Respect to Protection of Environmentally Endangered Riparian Land,
W74-08534 6E

CONSTRUCTION COSTS
A Cofferdam Design Optimization,
W74-08511 8A

CONSUMPTIVE USE
Identification and Control of Pollution from Salt Water Intrusion.
W74-08293 5B

CONTRACT ADMINISTRATION
A Bill to Amend the Soil Conservation and Domestic Allotment Act.
W74-08554 6E

CONTRACTS
Water and Sewerage Disposal Agencies,
W74-08571 6E

CONTROL SYSTEMS
Water Pollution Control Facilities--Tax Exemption.
W74-08577 6E

COOSA COUNTY (ALA)
Water Availability, Coosa County, Alabama,
W74-08188 4A

COPEPODA
Biology of Arctodiaptomus acutilobatus Sars (Copepoda, Crustacea) in the Mingechaur Water Reservoir, (In Russian),
W74-08683 2H

COPEPODS
Research on the Culture of Certain Common Marine Organisms in Singapore Waters,
W74-08477 3F

CORBICULA-MANILENSIS
Range Extensions of Corbicula manilensis (Philippi) in the Atlantic Drainage of the United States,
W74-08685 2I

CORN (FIELD)
Reflectance Discrimination of Cotton and Corn at Four Growth Stages,
W74-08269 3F

Maximum Corn Yields With Minimum Water.
W74-08312 3F

CORROSION
Development of a Production Technique for Porous Stainless Steel Tubes,
W74-08503 8G

COST ANALYSIS
Cost Effectiveness in Sewage Treatment,
W74-08263 5D

Field Test Evaluation of the High Temperature Electrodialysis Process at Webster, S.D.,
W74-08345 3A

Supply Curve for Thermal Efficiency,
W74-08509 6A

COST-BENEFIT ANALYSIS
Multiobjective Redesign of the Big Walnut Project,
W74-08515 4A

Environmental Policies as a Congressional Requirement for Social Efficacy,
W74-08539 6E

COST-EFFECTIVENESS
Systems Analysis of Large-Scale Public Facilities: New York City's Water Supply Network as a Case Study,
W74-08507 3D

COSTS
All Costs Must be Counted . . . ,
W74-08211 5D

Letchworth Water Pollution Control Works,
W74-08260 5D

Some Results of Water Purification at Viscose Rayon Factories (Nekotorye itogi raboty vodoochistnykh sooruzhennii predpriyatii viskoznykh volokon),
W74-08429 5D

Activated Sludge Disposal in a Subarctic Environment,
W74-08443 5E

Aims of Water Pollution Control.
W74-08470 5G

COTTON
Reflectance Discrimination of Cotton and Corn at Four Growth Stages,
W74-08269 3F

Computer Simulation of Crop Production - Potential and Hazards,
W74-08331 3F

CREEP
Some Rates of Geomorphological Processes,
W74-08304 2J

CRETE (NEB)
Floods in the Vicinity of Crete, Nebraska,
W74-08444 7C

CROP PRODUCTION
Controlling Soil Crusting with Phosphoric Acid to Enhance Seedling Emergence,
W74-08279 3F

Maximum Corn Yields With Minimum Water.
W74-08312 3F

Computer Simulation of Crop Production - Potential and Hazards,
W74-08331 3F

CROP RESPONSE
Water Relations and Growth of Cotton in Drying Soil,
W74-08272 2G

The Problems of Increased Life-Activity of Hydroponic Plants, (In Russian),
W74-08688 3F

CROSS-SECTIONS
Turbulence Characteristics in a Smooth Open Channel of Circular Cross-Section (Caracteristiques de la Turbulence au Sein d'un Ecoulement a Surface Libre En Conduite Lisse De Section Circulaire,
W74-08192 8B

CRUDE OIL
Microbial Degradation of Crude Oil and the Various Hydrocarbon Derivatives,
W74-08620 5B

CRYSTALLIZATION
Economic Optimization of the Avco Crystallization Process,
W74-08337 3A

CULTIVATION
Concepts of Conservation Tillage Systems Using Surface Mulches,
W74-08277 3F

CULTURES
Utilization of Crude Oil Hydrocarbons by Mixed Cultures of Marine Bacteria,
W74-08616 5B

CUTANEOUS LEISHMANIA
Natural Nidi of Cutaneous Leishmaniasis in the Zone of the Kara Kum Canal (4th Stage) and Their Epidemic Significance, (In Russian),
W74-08696 5B

CUTTING MANAGEMENT
Hydrologic Effects of Patch Cutting of Lodgepole Pine,
W74-08603 4C

CYANOPHYTA
Changes of the Number of Bacterial Cells of Different Morphological Groups in the Water and Bottom Deposits of the Khakon Reservoir as a Function of the Intensity of Development of Blue-Green Algae, (In Ukrainian),
W74-08505 5C

CYANOPLITA
Development of Blue-Green Algal Blooms in Non-Alkaline Waters,
W74-08478 5C

CYATHOCEPHALUS-TRUNCATUS
Studies of the Helminth Fauna of Norway, XXVI: The Distribution of Cyathocephalus Truncatus (Pallas) in the Intestine of Brown Trout (Salmo Trutta L.),
W74-08699 2I

CYCLOHEXANE
Bacterial Degradation of Cyclohexane Participation of a Co-Oxidation Reaction,
W74-08244 5B

CYCLOHEXANOL UTILIZATION
Bacterial Degradation of Cyclohexane Participation of a Co-Oxidation Reaction,
W74-08244 5B

DAMS
Navigation and Navigable Waters--Flood Control Regulations.
W74-08551 4A

DATA COLLECTIONS
Low-Flow Characteristics of Kentucy Streams,
W74-08173 7C

A Plan for the Improvement of the Low Flow Data Network in Alabama,
W74-08175 7A

Automated Flow-Recording System for Field Drainage Monitoring--Direct Data Compilation of Surface and Subsurface Drain Flow,
W74-08267 4A

Records of Water Wells, Springs, Oil- and Gas-Test Holes, and Chemical Analyses of Water for the Madison Limestone and Equivalent Rocks in the Powder River Basin and Adjacent Areas, Northeastern Wyoming,
W74-08296 4B

User's Guide to NODC's Data Services.
W74-08311 10A

Environmental Information Sources -- Engineering and Industrial Applications: A Selected Annotated Bibliography.
W74-08401 10C

Hydrological Activities in Singapore,
W74-08457 7C

Some Factors Affecting the Annual Railfall of Singapore,
W74-08459 2B

Flood Plain Information, Grants Creek - Town Creek, City of Salisbury, North Carolina
W74-08490 4A

Flood Plain Information; Peters Creek and Lick Run, Roanoke, Virginia
W74-08491 4A

Floods in Alabama--Magnitude and Frequency Based on Data Through September 30, 1971,
W74-08587 2E

Digest of the 1972 Catalog of Information on Water Data,
W74-08600 10D

Trends and Variability of Yearly Mean Sea Level 1893-1972,
W74-08643 2B

Water Atlas of the United States,
W74-08668 7C

DDT
Simple Apparatus for On-Site Continuous Liquid-Liquid Extraction of Organic Compounds from Natural Waters,
W74-08414 5A

DEAERATION
Permeability of High Ash Papermill Sludge,
W74-08425 5D

DECISION MAKING
System Optimization for Pulp and Paper Industrial Wastewater Treatment Design,
W74-08418 5D

Technical and Economic Issues in the Water Quality Management of Yaquina Bay,
W74-08672 2L

DEER FLIES
Insects (Chrysops Flies) in Connecticut Salt Marshes,
W74-08166 2L

DEGRADATION (BACTERIAL)
Chemical Composition and Molecular Weight Distribution of Dissolved Organic Matter Produced by Bacterial Degradation of Green Algae,
W74-08494 5C

DEGRADATION (DECOMPOSITION)
Model Studies on Reactions Occurring in Oxidations of Lignin with Molecular Oxygen in Alkaline Media,
W74-08359 5B

DEICERS
Water Pollution and Associated Effects from Street Salting,
W74-08306 5B

DELAWARE RIVER
The Combined Use of Optimization and Simulation Models in River Basin Planning.,
W74-08512 4A

The Use of ERTS-1 for Relaying Hydrologic Data in the Delaware River Basin,
W74-08583 7B

DELAWARE VALLEY
Summary of Environmental Monitoring at Philadelphia, 1958-1971,
W74-08648 5B

DEMINERALIZATION
Reverse Osmosis Membrane Filters for Seawater Pretreatment,
W74-08334 3A

Field Test Evaluation of the High Temperature Electrodialysis Process at Webster, S.D.
W74-08345 3A

DENITRIFICATION
Process Kinetics for Denitrification.
W74-08320 5D

Fate of Nitrate from Manure and Inorganic Nitrogen in A Clay Soil Cropped to Continuous Corn.
W74-08321 5B

Increased Denitrification in Soils by Additions of Sulfur as an Energy Source.
W74-08322 5B

DENSITOMETRY
Measurement of Dye Concentrations by Photography.
W74-08376 2E

DENSITY STRATIFICATION
Selective Withdrawal from Man-Made Lakes.
W74-08585 4A

DEPTH
Turbulence Characteristics in a Smooth Open Channel of Circular Cross-Section (Caracteristiques de la Turbulence au Sein d'un Ecoulement a Surface Libre En Conduite Lisse De Section Circulaire.
W74-08192 8B

DESALINATION
Reverse Osmosis and Ultrafiltration - A Survey of Auxiliary Apparatuses Available in this Field (Umgekehrte Osmose und Ultrafiltration - Ein Ueberblick Ueber die auf Diesem Gebiet Verfuegbaren Apparativen Hilfsmittel).
W74-08218 5D

Reverse Osmosis Membrane Filters for Seawater Pretreatment.
W74-08334 3A

Economic Optimization of the Avco Crystallization Process,
W74-08337 3A

Development of Large Spiral Membrane Reverse Osmosis Elements for Low-Cost Water Purification and Reclamation.
W74-08338 3A

Brackish Water Desalting Testing and Field Evaluation with Reverse Osmosis and Electrodialysis Pilot Plants.
W74-08339 3A

Development of a Reverse Osmosis Module for Wash Water Recycling in a Space Environment at 165 deg F,
W74-08344 5D

Feasibility Study on Desalting Brackish Water from the Mt. Simon Aquifer in Northeastern Illinois.
W74-08499 3A

Brine Concentration by Electrodialysis, Phase I,
W74-08500 3A

Brine Concentration by Electrodialysis, Phase II,
W74-08501 3A

Development of a Production Technique for Porous Stainless Steel Tubes,
W74-08503 8G

In-Situ Formed Condensation Polymers for Reverse Osmosis Membranes,
W74-08504 3A

DESALINATION PLANTS
Manual for Calculation of Conventional Water Treatment Costs,
W74-08333 3A

Field Test Evaluation of the High Temperature Electrodialysis Process at Webster, S.D.,
W74-08345 3A

DESALINATION PROCESS
Evaluation of Ion Exchange Processes for Treatment of Mine Drainage Waters,
W74-08341 5D

DESALINATION PROCESSES
Brackish Water Desalting, Testing and Evaluation Procedures with Mobile Test Facility,
W74-08335 3A

Development of High-Pressure Spiral Membrane Elements for Seawater Desalination,
W74-08336 3A

Development of a One-Pass Hollow Fiber Seawater Desalination Module Having a Capacity of 2500-3000 GPD,
W74-08342 3A

Design and Construction of a Large Brackish Water Desalination Module,
W74-08343 3A

High Rejection Hollow Fiber Membranes for Desalination of Sea Water,
W74-08502 3A

DESIGN
Systems Planning Design: Case Studies in Modeling, Optimization, and Evaluation,
W74-08506 6A

Systems Analysis of Large-Scale Public Facilities: New York City's Water Supply Network as a Case Study,
W74-08507 3D

Economics of Inland Water Transport,
W74-08508 4A

Supply Curve for Thermal Efficiency,
W74-08509 6A

Multiobjective Redesign of the Big Walnut Project,
W74-08515 4A

DESIGN CRITERIA
The River Itchen Scheme of the Portsmouth Water Company.
W74-08216 8A

Some Useful Ideas on Waste Water Reduction,
W74-08355 5D

DESIGN FLOOD
Flood Plain Information; Grants Creek - Town Creek, City of Salisbury, North Carolina.
W74-08490 4A

Flood Plain Information; Peters Creek and Lick Run, Roanoke, Virginia.
W74-08491 4A

DEWATERING
Those Nasty Phosphatic Clay Ponds.
W74-08227 5D

Role of Ultrafiltration in Industrial Effluent Problems,
W74-08408 5D

Centrifugal Dewatering of Secondary Waste Sludges,
W74-08431 5D

Sludge Incineration and Afterburning,
W74-08441 5D

DIATOMACEOUS EARTH
Virus Removal by Diatomaceous-Earth Filtration - Part 1,
W74-08215 5F

DIELDRIN
Simple Apparatus for On-Site Continuous Liquid-Liquid Extraction of Organic Compounds from Natural Waters,
W74-08414 5A

DIGESTION
A Simple Digestion Procedure for Estimation of Total Nitrogen in Soils and Sediments,
W74-08324 5B

DIKES
Operation and Maintenance of New Bedford Hurricane Barrier (Final Environmental Statement).
W74-08520 8D

DILUTION WATER
The Use of the Dilution Water Effect as a Water Quality Criterion,
W74-08356 5A

DIMENSIONAL ANALYSIS
To Establish Viable Methods of Maintaining Waste Treatment Facility Efficiencies with Reference to Flow Variations.
W74-08398 5D

DIRECTORIES (PERSONNEL)
A Worldwide Directory of Stream Ecologists,
W74-08235 10C

DISCHARGE POLICY
Determination of the Discharge Policy for Existing Reservoir Networks,
W74-08513 4A

DISCHARGE (WATER)
Generalization of Spawning and Rearing Discharges for Several Pacific Salmon Species in Western Washington,
W74-08370 2I

Discharge and Travel Time for Ground-Water Conduits,
W74-08383 8B

DISINFECTION
The Role of Disinfection in the Optimum Environment,
W74-08205 5F

New Tertiary Sewage Process Needs No Chlorine to Disinfect.
W74-08229 5D

Disinfection of Water Using Chlorine Dioxide.
W74-08253 5D

DISPERSION
Tracer Simulation of Soluble Waste Concentration,
W74-08377 5B

Transverse Dispersion in Ocillatory Channel Flow,
W74-08389 5B

Enhanced Dispersion in Drag Reducing Open Channel Flow,
W74-08390 5B

Model Study of the Dilution of Soluble Liquids Discharge from Tankers.
W74-08451 5B

DISSOLVED OXYGEN
Modleing of Land Runoff Effects on Dissolved Oxygen,
W74-08316 5B

Water Quality Monitoring Experience in the Somerset River Authority Area, 1968-1972,
W74-08360 5A

DISTRIBUTION
Vertical Distribution of Fallout Cesium-137 in Cultivated Soils.
W74-08644 5B

DISTRIBUTION PATTERNS
Chemical Distribution of Residual Fertilizer Nitrogen in Soil as Revealed by Nitrogen-15 Studies.
W74-08332 5B

DISTRICT OF COLUMBIA
Water and Sewer Supply Decisions: A Case Study of the Washington Suburban Sanitary Commission.
W74-08497 5G

Water from the Coastal Plain Aquifers in the Washington, D.C., Metropolitan Area.
W74-08597 4B

DOCUMENTATION
User's Guide to NODC's Data Services.
W74-08311 10A

Environmental Information Sources -- Engineering and Industrial Applications: A Selected Annotated Bibliography.
W74-08401 10C

Digest of the 1972 Catalog of Information on Water Data.
W74-08600 10D

DOMESTIC WASTES
Grangemouth Tunnel Sewer.
W74-08197 8A

DRAINAGE
Automated Flow-Recording System for Field Drainage Monitoring--Direct Data Compilation of Surface and Subsurface Drain Flow.
W74-08267 4A

Drainage Observations in Latin America.
W74-08268 4A

A Computer Model for Predicting Nitrate and Other Solutes of Agricultural Drain Water.
W74-08280 5B

Operation and Maintenance of Irrigation and Drainage Systems: Section III--Operation.
W74-08318 4A

Drainage--Miscellaneous Provisions; Penalties.
W74-08576 6E

DRAINAGE SYSTEMS
Utilitarian Leisure for Burnham-On-Sea.
W74-08262 5D

Operation and Maintenance of Irrigation and Drainage Systems: Section III--Operation.
W74-08318 4A

Effective Use of High Water Table Areas for Sanitary Landfill.
W74-08486 5E

DRAINS
Drainage--Miscellaneous Provisions; Penalties.
W74-08576 6E

DRAWDOWN
Determination of the Discharge Policy for Existing Reservoir Networks,
W74-08513 4A

DRAY REDUCTION
Enhanced Dispersion in Drag Reducing Open Channel Flow,
W74-08390 5B

DREDGE SPOILS
Research to Determine the Environmental Response to the Deposition of Spoil on Salt Marshes Using Diked and Undiked Techniques.
W74-08677 5C

DREDGING
Port Everglades Harbor, Broward County, Florida (Final Environmental Statement).
W74-08518 8A

Research to Determine the Environmental Response to the Deposition of Spoil on Salt Marshes Using Diked and Undiked Techniques.
W74-08677 5C

DROPS (STRUCTURES)
Observations on Hydraulic Jumps at Rounded Step,
W74-08391 8B

DROUGHTS
Natural Forage Reserve of Turkmen SSR and Ways of its Improvement to Develop Sheep-Raising, (In Russian),
W74-08547 3F

DRYING
Sludge Incineration and Afterburning,
W74-08441 5D

DUVAL COUNTY (TEX)
Ground-Water Resources of Duval County, Texas,
W74-08372 4B

DYE RELEASES
Measurement of Dye Concentrations by Photography,
W74-08376 2E

DYNAMIC PROGRAMMING
System Optimization for Pulp and Paper Industrial Wastewater Treatment Design,
W74-08418 5D

E
Virus Removal by Diatomaceous-Earth Filtration - Part I,
W74-08215 5F

Sanitary-Microbiological Investigations in Preventing Infections of Bacterial and Viral Etiology, (In Russian),
W74-08692 5C

EARTHQUAKES
Road Log and Guide--Geology and Hydrology for Planning, Anchorage Area.
W74-08180 4A

EASEMENTS
Easements: Judicial and Legislative Protection of the Public's Rights in Florida's Beaches,
W74-08540 6E

EAST RIVER (N
Spur Channel to Astoria Waterfront, East River, New York (Final Environmental Statement)
W74-08519 8A

EAST ST
Riverfront Development. The Politics of Master Planning,
W74-08495 3D

ECOLOGY
The Ecological Role of Inland Wetlands,
W74-08164 2L

Ecological History of Wetlands,
W74-08165 2L

A Worldwide Directory of Stream Ecologists.
W74-08235 10C

Concepts of Pollution and Its Control,
W74-08422 5G

A Threnody Concerning the Biodegradation of Oil in Natural Waters,
W74-08612 5B

Coastal Ecosystems. Ecological Considerations for Management of the Coastal Zone,
W74-08642 2L

ECONOMIC ASPECTS
Effluent Charges on Air and Water pollution,
W74-08524 5G

ECONOMIC EFFICIENCY
Potential for Marginal Cost Pricing in Water Resource Management,
W74-08496 6C

Economics of Inland Water Transport,
W74-08508 4A

Supply Curve for Thermal Efficiency,
W74-08509 6A

Multiobjective Analysis in Water Resource Planning,
W74-08514 4A

Multiobjective Redesign of the Big Walnut Project,
W74-08515 4A

ECONOMIC FEASIBILITY
The Use of Questionnaires in Collecting Information for Urban Flood Control Planning,
W74-08151 6F

Spur Channel to Astoria Waterfront, East River, New York (Final Environmental Statement).
W74-08519 8A

ECONOMIC IMPACT
Technical and Economic Issues in the Water Quality Management of Yaquina Bay,
W74-08672 2L

ECONOMICS
Systems Analysis of Large-Scale Public Facilities: New York City's Water Supply Network as a Case Study,
W74-08507 3D

ECOSYSTEMS
Proceedings: First Wetlands Conference, June 20, 1973,
W74-08157 2L

Microbial Degradation of Oil and Hydrocarbons in Continuous Culture,
W74-08615 5B

Coastal Ecosystems. Ecological Considerations for Management of the Coastal Zone
W74-08642 2L

EFFLUENTS
Best Effluent the Goal.
W74-08214 5D

Environmental Radioactivity in Illinois, 1970
W74-08646 5B

ELECTRIC POWER INDUSTRY
Industrial Aspects of Wetland Uses.
W74-08171 6E

ELECTRICAL CONDUCTANCE
Replacement of the Anthracite Sublayer in Anion-Exchange Filters of Water Purification Equipment (Zamena antratsitovogo podsloya v anionitovykh fil'trakh vodoochistnykh ustanovok),
W74-08407 5D

ELECTROCHEMISTRY
Electroanalytical Studies of Methylmercury in Aqueous Solution,
W74-08362 5A

ELECTRODES
Determination of Nitrate in Water with a New Construction of Ion-Selective Electrode,
W74-08420 5A

ELECTRODIALYSIS
Brackish Water Desalting Testing and Field Evaluation with Reverse Osmosis and Electrodialysis Pilot Plants,
W74-08339 3A

Field Test Evaluation of the High Temperature Electrodialysis Process at Webster, S.D.,
W74-08345 3A

Brine Concentration by Electrodialysis, Phase I,
W74-08500 3A

Brine Concentration by Electrodialysis, Phase II,
W74-08501 3A

Industrial Processing with Membranes.
W74-08664 5D

ELECTROLYTES
Water: A Comprehensive Treatise. Volume 3. Aqueous Solutions of Simple Electrolytes.
W74-08667 1B

EMULSIONS
New Methods to Dispose of Used Metalworking Emulsions, (Neue Verfahren Zur Beseitigung Gebraughter Metall-Bearbeitungs-Emulsionen),
W74-08247 5D

ENGINEERING STRUCTURES
Pinch Valves Take Hold on the Industry,
W74-08363 8A

ENVIRONMENT
Environmental Information Sources -- Engineering and Industrial Applications: A Selected Annotated Bibliography.
W74-08401 10C

The Impact of Growth on the Environment.
W74-08523 6G

Radiological Survey of New London Harbor, Thames River, Conn., and Environs,
W74-08645 5B

Tritium Burdens in Two Arctic Villages,
W74-08649 5B

ENVIRONMENT IMPACT STATEMENT
Lower Rio Grande Flood Control Project, Texas.
W74-08521 8A

ENVIRONMENTAL CONTROL
Pulp, Paper, and Board in the Environment -- Part 8: Environmental Problems of the West German Pulp, Paper, and Board Industry.
W74-08405 5G

Concepts of Pollution and Its Control,
W74-08422 5G

Utah Environmental Problems and Legislative Response: II, Legislative Response,
W74-08535 5G

ENVIRONMENTAL EFFECTS
Environmental Research and Highways,
W74-08251 5B

Environmental Effect of a Complex Nuclear Facility,
W74-08254 5D

Environmental Impact Statements.
W74-08517 6G

Port Everglades Harbor, Broward County, Florida (Final Environmental Statement).
W74-08518 8A

Water Resources Council Report on the Pearl River Comprehensive Basin Study Mississippi and Louisiana.
W74-08522 4A

The Impact of Growth on the Environment.
W74-08523 6G

Environmental Law--Water Pollution--Conflict Between Refuse Act Permit Program and National Environmental Policy Act,
W74-08550 5G

Environmental Hazards of Large-Scale Developments,
W74-08601 6G

Microbial-Facilitated Degradation of Oil: A Prospectus,
W74-08610 5B

Microbial Degradation of Oil and Hydrocarbons in Continuous Culture,
W74-08615 5B

The Impact of Oil on Marshland Microbial Ecosystems,
W74-08631 5C

Coastal Ecosystems. Ecological Considerations for Management of the Coastal Zone,
W74-08642 2L

The Brackish Water Clam Rangia Cuneata as Indicator of Ecological Effects of Salinity Changes in Coastal Waters,
W74-08676 5C

ENVIRONMENTAL HAZARDS
Environmental Hazards of Large-Scale Developments,
W74-08601 6G

ENVIRONMENTAL IMPACT STATEMENT
Port Everglades Harbor, Broward County, Florida (Final Environmental Statement).
W74-08518 8A

Operation and Maintenance of New Bedford Hurricane Barrier (Final Environmental Statement).
W74-08520 8D

Water Resources Council Report on the Pearl River Comprehensive Basin Study Mississippi and Louisiana.
W74-08522 4A

Environmental Law--Water Pollution--Conflict Between Refuse Act Permit Program and National Environmental Policy Act,
W74-08550 5G

Final Environmental Statement, West Terre Haute Levee, Wabash River, Indiana, Wabash River Basin.
W74-08660 8D

ENVIRONMENTAL IMPACT STATEMENTS
Environmental Impact Statements.
W74-08517 6G

ENVIRONMENTAL POLICY
Proceedings: First Wetlands Conference, June 20, 1973,
W74-08157 2L

ENVORNMENTAL IMPACT STATEMENT
Spur Channel to Astoria Waterfront, East River, New York (Final Environmental Statement).
W74-08519 8A

EQUALIZING RESERVOIRS
To Establish Viable Methods of Maintaining Waste Treatment Facility Efficiencies with Reference to Flow Variations.
W74-08398 5D

EQUIPMENT
The River Itchen Scheme of the Portsmouth Water Company.
W74-08216 8A

Aeration of Effluents in Aeration Tanks (Aeratsiya stochnykh vod v aerotenkakh-vytesnitelyakh),
W74-08413 5D

Voith Circular Clarifying Basin for Baiersbronn (Voith-Rundklaerbecken fuer Baiersbronn).
W74-08427 5D

Centrifugal Dewatering of Secondary Waste Sludges,
W74-08431 5D

Media Filtration in Effluent and Waste Water Treatment,
W74-08432 5D

EQUITABLE APPORTIONMENT
State V Bishop (Action for Public Nuisance and Trepass in Filling Area Below High Water Mark of Bay).
W74-08573 6E

EROSION
Concepts of Conservation Tillage Systems Using Surface Mulches,
W74-08277 3F

Inland Lakes.
W74-08659 6E

The National Shoreline Study,
W74-08671 2L

EROSION CONTROL
Erosion Control on Highway Construction.
W74-08178 4D

Improvement of Soil Cover for Water Conservation, Prevention of Sedimentation and Pollution Control in the Philippines,
W74-08481 5G

Erosion Control and Bank Stabilization in Metropolitan Toronto--10 Year Programme and 5 Year Project.
W74-08488 4D

ERTS
Survey of the Seasonal Snow Cover in Alaska.
W74-08179 2C

Application of ERTS-1 Imagery to the Study of Caribou Movements and Winter Dispersal in Relation to Prevailing Snowcover.
W74-08602 2C

ESTUARIES
A Parametric Study of Water Resource Variables in a Delta Region of South Louisiana...Bayou Lafourche Volume I - Technical Discussion, Volume II - Appendices.
W74-08289 5B

Predicting Reaeration Coefficients for Polluted Estuary,
W74-08307 5B

Transverse Dispersion in Ocillatory Channel Flow,
W74-08389 5B

Hydrocarbon Biodegradation in Alaskan Waters,
W74-08627 5B

Microbial Ecology and the Problem of Petroleum Degradation in Chesapeake Bay,
W74-08628 5B

Estuarine Microbes and Organochlorine Pesticides (A Brief Review),
W74-08634 5B

Difficulties Ahead for Oregon Regarding Estuary Regulations, Control and Protection,
W74-08670 2L

ETOWAH COUNTY (ALA)
Surface-Water Availability, Etowah County, Alabama,
W74-08190 4A

EUTROPHICATION
Indications of the Relationship Between Phyto-Plankton Distribution and Phosphate Levels,
W74-08476 5C

Development of Blue-Green Algal Blooms in Non-Alkaline Waters,
W74-08478 5C

Heterotrophic Potential for Amino Acid Uptake in a Naturally Eutrophic Lake,
W74-08678 5C

Water Quality and Water Pollution Control in Switzerland,
W74-08697 5G

EVALUATION
Recipient Capacity to Limit Discharge of Pollutants to Receiving Waters,
W74-08351 5B

Systems Planning Design: Case Studies in Modeling, Optimization, and Evaluation,
W74-08506 6A

EVAPORATION
Evaporation from Bare Soil in a Coastal Environment,
W74-08305 2D

EXCAVATION
Spur Channel to Astoria Waterfront, East River, New York (Final Environmental Statement).
W74-08519 8A

EXPENDITURES
Some Results of Water Purification at Viscose Rayon Factories (Nekotorye itogi raboty vodoochistnykh sooruzhennii predpriyatii viskoznykh volokon),
W74-08429 5D

FALLOUT
Vertical Distribution of Fallout Cesium-137 in Cultivated Soils,
W74-08644 5B

Summary of Environmental Monitoring at Philadelphia, 1958-1971,
W74-08648 5B

Water Surveillance Programs, February 1973 and 1972, Special Analyses.
W74-08652 5B

FARM MANAGEMENT
A Bill to Amend the Soil Conservation and Domestic Allotment Act.
W74-08554 6E

FARM WASTES
Animal Waste Utilization for Pollution Abatement Technology and Economics. Phase II,
W74-08231 5D

Project of the Agricultural and Marine Pollution Control Section, March 1973,
W74-08237 5G

Fate of Nitrate from Manure and Inorganic Nitrogen in A Clay Soil Cropped to Continuous Corn,
W74-08321 5B

FEASIBILITY STUDIES
Reverse Osmosis Membrane Filters for Seawater Pretreatment,
W74-08334 3A

Feasibility Study on Desalting Brackish Water from the Mt. Simon Aquifer in Northeastern Illinois.
W74-08499 3A

FEDERAL GOVERNMENT
National Water Commission Report,
W74-08527 6B

New Laws: Clean Waters in the Next Decade,
W74-08542 5G

A Bill to Provide for a National Program of Disaster Insurance.
W74-08552 6E

A Bill to Preserve and Promote the Resources of the Connecticut River Valley.
W74-08553 6E

Pollution Prevention Inspection of Vessels and Deck and Engineer Officers' Licenses.
W74-08559 6E

State Program Elements Necessary for Participation in the National Pollutant Discharge Elimination System.
W74-08560 6E

Oil Pollution Prevention--Non-Transportation-Related Onshore and Offshore Facilities--Proposed Rules
W74-08561 6E

Pollution of Coastal and Navigable Waters (CFR Title 19, Part 4).
W74-08562 6E

FEDERAL JURISDICTION
Memorandum of Understanding Regarding Implementation of Certain Complementary Responsibilities--Notice.
W74-08566 6E

FEDERAL PROJECT POLICY
Spur Channel to Astoria Waterfront, East River, New York (Final Environmental Statement).
W74-08519 8A

National Sea Grant College and Program--Extension.
W74-08568 6E

FEDERAL-STATE WATER RIGHTS CONFLICTS
The Atlantic States' Claim to Offshore Oil Rights: United States v. Maine,
W74-08538 6E

FEDERAL WATER POLLUTION CONTROL ACT
Federal Policy Towards Wetlands,
W74-08170 5G

Cleanup Down by the Old Mill Stream.
W74-08203 5G

Utah Environmental Problems and Legislative Response: II, Legislative Response,
W74-08535 5G

Environmental Policies as a Congressional Requirement for Social Efficacy,
W74-08539 6E

New Laws: Clean Waters in the Next Decade,
W74-08542 5G

Environmental Law--Water Pollution--Conflict Between Refuse Act Permit Program and National Environmental Policy Act,
W74-08550 5G

Oil Pollution Prevention--Non-Transportation-Related Onshore and Offshore Facilities--Proposed Rules.
W74-08561 6E

Interim Policy Statement on Implementation, Federal Water Pollution Control Act Amendments of 1972.
W74-08563 6E

National Oil and Hazardous Substances Pollution Contingency Plan.
W74-08564 6E

Memorandum of Understanding Regarding Implementation of Certain Complementary Responsibilities--Notice.
W74-08566 6E

FEED LOTS
Beef Cattle Feedlot Site Selection for Environmental Protection,
W74-08156 5G

A Programmed Sampler for Runoff and Bedloads,
W74-08361 5A

FEEDING BEHAVIOR
Sublethal Effects of the Water Soluble Component of Oil: Chemical Communication in the Marine Environment.
W74-08636 5

FERRIC CHLORIDE
Nutrient Control in Sewage Lagoons
W74-08395 5

Design and Performance Criteria for Settling Tanks for the Removal of Physical-Chemical Flocs.
W74-08396 5

FERTILIZERS
Recovery of N15-Labeled Fertilizers in Field Experiments,
W74-08315 5

Fate of Nitrate from Manure and Inorganic Nitrogen in A Clay Soil Cropped to Continuous Corn,
W74-08321 5

Agricultural Chemicals in Relation to Environmental Quality: Chemical Fertilizers, Present and Future,
W74-08325 5

Chemical and Biochemical Considations for Maximizing the Efficiency of Fertilizer Nitrogen,
W74-08326 5

Recycling and Recovery of Nitrogen, Phosphorus, and Potassium by Coastal Bermudagrass: I. Effect of Sources and Rates of Nitrogen Under a Clipping System,
W74-08327 5

Recycling and Recovery of Nitrogen, Phosphorus, and Potassium by Coastal Bermudagrass: II. Under Grazing Conditions with Two Stocking Rates,
W74-08328 5

Chemical Distribution of Residual Fertilizer Nitrogen in Soil as Revealed by Nitrogen-15 Studies,
W74-08332 5

Heavy Metals in Agricultural Lands Receiving Chemical Sewage Sludges,
W74-08397 5

FIBERS (PLANT)
Lamellar Sedimentation of Fiber-Carrying Waste Waters (Lamellsedimentering av fiberholdig vann),
W74-08437 5

FILOCHONK
Studies on the Development of the Nematode Rhabdochona (Filochona) ergensi Moravec 1968,
W74-08684

FILTER PRESS
The Automatic Filter Press FPAKM (D Autotomatische Filterpress FPAKM),
W74-08217 5

FILTERS
The Automatic Filter Press FPAKM (D Autotomatische Filterpress FPAKM),
W74-08217 5

The Pros and Cons of Automated Filters,
W74-08226 5

Bituminous Coal - A Substitute for Anthracite Filter Media in Two-Layer Filtration of Water,
W74-08350 5F

Media Filtration in Effluent and Waste Water Treatment,
W74-08432 5D

ILTRATION
Virus Removal by Diatomaceous-Earth Filtration - Part 1,
W74-08215 5F

The Pros and Cons of Automated Filters,
W74-08226 5D

Countercurrent Washing Turns the Tide Against Rising Effluent Costs,
W74-08228 5D

Bituminous Coal - A Substitute for Anthracite Filter Media in Two-Layer Filtration of Water,
W74-08350 5F

Role of Ultrafiltration in Industrial Effluent Problems,
W74-08408 5D

Media Filtration in Effluent and Waste Water Treatment,
W74-08432 5D

Industrial Processing with Membranes.
W74-08664 5D

FINANCING
Water and Sewer Supply Decisions: A Case Study of the Washington Suburban Sanitary Commission,
W74-08497 5G

FINLAND
Pulp, Paper, and Board in the Environment -- Part 9. Pollution Abatement in the Finnish Pulp and Paper Industry.
W74-08406 5G

FISH
The Fish of the South Westphalian Highland Including the Moehne Dam and Ruhr,
W74-08681 2I

FISH ATTRACTANTS
Conservation of Marine Life--Use of Liberty Ships by States as Offshore Artificial Reefs.
W74-08557 6E

FISH DIETS
Optimum Escapement Studies of Chignik Sockeye Salmon,
W74-08176 8I

Nourishment of Rutilus rutilus aralensis morpha fragmiteti Berg. of the Kayrakkum Water Reservoir, (In Russian),
W74-08663 2H

An Investigation of the Food of One- to Four-Month-Old Salmon Fry (Salmo salar L.) in the Suldalslagen, West Norway,
W74-08679 2I

Notes on the Feeding Relationships of Trout (Salmo trutta L.) and Salmon (Salmo salar L.) in the River Suldalslagen, West Norway,
W74-08680 2I

FISH FARMING
Research on the Culture of Certain Common Marine Organisms in Singapore Waters,
W74-08477 3F

FISH GILL DAMAGE
Some Acute Effects of Low-Boiling Petroleum Fractions on the Cellular Structure of Fish Gills Under Field Conditions,
W74-08637 5C

FISH PARASITES
Studies on the Development of the Nematode Rhabdochona (Filochona) ergensi Moravec, 1968,
W74-08684 2I

Studies of the Helminth Fauna of Norway, XXVI: The Distribution of Cyathocephalus Truncatus (Pallas) in the Intestine of Brown Trout (Salmo Trutta L.),
W74-08699 2I

FISH POPULATIONS
Structure of Oncorhynchus nerka (Walb.) Isolated Population of the Azabachye Lake, (In Russian),
W74-08548 2H

FISHERIES
Optimum Escapement Studies of Chignik Sockeye Salmon,
W74-08176 8I

Generalization of Spawning and Rearing Discharges for Several Pacific Salmon Species in Western Washington,
W74-08370 2I

FLAME EVAPORATION
New Methods to Dispose of Used Metalworking Emulsions, (Neue Verfahren Zur Beseitigung Gebraughter Metall-Bearbeitungs-Emulsionen),
W74-08247 5D

FLITRATION
Potable-Water Supply by Means of Upflow Filtration (L'Eau Claire Process),
W74-08210 5F

FLOCCULATION
Design and Performance Criteria for Settling Tanks for the Removal of Physical-Chemical Flocs,
W74-08396 5D

Recent Developments in Treatment of Papermaking Effluents in France (Developpements recents du traitement des effluents de papeterie en France),
W74-08402 5D

FLOOD CONTROL
New Roller Gate Improves the River Walk.
W74-08250 8A

Flood Control and Water Conservation Works in Bukit Timah Catchment, Singapore,
W74-08456 4A

A Cofferdam Design Optimization,
W74-08511 8A

Lower Rio Grande Flood Control Project, Texas.
W74-08521 8A

Navigation and Navigable Waters--Flood Control Regulations.
W74-08551 4A

FLOOD DAMAGE
Monitoring Flood Damage with Satellite Imagery,
W74-08294 4A

Joint Flood Control Commission.
W74-08570 6E

Final Environmental Statement, West Terre Haute Levee, Wabash River, Indiana, Wabash River Basin.
W74-08660 8D

FLOOD DATA
Flood Plain Information; Grants Creek - Town Creek, City of Salisbury, North Carolina.
W74-08490 4A

Flood Plain Information; Peters Creek and Lick Run, Roanoke, Virginia.
W74-08491 4A

FLOOD FORECASTING
Flood Plain Information; Grants Creek - Town Creek, City of Salisbury, North Carolina.
W74-08490 4A

Flood Plain Information; Peters Creek and Lick Run, Roanoke, Virginia.
W74-08491 4A

FLOOD FREQUENCY
Floods in Alabama--Magnitude and Frequency Based on Data Through September 30, 1971.
W74-08587 2E

FLOOD PLAIN ZONING
The Use of Questionnaires in Collecting Information for Urban Flood Control Planning.
W74-08151 6F

FLOOD PLAINS
The Development of Meanders in Natural River-Channels,
W74-08357 2E

FLOOD PROTECTION
Operation and Maintenance of New Bedford Hurricane Barrier (Final Environmental Statement).
W74-08520 8D

Lower Rio Grande Flood Control Project, Texas.
W74-08521 8A

Water Resources Council Report on the Pearl River Comprehensive Basin Study Mississippi and Louisiana.
W74-08522 4A

Joint Flood Control Commission.
W74-08570 6E

Flood Hazard Areas.
W74-08572 6E

Galveston Bay Hurricane Surge Study: Report 1. Effects of Proposed Barriers on Hurricane Surge Heights--Appendix A, Calibration Tests,
W74-08586 8B

Final Environmental Statement, West Terre Haute Levee, Wabash River, Indiana, Wabash River Basin.
W74-08660 8D

FLOOD RELIEF
Sewage Treatment and Disposal.
W74-08261 5D

FLOODPROOFING
The Use of Questionnaires in Collecting Information for Urban Flood Control Planning,
W74-08151 6F

FLOODS
Floodflows from Small Drainage Areas in Oklahoma: Progress Report and Data Compilation,
W74-08292 2E

Monitoring Flood Damage with Satellite Imagery,
W74-08294 4A

Floods in Punaluu-Hauula Area, Oahu, Hawaii,
W74-08310 7C

A Summary of Peak Stages and Discharges for the Flood of August 1973 in New Jersey,
W74-08374 2E

Floods in the Vicinity of Crete, Nebraska,
W74-08444 7C

Floods in Alabama--Magnitude and Frequency Based on Data Through September 30, 1971,
W74-08587 2E

FLORIDA
Concentrations of Nitrogen, Phosphorus, Potassium, and Total Soluble Salts in Soil Solution Samples from Fertilized and Unfertilized Histosols,
W74-08319 5B

Appraisal of the Water Resources of Eastern Palm Beach County, Florida,
W74-08445 4B

Effective Use of High Water Table Areas for Sanitary Landfill.
W74-08486 5E

Port Everglades Harbor, Broward County, Florida (Final Environmental Statement).
W74-08518 8A

What are Powers of Local Governmental Authorities Under Florida Law to Dispose of Derelict and Abandoned Vessels Found in or Near Local Navigable Waters,
W74-08533 6E

Municipal Powers Under Flirida Law with Respect to Protection of Environmentally Endangered Riparian Land,
W74-08534 6E

Easements: Judicial and Legislative Protection of the Public's Rights in Florida's Beaches,
W74-08540 6E

Boundary and Land Development Regulation Recommendations for the Big Cypress Area of Critical State Concern.
W74-08543 4A

A Model Water Use Act for a Riparian State--The Florida Experience,
W74-08545 6E

Electrophoresis and Coagulation Studies of Some Florida Phosphate Slimes,
W74-08591 5D

Quality of Surface Water in the Vicinity of Oil Exploration Sites, Big Cypress Area, South Florida,
W74-08596 5A

Inland Lakes.
W74-08659 6E

FLOTATION
Recent Developments in Treatment of Papermaking Effluents in France (Developpements recents du traitement des effluents de papeterie en France),
W74-08402 5D

Laboratory Flotation Studies of Tennessee Phosphates in the Presence of Slimes,
W74-08588 5D

Solubility of 1,1,2,2-Tetrabromoethane in Water as a Function of Temperature,
W74-08589 5B

FLOW
Two-Phase Flows in Porous Media,
W74-08303 2F

To Establish Viable Methods of Maintaining Waste Treatment Facility Efficiencies with Reference to Flow Variations.
W74-08398 5D

FLOW AUGMENTATION
Lamellar Sedimentation of Fiber-Carrying Waste Waters (Lamellsedimentering av fiberholdig vann),
W74-08437 5D

FLOW MEASUREMENT
Comparison of Numerical Methods Solving Flow Through Porous Media (Ein Vergleich Von Numerischen Verfahren Zur Loesung Von Sickerstroemungen),
W74-08194 2G

The Calibration and Use of a Conical Hot Film Anemometer Probe in Recirculating Water Flow,
W74-08222 2E

Automated Flow-Recording System for Field Drainage Monitoring--Direct Data Compilation of Surface and Subsurface Drain Flow,
W74-08267 4A

FLOW SEPARATION
Lamellar Sedimentation of Fiber-Carrying Waste Waters (Lamellsedimentering av fiberholdig vann),
W74-08437 5D

FLUORIDE DISTRIBUTION
Distribution of Fluoride in Waters of Tokyo Bay,
W74-08549 5B

FLY ASH
An Evaluation of the Adsorptive Properties of Fly Ash and Bark-Derived Activated Char,
W74-08435 5D

Sludge Incineration and Afterburning,
W74-08441 5D

FOG
Fog Modification--A Technology Assessment,
W74-08177 3B

FOG DISPERSAL
Fog Modification--A Technology Assessment,
W74-08177 3B

FOOD CHAINS
Estimation and Evaluation of Radioactive Contamination Through a Food Web in an Aquatic Ecosystem (1), An Application of the Compartment Model to Transfer of Radioactive Substances Through a Food Chain,
W74-08365 5B

FOOD NICHE
Food Niche of Graus Nigra Philippi (Osteichthyes, Labridae),
W74-08526 2I

FOOD PROCESSING INDUSTRY
Disposal of Industrial Trade Effluents from the Food Industries
W74-08468 5D

FOOD WEBS
Estimation and Evaluation of Radioactive Contamination Through a Food Web in an Aquatic Ecosystem (1), An Application of the Compartment Model to Transfer of Radioactive Substances Through a Food Chain
W74-08365 5B

FORAGE RESERVES
Natural Forage Reserve of Turkmen SSR and Ways of its Improvement to Develop Sheep-Raising. (In Russian).
W74-08547 3F

FORECASTING
Irrigation Number--A New Technique to Evaluate Irrigation Advance Distance.
W74-08266 3F

Average Weekly Rainfall and Probabilities During the Planting-Growing-Harvesting Period in South Carolina.
W74-08295 2B

Supply Curve for Thermal Efficiency.
W74-08509 6A

FORESTS
Characteristic Use of Genetic Principles in the Classification of North Kazakhstan Forests on the Ancient Crusts of Wheathering and on Quaternary Deposits, (In Russian).
W74-08182 2I

FOX RIVER (WIS)
Cellulosic Deposits in Benthal Environments: Occurrence, Evolution, and Decomposition.
W74-08423 5B

FRANCE
Recent Developments in Treatment of Papermaking Effluents in France (Developpements recents du traitement des effluents de papeterie en France),
W74-08402 5D

Pollution Abatement at the Venizel Mill of La Rochette-Cenpa (Lutte anti-pollution a l'usine de Venizel de la Rochette-Cenpa),
W74-08416 5D

Examples of the Use of the 'Seclar' Decanter in Treating Paper Industry Effluents (Exemples d'application du decanteur 'Seclar' au traitement d'effluents de l'industrie papetiere),
W74-08419 5D

Microbiological Comparison Between a Few Aquatic Mediums, (In French),
W74-08669 5C

FRANCE (SEINE RIVER)
A New Aspect of Pollution: Increase in the Salinity of Water During Its Use in Mills (Un nouvel aspect de la pollution: la salinite ajoutee a l'eau au cours de son utilisation dans les usines),
W74-08404 5B

FREQUENCY ANALYSIS
Rainfall Frequency Atlas for Missouri,
W74-08174 7C

FUNGI
Hydrocarbon Utilization by Cladosporium resinae,
W74-08613 5B

Studies on the Degradation of Petroleum by Filamentous Fungi,
W74-08619 5B

Bacterial Degradation of Mineral Oils at Low Temperatures,
W74-08625 5B

URROW IRRIGATION
Hydrodynamics of Surface Irrigation-Advance Phase,
W74-08384 8B

ALVESTON BAY (TEX)
Galveston Bay Hurricane Surge Study: Report 1. Effects of Proposed Barriers on Hurricane Surge Heights--Appendix A, Calibration Tests,
W74-08586 8B

AS CHROMATOGRAPHY
Quantitative Measurements of Inorganic Mercury and Organomercurials in Water and Biological Media by Gas-Liquid Chromatography,
W74-08415 5A

The Gas-Chromatographic Determination of Some Lignin Compounds in Surface Waters (Die gaschromatographische Bestimmung einiger Ligninverbindungen in Oberflaechengewaessern),
W74-08433 5A

ASES
Permeability of High Ash Papermill Sludge,
W74-08425 5D

ENETIC PRINCIPLES
Characteristic Use of Genetic Principles in the Classification of North Kazakhstan Forests on the Ancient Crusts of Wheathering and on Quaternary Deposits, (In Russian),
W74-08182 2I

EOCHEMISTRY
A Vessel for Collecting Subsurface Water Samples from Geothermal Drillholes,
W74-08366 4B

Use of Hydrochemistry for Interpreting Ground-Water Flow Systems in Central Nevada,
W74-08453 2F

EOMETRIC PROGRAMMING
A Cofferdam Design Optimization,
W74-08511 8A

EOMORPHOLOGY
Some Rates of Geomorphological Processes,
W74-08304 2J

EORGIA
A Guide to Natural Resource Information of Georgia.
W74-08487 10C

Measurement of Baseline Levels of Enteric Bacterial Activity in River Water,
W74-08635 5B

EOTHERMAL STUDIES
A Vessel for Collecting Subsurface Water Samples from Geothermal Drillholes,
W74-08366 4B

HANA (VOLTA LAKE)
Changes in the Heterotrophic Bacteria of Volta Lake, 1968-1971,
W74-08434 5C

GIRDWOOD (ALASKA)
Geology and Water Resources of the Girdwood-Alyeska Area, Alaska,
W74-08595 4B

GLACIAL DRIFT
Sedimentology and Bar Formation in the Upper Kicking Horse River, A Braided Outwash Stream,
W74-08297 2J

Geology and Water Resources of the Girdwood-Alyeska Area, Alaska,
W74-08595 4B

GLACIATION
Wetland Geology,
W74-08161 2L

GOVERNMENTAL INTERRELATIONS
Progress Evaluation Meeting in the Matter of Pollution of the Interstate Waters of the Missouri River, Omaha, Nebraska Area (Nebraska-Iowa-Missouri-Kansas).
W74-08529 5G

The Atlantic States' Claim to Offshore Oil Rights: United States v. Maine,
W74-08538 6E

Memorandum of Understanding Regarding Implementation of Certain Complementary Responsibilities--Notice.
W74-08566 6E

GRAIN SORGHUM
Grow Wheat and Grain Sorghum with Less Water.
W74-08265 3F

GRANTS
Coastal Zone Management Act of 1972.
W74-08581 6E

GRASSES
Considering Irrigated Grass. Take a Tip from New Mexico.
W74-08282 3F

Utilization Patterns of the Deep Water by a Weeping Lovegrass Crop (Eragrostis curvula Nees), in a Regosol Soil of the Pampean Semiarid Region. (In Spanish),
W74-08682 2I

GRASSLANDS
Movement of Nitrate Nitrogen in Some Grassland Soils of Southern Alberta,
W74-08329 5B

GRAUS-NIGRA
Food Niche of Graus Nigra Philippi (Osteichthyes, Labridae),
W74-08526 2I

GREAT BRITAIN
Turbulence Characteristics in a Smooth Open Channel of Circular Cross-Section (Caracteristiques de la Turbulence au Sein d'un Ecoulement a Surface Libre En Conduite Lisse De Section Circulaire,
W74-08192 8B

Small Balls Repeal Smell,
W74-08201 5D

The Potential Application of Satellites in River Regulation,
W74-08206 4A

Countercurrent Washing Turns the Tide Against Rising Effluent Costs,
W74-08228 5D

Disinfection of Water Using Chlorine Dioxide.
W74-08253 5D

Sewage Treatment and Disposal.
W74-08261 5D

GREAT BRITAIN (BIRMINGHAM)
Rippon Squashes Central Waste Treatment Precedent.
W74-08213 5E

GREAT BRITAIN (BRADFORD)
Reconstructing an Egg-Shaped Sewer.
W74-08249 8A

GREAT BRITAIN (BURNHAM-ON-SEA)
Utilitarian Leisure for Burnham-On-Sea.
W74-08262 5D

GREAT BRITAIN (E
Cost Effectiveness in Sewage Treatment.
W74-08263 5D

GREAT BRITAIN (GRANGEMOUTH)
Grangemouth Tunnel Sewer.
W74-08197 8A

GREAT BRITAIN (LETCHWORTH)
Letchworth Water Pollution Control Works.
W74-08260 5D

GREAT BRITAIN (PORTSMOUTH)
The River Itchen Scheme of the Portsmouth Water Company.
W74-08216 8A

GREAT LAKES
Our Great Lakes.
W74-08531 2H

GREECE
Sewage Treatment and Disposal.
W74-08261 5D

GROUNDWATER
Ground Water Pollution from Subsurface Excavations.
W74-08185 5

Water Availability, Coosa County, Alabama.
W74-08188 4A

Interstate and International Aquifers.
W74-08276 6E

Groundwater Levels in Nebraska, 1973.
W74-08367 4B

Stochastic Analysis of Groundwater Level Time Series in the Western United States.
W74-08368 2F

Ground-Water Resources of Duval County, Texas.
W74-08372 4B

Ground-Water Resources, Allegheny River Basin and Part of The Lake Erie Basin, New York.
W74-08380 2F

Water-Level Records for the Northern High Plains of Colorado, 1970-74,
W74-08381 4B

Appraisal of the Water Resources of Eastern Palm Beach County, Florida.
W74-08445 4B

Groundwater investigations in Singapore.
W74-08455 4B

Pollution Control--Who Puts the Dirt in the Drinking Water.
W74-08565 6E

GROUNDWATER

Waste Disposal Systems from a Groundwater Hydrology and Pollution Point of View,
W74-08594 5E

An Appraisal of the Groundwater Resources of the Upper Cape Fear River Basin, North Carolina,
W74-08605 4B

GROUNDWATER MANAGEMENT
Problems Arising from Over Exploitation of the Natural Water Reservoir in the Urban District of Milan (I Problemi Posti Dal Sovrasfruttamento Idrico Del Serbatoio Naturale Nella Conurbazione Milanese),
W74-08354 4B

GROUNDWATER MOVEMENT
Two-Phase Flows in Porous Media,
W74-08303 2F

Discharge and Travel Time for Ground-Water Conduits,
W74-08383 8B

Use of Hydrochemistry for Interpreting Ground-Water Flow Systems in Central Nevada,
W74-08453 2F

GROUNDWATER POLLUTION
Pollution Control--Who Puts the Dirt in the Drinking Water.
W74-08565 6E

GROUNDWATER QUALITY
Ground Water Quality Effects on Domestic Water Utilization,
W74-08287 5B

GROWTH RATES
The Impact of Growth on the Environment.
W74-08523 6G

HALOGENS
Solubility of 1,1,2,2-Tetrabromoethane in Water as a Function of Temperature,
W74-08589 5B

HARBORS
Port Everglades Harbor, Broward County, Florida (Final Environmental Statement).
W74-08518 8A

Operation and Maintenance of New Bedford Hurricane Barrier (Final Environmental Statement).
W74-08520 8D

Radiological Survey of New London Harbor, Thames River, Conn., and Environs,
W74-08645 5B

HAWAII
Floods in Punaluu-Hauula Area, Oahu, Hawaii,
W74-08310 7C

Honolulu Board of Water Supply Annual Report for the Year Ended June 30, 1973.
W74-08492 5G

HAZARDS
Preliminary System Development--Chemical Hazards Response Information System (CHRIS), Appendix VII--Supporting Information.
W74-08181 5B

Environmental Hazards of Large-Scale Developments,
W74-08601 6G

HEAVY MEDIA SEPARATION
Solubility of 1,1,2,2-Tetrabromoethane in Water as a Function of Temperature,
W74-08589 5B

HEAVY METALS
Water Transport of Heavy Metals in Solution and by Different Sizes of Particulate Solids,
W74-08238 5B

Absorption of Mercuric Cation by Tannins in Agricultural Residues,
W74-08314 5G

Heavy Metals in Agricultural Lands Receiving Chemical Sewage Sludges,
W74-08397 5E

HELMINTH FAUNA
Studies of the Helminth Fauna of Norway, XXVI: The Distribution of Cyathocephalus Truncatus (Pallas) in the Intestine of Brown Trout (Salmo Trutta L.),
W74-08699 2I

HETEROTROPHIC POTENTIAL
Heterotrophic Potential for Amino Acid Uptake in a Naturally Eutrophic Lake,
W74-08678 5C

HIGH PLAINS (COLO)
Water-Level Records for the Northern High Plains of Colorado, 1970-74,
W74-08381 4B

HIGHWAY EFFECTS
Environmental Research and Highways,
W74-08251 5B

HIGHWAYS
Erosion Control on Highway Construction.
W74-08178 4D

Water Pollution and Associated Effects from Street Salting,
W74-08306 5B

HISTORIC FLOODS
A Summary of Peak Stages and Discharges for the Flood of August 1973 in New Jersey,
W74-08374 2E

HONOLULU (H
Honolulu Board of Water Supply Annual Report for the Year Ended June 30, 1973.
W74-08492 5G

HOSPITALS
Results of Examinations of Hospital Waste Water (Ergebnisse der Untersuchungen von Krankenhausabwaessern),
W74-08286 5B

HOUSTON SHIP CHANNEL
Predicting Reaeration Coefficients for Polluted Estuary,
W74-08307 5B

HUMAN DISEASES
Free-Living Amoebae Isolated from Waters Frequented by People in the Vicinity of Poznan: Poland: Experimental Studies in Mice on the Pathogenicity of the Isolates,
W74-08687 5C

HUMAN INFECTIONS
Sanitary-Microbiological Investigations in Preventing Infections of Bacterial and Viral Etiology, (In Russian),
W74-08692 5C

HURRICANE
Galveston Bay Hurricane Surge Study Report 1. Effects of Proposed Barriers on Hurricane Surge Heights--Appendix A. Calibration Tests.
W74-08586 8B

HURRICANE CAMILLE (1969)
Satellite Views of Hurricane Camille.
W74-08291 2B

HURRICANES
Satellite Views of Hurricane Camille.
W74-08291 2B

Operation and Maintenance of New Bedford Hurricane Barrier (Final Environmental Statement)
W74-08520 8D

HYDRAULIC DESIGN
To Establish Viable Methods of Maintaining Waste Treatment Facility Efficiencies with Reference to Flow Variations.
W74-08398 5D

HYDRAULIC JUMP
Flow Characteristics of Sloping Channel Jumps,
W74-08387 8B

Observations on Hydraulic Jumps at Rounded Step,
W74-08391 8B

HYDRAULIC MODELS
Investigations of the Response of an Unconfined Aquifer to Localized Recharge.
W74-08234 2F

Outlet Works, Warm Springs Dam, Dry Creek, Russian River Basin, Sonoma County, California.
W74-08584 8A

Galveston Bay Hurricane Surge Study: Report 1. Effects of Proposed Barriers on Hurricane Surge Heights--Appendix A, Calibration Tests,
W74-08586 8B

HYDRAULIC PROPERTIES
Permeability of High Ash Papermill Sludge.
W74-08425 5D

HYDRAULIC STRUCTURES
New Roller Gate Improves the River Walk.
W74-08250 8A

HYDROCARBON OXIDIZERS
Microbial Degradation of Oil: Present Status, Problems, and Perspectives.
W74-08611 5B

HYDROCARBON POLLUTION
Hydrocarbons of Suspected Pollutant Origin in Aquatic Organisms of San Francisco Bay: Methods and Preliminary Results.
W74-08630 5B

HYDROCARBONOCLASTIC MICROORGANISMS
Production and Characterization of Emulsifying Factors from Hydrocarbonoclastic Yeast and Bacteria,
W74-08632 5B

HYDROCARBONS
Determination of Total Hydrocarbons in Sea Water at the Microgram Level with a Flow Calorimeter.
W74-08430 5A

DROGEOLOGY
Vetland Geology,
W74-08161 2L

nland Wetlands and Ground Water in Eastern Connecticut,
W74-08162 2F

Vetland Hydrology,
W74-08163 2L

he Ecological Role of Inland Wetlands,
W74-08164 2L

oad Log and Guide--Geology and Hydrology or Planning, Anchorage Area.
W74-08180 4A

Vell Yields in the Bedrock Aquifers of Maryand,
W74-08446 4B

Use of Hydrochemistry for Interpreting Ground-Water Flow Systems in Central Nevada,
W74-08453 2F

Groundwater investigations in Singapore,
W74-08455 4B

Geology and Water Resources of the Girdwood-Alyeska Area, Alaska,
W74-08595 4B

Water from the Coastal Plain Aquifers in the Washington, D.C., Metropolitan Area,
W74-08597 4B

Hydrogeology of Antietam Creek Basin,
W74-08607 2F

YDROGRAPHS
Time of Concentration--A Kinematic Wave Approach,
W74-08593 2E

YDROLOGIC DATA
Records of Water Wells, Springs, Oil- and Gas-Test Holes, and Chemical Analyses of Water for the Madison Limestone and Equivalent Rocks in the Powder River Basin and Adjacent Areas, Northeastern Wyoming,
W74-08296 4B

Ground-Water Resources of Duval County, Texas,
W74-08372 4B

Hydrological Activities in Singapore,
W74-08457 7C

Floods in Alabama--Magnitude and Frequency Based on Data Through September 30, 1971,
W74-08587 2E

Digest of the 1972 Catalog of Information on Water Data,
W74-08600 10D

YDROLYSIS
Hydrolysis and Availability of Pyrophosphate in Tropical Soils,
W74-08498 2G

YDROPONIC PLANTS
The Problems of Increased Life-Activity of Hydroponic Plants, (In Russian),
W74-08688 3F

CE
Water: A Comprehensive Treatise. Volume 1. Physics and Physical Chemistry of Water.
W74-08665 1A

ICE BREAKUP
Survey of the Seasonal Snow Cover in Alaska,
W74-08179 2C

ICE FOG
Fog Modification--A Technology Assessment,
W74-08177 3B

ILLINOIS
Riverfront Development: The Politics of Master Planning,
W74-08495 3D

Feasibility Study on Desalting Brackish Water from the Mt. Simon Aquifer in Northeastern Illinois.
W74-08499 3A

Drainage--Miscellaneous Provisions; Penalties.
W74-08576 6E

Environmental Radioactivity in Illinois, 1970,
W74-08646 5B

Control of Mine Drainage from Coal Mine Mineral Wastes: Phase II. Pollution Abatement and Monitoring,
W74-08661 5G

INCINERATION
Furnace Constructions for Incineration (Ofenkonstruktionen Fuer Die Abfallverbrennung).
W74-08248 5D

Examples of Sewage Sludge Incineration in the UK,
W74-08364 5D

Sludge Incineration and Afterburning,
W74-08441 5D

INDIA
Improving the Accuracy of Point-Gauge Measurement in High-Velocity Flows (Amelioration de la Precision de la Pointe de Mesure Dans Les Ecoulements Rapids),
W74-08195 7B

Bituminous Coal - A Substitute for Anthracite Filter Media in Two-Layer Filtration of Water,
W74-08350 5F

INDIA (MAHARASHTRA)
Soil Potassium Forms in Relation to Agroclimatic Conditions in Maharashtra,
W74-08378 2G

INDIANA
Multiobjective Redesign of the Big Walnut Project,
W74-08515 4A

Final Environmental Statement, West Terre Haute Levee, Wabash River, Indiana, Wabash River Basin.
W74-08660 8D

INDONESIA
Rational Use of Water,
W74-08466 6B

Summary Report on Pollution Control in Indonesia,
W74-08484 5G

Sea Pollution--Some Aspects and the Need to Fight It,
W74-08485 5B

INDONSIA
Water Resources, Environment and National Development--Volume I: Summary of Proceedings, and Volume II: Selected Papers.
W74-08454 5G

INDUSTRIAL PLANTS
Cleanup Down by the Old Mill Stream.
W74-08203 5G

INDUSTRIAL WASTES
Utilization of Industrial Wastes and Waste By-Products for Phosphorus Removal: An Inventory and Assessment,
W74-08394 5D

A New Aspect of Pollution: Increase in the Salinity of Water During Its Use in Mills (Un nouvel aspect de la pollution: la salinite ajoutee a l'eau au cours de son utilisation dans les usines),
W74-08404 5B

Treatment System Handles Flexo Ink and Starch Waste in Single Operation.
W74-08409 5D

Waste Water Problems of the Textile Industry. Part I. Oxygen Demand of Printing Paste Thickeners. (Problemi inerenti le acque di scarico nell'industria tessile. Io. La domanda di ossigeno di addensanti da stampa),
W74-08421 5B

Some Results of Water Purification at Viscose Rayon Factories (Nekotorye itogi raboty vodoochistnykh sooruzhennii predpriyatii viskoznykh volokon),
W74-08429 5D

Pollution Control of Discharges into Rivers, Streams and Sea,
W74-08469 5G

Pollution Control of Discharge Into Rivers, Lakes and Coastal Waters in the Philippines,
W74-08482 5G

Report on the Second Session of the Conference in the Matter of Pollution of the South Platte River Basin.
W74-08530 5G

Environmental Policies as a Congressional Requirement for Social Efficacy,
W74-08539 6E

Analyses of Tars, Chars, Gases, and Water Found in Effluents from the Synthane Process,
W74-08592 5A

INDUSTRIAL WATER
Problems Arising from Over Exploitation of the Natural Water Reservoir in the Urban District of Milan (I Problemi Posti Dal Sovrasfruttamento Idrico Del Serbatoio Naturale Nella Conurbazione Milanese),
W74-08354 4B

Replacement of the Anthracite Sublayer in Anion-Exchange Filters of Water Purification Equipment (Zamena antratsitovogo podsloya v anionitovykh fil'trakh vodoochistnykh ustanovok),
W74-08407 5D

Difficulties in Planning Water Supply Schemes in West Malaysia,
W74-08462 6B

INFILTRATION
Infiltration into a Swelling Material,
W74-08230 2G

INFILTRATION

Infiltration and Root Extraction from Subsurface Irrigation Laterals,
W74-08270 3F

Soil Moisture Profile Under Steady Infiltration,
W74-08273 2G

Transient Response of a Layered, Sloping Soil to Natural Rainfall in the Presence of a Shallow Water Table: Experimental Results,
W74-08375 2A

Industrial Processing with Membranes.
W74-08664 5D

INFILTRATION RATES

Determination of Water Intake Rate of Advance,
W74-08275 3F

INFILTROMETERS

Determination of Water Intake Rate of Advance,
W74-08275 3F

INFORMATION EXCHANGE

User's Guide to NODC's Data Services.
W74-08311 10A

Environmental Information Sources -- Engineering and Industrial Applications: A Selected Annotated Bibliography.
W74-08401 10C

Digest of the 1972 Catalog of Information on Water Data,
W74-08600 10D

INFORMATION RETRIEVAL

Preliminary System Development--Chemical Hazards Response Information System (CHRIS), Appendix VII--Supporting Information.
W74-08181 5B

A Guide to Natural Resource Information of Georgia.
W74-08487 10C

Digest of the 1972 Catalog of Information on Water Data,
W74-08600 10D

INJECTION WELLS

Ground Water Pollution From Subsurface Excavations: Part III. More on Pollution from Wells.
W74-08184 5B

INLAND WATERWAYS

Economics of Inland Water Transport,
W74-08508 4A

INLAND WETLANDS

Proceedings: First Wetlands Conference, June 20, 1973,
W74-08157 2L

INORGANIC REACTIONS

Inorganic Transformation of Added Phosphorus in Soil Relation to Soil Characteristics and Moisture Regime,
W74-08258 2G

INPUT-OUTPUT ANALYSIS

Technical and Economic Issues in the Water Quality Management of Yaquina Bay,
W74-08672 2L

INSECT BEHAVIOR

Insects (Chrysops Flies) in Connecticut Salt Marshes,
W74-08166 2L

INSECTICIDES

Residues of Mirex and Other Chlorinated Pesticides in Commercially Raised Catfish.
W74-08347 5C

INSTRUMENTATION

Improving the Accuracy of Point-Gauge Measurement in High-Velocity Flows (Amelioration de la Precision de la Pointe de Mesure Dans Les Ecoulements Rapids),
W74-08195 7B

Measurement and Monitoring Units for Waste Water (Mess-und Ueberwwachungsgeraete fuer Abwasser),
W74-08219 5A

The Calibration and Use of a Conical Hot Film Anemometer Probe in Recirculating Water Flow,
W74-08222 2E

Water Quality Monitoring Experience in the Somerset River Authority Area, 1968-1972,
W74-08360 5A

INSURANCE

A Bill to Provide for a National Program of Disaster Insurance.
W74-08552 6E

INTERNATION LAW

Lower Rio Grande Flood Control Project, Texas.
W74-08521 8A

INTERNATIONAL LAW

The Deep Seabed Hard Mineral Resources Act--A Negative View,
W74-08658 6E

INTERNATIONAL WATERS

Lower Rio Grande Flood Control Project, Texas.
W74-08521 8A

INVESTIGATIONS

The Friction Factors of Oscillating Pipe Flows,
W74-08259 8B

ION EXCHANGE

Nitrate Removed at Water Treatment Plant,
W74-08317 5F

Evaluation of Ion Exchange Processes for Treatment of Mine Drainage Waters,
W74-08341 5D

Replacement of the Anthracite Sublayer in Anion-Exchange Filters of Water Purification Equipment (Zamena antratsitovogo podsloya v anionitovykh fil'trakh vodoochistnykh ustanovok),
W74-08407 5D

IONS

A New Approach to Soil Testing: II. Ionic Equilibria Involving H, K, Ca, Mg, Mn, Fe, Cu, Zn, Na, P, and S,
W74-08281 2G

IRON COMPOUNDS

Utilization of Industrial Wastes and Waste By-Products for Phosphorus Removal: An Inventory and Assessment,
W74-08394 5D

IRRADIATION

An Experimental Irradiation Facility for the Sterilization of Sewage Sludge (Eine Versuchsbestrahlungsanlage Zur Hygienisierung Von Klaerschlamm),
W74-08198 5D

IRRIGATION

Infiltration and Root Extraction from Subsurface Irrigation Laterals.
W74-08270 3F

Water Relations and Growth of Cotton in Drying Soil.
W74-08272 2G

Considering Irrigated Grass Take a Tip from New Mexico
W74-08282 3F

Operation and Maintenance of Irrigation and Drainage Systems Section III--Operation
W74-08318 4A

IRRIGATION DESIGN

Irrigation Number--A New Technique to Evaluate Irrigation Advance Distance,
W74-08266 3F

IRRIGATION ENGINEERING

Irrigation Number--A New Technique to Evaluate Irrigation Advance Distance,
W74-08266 3F

IRRIGATION PRACTICES

Grow Wheat and Grain Sorghum with Less Water.
W74-08265 3F

Irrigation Number--A New Technique to Evaluate Irrigation Advance Distance,
W74-08266 3F

Center Pivot Problems.
W74-08283 3F

Gated Pipe and Reuse System.
W74-08284 3F

Maximum Corn Yields With Minimum Water.
W74-08312 3F

Uniform Irrigation with Low-Pressure Trickle Systems,
W74-08323 3F

Improved Water Management for Paddy Rice Production in the Philippines,
W74-08464 3F

IRRIGATION PROGRAMS

Objectives of Irrigation Management Committee,
W74-08264 3F

Grow Wheat and Grain Sorghum with Less Water.
W74-08265 3F

IRRIGATION SYSTEMS

Gated Pipe and Reuse System.
W74-08284 3F

Operation and Maintenance of Irrigation and Drainage Systems: Section III--Operation.
W74-08318 4A

Uniform Irrigation with Low-Pressure Trickle Systems,
W74-08323 3F

IRRIGATION WATER

Digital-Model Study of Ground-Water Hydrology, Columbia Basin Irrigation Project Area, Washington,
W74-08382 2F

Sediment Routing in Irrigation Canal Systems,
W74-08385 2J

SRAEL
Evaporation from Bare Soil in a Coastal Environment,
W74-08305 2D

A 6000 Gallon/Ton Fine Paper Machine Water System,
W74-08424 5D

TALY (MILAN)
Problems Arising from Over Exploitation of the Natural Water Reservoir in the Urban District of Milan (I Problemi Posti Dal Sovrasfruttamento Idrico Del Serbatoio Naturale Nella Conurbazione Milanese),
W74-08354 4B

APAN
Thermodynamics of Soil Water: IV. Chemical Potential of Soil Water,
W74-08191 2G

Estimation and Evaluation of Radioactive Contamination Through a Food Web in an Aquatic Ecosystem (1), An Application of the Compartment Model to Transfer of Radioactive Substances Through a Food Chain,
W74-08365 5B

APAN (LAKE HARUMA)
Chemical Composition and Molecular Weight Distribution of Dissolved Organic Matter Produced by Bacterial Degradation of Green Algae,
W74-08494 5C

APAN (TOKOYO BAY)
Distribution of Fluoride in Waters of Tokyo Bay,
W74-08549 5B

UDICIAL DECISIONS
The Atlantic States' Claim to Offshore Oil Rights: United States v. Maine,
W74-08538 6E

Environmental Law--Water Pollution--Conflict Between Refuse Act Permit Program and National Environmental Policy Act,
W74-08550 5G

KANSAS
Navigation and Navigable Waters--Flood Control Regulations.
W74-08551 4A

KARST HYDROLOGY
Hydrogeology of Antietam Creek Basin,
W74-08607 2F

KENTUCKY
Low-Flow Characteristics of Kentucy Streams,
W74-08173 7C

KICKING HORSE RIVER (BC)
Sedimentology and Bar Formation in the Upper Kicking Horse River, A Braided Outwash Stream,
W74-08297 2J

KINEMATIC WAVE THEORY
Time of Concentration--A Kinematic Wave Approach,
W74-08593 2E

KINETICS
Process Kinetics for Denitrification,
W74-08320 5D

KJELDAHL METHOD
A Simple Digestion Procedure for Estimation of Total Nitrogen in Soils and Sediments,
W74-08324 5B

KLAMATH LAKE (ORE)
Heterotrophic Potential for Amino Acid Uptake in a Naturally Eutrophic Lake,
W74-08678 5C

LABORATORIES
Environmental Research in 1973--Annual Report.
W74-08309 5G

LABORATORY TESTS
The Accumulation of Organic and Inorganic Mercury Compounds by the Eastern Oyster (Crassostrea virginica),
W74-08346 5C

Cadmium Uptake and Time Dependent Alterations in Tissue Levels in the White Catfish Ictalurus catus (Pisces: Ictaluridae),
W74-08348 5C

LAKE APOPKA (FLA)
Concentrations of Nitrogen, Phosphorus, Potassium, and Total Soluble Salts in Soil Solution Samples from Fertilized and Unfertilized Histosols,
W74-08319 5B

LAKE ERIE
Our Great Lakes.
W74-08531 2H

LAKE HURON
Our Great Lakes.
W74-08531 2H

LAKE MICHIGAN
Our Great Lakes.
W74-08531 2H

LAKE ONTARIO
Our Great Lakes.
W74-08531 2H

LAKE SUPERIOR
Our Great Lakes.
W74-08531 2H

LAKE TAHOE
Limnological Studies and Remote Sensing of the Upper Truckee River Sediment Plume in Lake Tahoe, California-Nevada,
W74-08302 2J

LAKES
Inland Lakes.
W74-08659 6E

Preliminary Papers for UNESCO-IBP Symposium on Productivity Problems of Freshwaters.
W74-08673 5C

LAND CLASSIFICATION
A Detailed Procedure for the Use of Small-Scale Photography in Land Use Classification.
W74-08299 4A

LAND DEVELOPMENT
The Metropolitan Toronto and Region Waterfront Plan, 1972-1976.
W74-08489 6B

LAND DISPOSAL (WASTES)
Waste Disposal Systems from a Groundwater Hydrology and Pollution Point of View,
W74-08594 5E

LAND FILLS
Municipal Powers Under Flirida Law with Respect to Protection of Environmentally Endangered Riparian Land,
W74-08534 6E

LAND MANAGEMENT
Heavy Metals in Agricultural Lands Receiving Chemical Sewage Sludges,
W74-08397 5E

Boundary and Land Development Regulation Recommendations for the Big Cypress Area of Critical State Concern.
W74-08543 4A

Coastal Zone Management Act of 1972.
W74-08581 6E

LAND RECLAMATION
Mining Act of 1971.
W74-08575 6E

LAND RESOURCES
A Guide to Natural Resource Information of Georgia.
W74-08487 10C

LAND USE
A Parametric Study of Water Resource Variables in a Delta Region of South Louisiana...Bayou Lafourche Volume I - Technical Discussion, Volume II - Appendices.
W74-08289 5B

Identification and Control of Pollution from Salt Water Intrusion.
W74-08293 5B

Monitoring Flood Damage with Satellite Imagery.
W74-08294 4A

A Detailed Procedure for the Use of Small-Scale Photography in Land Use Classification.
W74-08299 4A

Water and Sewer Supply Decisions: A Case Study of the Washington Suburban Sanitary Commission.
W74-08497 5G

Definition of Critical Coastal Areas and Approaches to Standards for Management.
W74-08532 2L

Environmental Hazards of Large-Scale Developments.
W74-08601 6G

Coastal Ecosystems. Ecological Considerations for Management of the Coastal Zone.
W74-08642 2L

LANDFILLS
Anaerobic Biological Stabilization of Sanitary Landfill Leachate.
W74-08448 5D

Effective Use of High Water Table Areas for Sanitary Landfill.
W74-08486 5E

The Metropolitan Toronto and Region Waterfront Plan, 1972-1976.
W74-08489 6B

LANDSLIDES
Road Log and Guide--Geology and Hydrology for Planning, Anchorage Area.
W74-08180 4A

LAW OF THE SEA
The Deep Seabed Hard Mineral Resources Act--A Negative View,
W74-08658 6E

LEACHING
Saline-Seep Development in Dryland Soils of Northeastern Montana,
W74-08300 3C

Recovery of N15-Labeled Fertilizers in Field Experiments,
W74-08315 5B

Increased Denitrification in Soils by Additions of Sulfur as an Energy Source,
W74-08322 5B

Agricultural Chemicals in Relation to Environmental Quality: Chemical Fertilizers, Present and Future,
W74-08325 5B

Anaerobic Biological Stabilization of Sanitary Landfill Leachate,
W74-08448 5D

Rates of Salt Solution in the Permian Basin,
W74-08608 2K

LEGAL ASPECTS
What are Powers of Local Governmental Authorities Under Florida Law to Dispose of Derelict and Abandoned Vessels Found in or Near Local Navigable Waters,
W74-08533 6E

LEGISLATION
The Connecticut Tidal Wetlands Survey,
W74-08158 6E

The Connecticut Tidal Wetlands Survey,
W74-08159 6E

Inland Wetland Soils,
W74-08160 2G

Cleanup Down by the Old Mill Stream.
W74-08203 5G

Water Pollution and Environmental Health,
W74-08479 5G

Utah Environmental Problems and Legislative Response: II, Legislative Response,
W74-08535 5G

Environmental Policies as a Congressional Requirement for Social Efficacy,
W74-08539 6E

Easements: Judicial and Legislative Protection of the Public's Rights in Florida's Beaches,
W74-08540 6E

A Model Water Use Act for a Riparian State--The Florida Experience,
W74-08545 6E

Environmental Law--Water Pollution--Conflict Between Refuse Act Permit Program and National Environmental Policy Act,
W74-08550 5G

A Bill to Provide for a National Program of Disaster Insurance.
W74-08552 6E

A Bill to Amend the Soil Conservation and Domestic Allotment Act.
W74-08554 6E

Conservation of Marine Life--Use of Liberty Ships by States as Offshore Artificial Reefs.
W74-08557 6E

Interim Policy Statement on Implementation, Federal Water Pollution Control Act Amendments of 1972.
W74-08563 6E

Pollution and Obstruction of Waters.
W74-08569 6E

Joint Flood Control Commission.
W74-08570 6E

Water and Sewerage Disposal Agencies.
W74-08571 6E

Flood Hazard Areas.
W74-08572 6E

Marine Fisheries.
W74-08574 6E

Water Pollution Control Facilities--Tax Exemption.
W74-08577 6E

Air and Water Pollution Control Permit Board.
W74-08579 6E

Coastal Zone Management Act of 1972.
W74-08581 6E

Inland Lakes.
W74-08659 6E

LEGISLATIONS
Drainage--Miscellaneous Provisions; Penalties.
W74-08576 6E

LENZING PULPING PROCESS
Pulp Industry and Environmental Protection (Zellstoff-Industrie und Umweltschutz),
W74-08436 5D

LESBISTES RETICULATUS
Degradation of Crude Oil by Yeasts and its Effects on Lesbistes reticulatus,
W74-08639 5C

LEVEES
Final Environmental Statement, West Terre Haute Levee, Wabash River, Indiana, Wabash River Basin.
W74-08660 8D

LIGNINS
Model Studies on Reactions Occurring in Oxidations of Lignin with Molecular Oxygen in Alkaline Media,
W74-08359 5B

Purification of Sulfite Mill Effluents from Lignosulfonates (Ochistka promstokov sulfitno-tsellyuloznogo proizvodstva ot lignosul'fonatov),
W74-08412 5D

The Gas-Chromatographic Determination of Some Lignin Compounds in Surface Waters (Die gaschromatographische Bestimmung einiger Ligninverbindungen in Oberflaechengewaessern),
W74-08433 5A

LIME
Primary Sludges Produced by the Addition of Lime to Raw Waste Water,
W74-08224 5D

Design and Performance Criteria for Settling Tanks for the Removal of Physical-Chemical Flocs,
W74-08396 5D

LIMESTONE COUNTY (ALA)
Surface-Water Availability, Limestone County, Alabama.
W74-08189 4A

LINEAR PROGRAMMING
Analysis of Water Reuse Alternatives in an Integrated Urban and Agricultural Area.
W74-08510 5D

Determination of the Discharge Policy for Existing Reservoir Networks.
W74-08513 4A

Multiobjective Analysis in Water Resource Planning.
W74-08514 4A

LIQUID WASTES
Small Balls Repeal Smell.
W74-08201 5D

Furnace Constructions for Incineration (Ofenkonstruktuonen Fuer Die Abfallverbrennung).
W74-08248 5D

Improved Control of Radioactive Wastes.
W74-08255 5D

LOCAL GOVERNMENTS
What are Powers of Local Governmental Authorities Under Florida Law to Dispose of Derelict and Abandoned Vessels Found in or Near Local Navigable Waters.
W74-08533 6E

Municipal Powers Under Flirida Law with Respect to Protection of Environmentally Endangered Riparian Land.
W74-08534 6E

LONG ISLAND (N
Nitrate Removed at Water Treatment Plant.
W74-08317 5F

LOS ANGELES (CALIF)
Methods Vary on MWD Pipelines.
W74-08193 8A

Best Effluent the Goal.
W74-08214 5D

Automation Comes to L.A..
W74-08225 5D

LOUISIANA
A Parametric Study of Water Resource Variables in a Delta Region of South Louisiana...Bayou Lafourche Volume I - Technical Discussion, Volume II - Appendices.
W74-08289 5B

Water Resources Council Report on the Pearl River Comprehensive Basin Study Mississippi and Louisiana.
W74-08522 4A

Water Pollution Control Facilities--Tax Exemption.
W74-08577 6E

The Relative Changes in n-Alkane Composition in Surface Water Slicks,
W74-08633 5B

Some Acute Effects of Low-Boiling Petroleum Fractions on the Cellular Structure of Fish Gills Under Field Conditions,
W74-08637 5C

FLOW
Plan for the Improvement of the Low Flow
ta Network in Alabama,
4-08175 7A

imating Low-Flow Frequency for Perennial
ssouri Ozarks Streams,
4-08599 4A

-FLOW FREQUENCY
w-Flow Characteristics of Kentucy Streams,
4-08173 7C

ROINVERTEBRATES
search to Determine the Environmental
sponse to the Deposition of Spoil on Salt
rshes Using Diked and Undiked Techniques.
4-08677 5C

ISON LAKES (WIS)
plications of Growth and Sorption Algal As-
s,
4-08154 5C

ISON LIMESTONE
cords of Water Wells, Springs, Oil- and Gas-
st Holes, and Chemical Analyses of Water
the Madison Limestone and Equivalent
cks in the Powder River Basin and Adjacent
eas, Northeastern Wyoming,
4-08296 4B

NTENANCE COSTS
e Pros and Cons of Automated Filters,
4-08226 5D

AYSIA
fficulties in Planning Water Supply Schemes
West Malaysia,
4-08462 6B

ater Resources Development in West Malay-
,
4-08463 3B

ater Pollution and Environmental Health,
4-08479 5G

AGEMENT
jectives of Irrigation Management Commit-
,
4-08264 3F

astal Ecosystems. Ecological Considerations
Management of the Coastal Zone,
4-08642 2L

GEMENT
e Citizen and Water Management: An Atlas
Water Attitudes in Southern Minnesota,
4-08288 6B

GNESIUM COMPOUNDS
lp Industry and Environmental Protection
ellstoff-Industrie und Umweltschutz),
4-08436 5D

PING
Detailed Procedure for the Use of Small-
ale Photography in Land Use Classification,
4-08299 4A

S
w-Flow Characteristics of Kentucy Streams,
4-08173 7C

infall Frequency Atlas for Missouri,
4-08174 7C

rface-Water Availability, Colbert County,
abama.
4-08187 4A

Water Availability, Coosa County, Alabama,
W74-08188 4A

Surface-Water Availability, Limestone County, Alabama,
W74-08189 4A

Surface-Water Availability, Etowah County, Alabama,
W74-08190 4A

The Citizen and Water Management: An Atlas of Water Attitudes in Southern Minnesota,
W74-08288 6B

Floods in the Vicinity of Crete, Nebraska,
W74-08444 7C

Water Atlas of the United States,
W74-08668 7C

MARGINAL COSTS
Potential for Marginal Cost Pricing in Water Resource Management,
W74-08496 6C

MARINE ANIMALS
Conservation of Marine Life--Use of Liberty Ships by States as Offshore Artificial Reefs.
W74-08557 6E

MARINE BIOLOGY
Conservation of Marine Life--Use of Liberty Ships by States as Offshore Artificial Reefs.
W74-08557 6E

MARINE GEOLOGY
The Deep Seabed Hard Mineral Resources Act--A Negative View,
W74-08658 6E

MARINE POLLUTION CONTROL
Project of the Agricultural and Marine Pollution Control Section, March 1973,
W74-08237 5G

MARINE WATER
National Sea Grant College and Program--Extension.
W74-08568 6E

MARSH PLANTS
Research to Determine the Environmental Response to the Deposition of Spoil on Salt Marshes Using Diked and Undiked Techniques.
W74-08677 5C

MARSHES
The Impact of Oil on Marshland Microbial Ecosystems,
W74-08631 5C

MARYLAND
Well Yields in the Bedrock Aquifers of Maryland,
W74-08446 4B

Water and Sewer Supply Decisions: A Case Study of the Washington Suburban Sanitary Commission,
W74-08497 5G

Hydrogeology of Antietam Creek Basin,
W74-08607 2F

Microbial Ecology and the Problem of Petroleum Degradation in Chesapeake Bay,
W74-08628 5B

MASS WASTING
Some Rates of Geomorphological Processes,
W74-08304 2J

MASSACHUSETTS
Operation and Maintenance of New Bedford Hurricane Barrier (Final Environmental Statement).
W74-08520 8D

A Bill to Preserve and Promote the Resources of the Connecticut River Valley.
W74-08553 6E

MATHEMATICAL MODELS
Optimization of the Assimilative Waste Capacity of the Unsaturated and Saturated Zones of an Unconfined Aquifer System.
W74-08152 5B

Probabilistic Models in the Design and Operation of a Multi-Purpose Reservoir System.
W74-08153 4A

Modeling Snowmelt Runoff in an Arctic Coastal Plain.
W74-08233 2C

Floodflows from Small Drainage Areas in Oklahoma: Progress Report and Data Compilation.
W74-08292 2E

Simulation of Water Quality in Tarawera River.
W74-08308 5B

Digital-Model Study of Ground-Water Hydrology, Columbia Basin Irrigation Project Area, Washington.
W74-08382 2F

Self-Diffusion Coefficients and Rotational Correlation Times in Polar Liquids. VI. Water.
W74-08439 1A

MEAN SEA LEVEL
Trends and Variability of Yearly Mean Sea Level 1893-1972.
W74-08643 2B

MEANDERS
The Development of Meanders in Natural River-Channels.
W74-08357 2E

Mechanism for Streamflow Meandering.
W74-08388 8B

MEASUREMENT
Improving the Accuracy of Point-Gauge Measurement in High-Velocity Flows (Amelioration de la Precision de la Pointe de Mesure Dans Les Ecoulements Rapids).
W74-08195 7B

Automated Method for Ortho-, Ortho-plus Hydrolyzable and Total Phosphate in Surface and Wastewaters.
W74-08208 5A

Measurement and Monitoring Units for Waste Water (Mess-und Ueberwwachungsgeraete fuer Abwasser).
W74-08219 5A

Direct Measurement of Water Movement in the Zone of Aeration.
W74-08256 2G

MEMBRANE PROCESSES
Reverse Osmosis and Ultrafiltration - A Survey of Auxiliary Apparatuses Available in this Field (Umgekehrte Osmose und Ultrafiltration - Ein Ueberblick Ueber die auf Diesem Gebiet Verfuegbaren Apparativen Hilfsmittel).
W74-08218 5D

MEMBRANE PROCESSES

Reverse Osmosis Membrane Filters for Seawater Pretreatment,
W74-08334 3A

Development of High-Pressure Spiral Membrane Elements for Seawater Desalination,
W74-08336 3A

Development of a One-Pass Hollow Fiber Seawater Desalination Module Having a Capacity of 2500-3000 GPD,
W74-08342 3A

Design and Construction of a Large Brackish Water Desalination Module,
W74-08343 3A

Development of a Reverse Osmosis Module for Wash Water Recycling in a Space Environment at 165 deg F,
W74-08344 5D

Role of Ultrafiltration in Industrial Effluent Problems,
W74-08408 5D

Brine Concentration by Electrodialysis, Phase I,
W74-08500 3A

Brine Concentration by Electrodialysis, Phase II,
W74-08501 3A

High Rejection Hollow Fiber Membranes for Desalination of Sea Water,
W74-08502 3A

Industrial Processing with Membranes.
W74-08664 5D

MEMBRANES

Brackish Water Desalting, Testing and Evaluation Procedures with Mobile Test Facility,
W74-08335 3A

Development of Large Spiral Membrane Reverse Osmosis Elements for Low-Cost Water Purification and Reclamation,
W74-08338 3A

Brackish Water Desalting Testing and Field Evaluation with Reverse Osmosis and Electrodialysis Pilot Plants,
W74-08339 3A

Development of a Reverse Osmosis Module for Wash Water Recycling in a Space Environment at 165 deg F,
W74-08344 5D

In-Situ Formed Condensation Polymers for Reverse Osmosis Membranes,
W74-08504 3A

MEMBRANES PROCESSES

Development of a Production Technique for Porous Stainless Steel Tubes,
W74-08503 8G

MERCURY

Neurological Changes in Cats Following Long-Term Diet of Mercury Contaminated Tuna,
W74-08200 5C

The Accumulation of Organic and Inorganic Mercury Compounds by the Eastern Oyster (Crassostrea virginica),
W74-08346 5C

A Simply Constructed and Adjustable Mercury Vapor Cell Mount,
W74-08379 7B

Quantitative Measurements of Inorganic Mercury and Organomercurials in Water and Biological Media by Gas-Liquid Chromatography,
W74-08415 5A

MERCURY VAPOR CELL

A Simply Constructed and Adjustable Mercury Vapor Cell Mount,
W74-08379 7B

METABOLISM

The Effect of Mineral Waters of the Kvasy Spa on Some Indices of Cholesterol and Sialic Acid Metabolism, (In Russian),
W74-08686 5C

METALS

The Surprise Factor in Marine Pollution Studies,
W74-08252 5B

METEOROLOGICAL DATA

Some Factors Affecting the Annual Rainfall of Singapore,
W74-08459 2B

Trends and Variability of Yearly Mean Sea Level 1893-1972,
W74-08643 2B

METHODOLOGY

The Counting of Aerobic Actinomycetes in Water Samples (Denombrement des Actinomycetes Aerobies De L'eau),
W74-08220 5A

Biological Methods for the Assessment of Water Quality. A Symposium Presented at the Seventy-Fifth Annual Meeting, June 26-29, 1972.
W74-08675 5A

METHYLMERCURY

Electroanalytical Studies of Methylmercury in Aqueous Solution,
W74-08362 5A

MEXICO

Lower Rio Grande Flood Control Project, Texas.
W74-08521 8A

MICROBIAL DEGRADATION

The Microbial Degradation of Oil Pollutants,
W74-08609 5B

Microbial-Facilitated Degradation of Oil: A Prospectus,
W74-08610 5B

Microbial Degradation of Oil: Present Status, Problems, and Perspectives,
W74-08611 5B

A Threnody Concerning the Biodegradation of Oil in Natural Waters,
W74-08612 5B

Hydrocarbon Utilization by Cladosporium resinae,
W74-08613 5B

Microbial Degradation of Aromatic Hydrocarbons,
W74-08614 5B

Microbial Degradation of Oil and Hydrocarbons in Continuous Culture,
W74-08615 5B

Microbial Decomposition Patterns Using Crude Oil,
W74-08617 5B

Studies on the Degradation of Petroleum b Filamentous Fungi.
W74-08619 5

Microbes and Petroleum Perspectives and Im plications,
W74-08621 5

Distribution and Abundance of Oil-Oxidizin Bacteria in the North Sea.
W74-08622 5

Marine Hydrocarbonoclastic Bacteria. Type and Range of Oil Degradation.
W74-08623 5

Bacterial Degradation of Petroleum Materia in Low Temperature Marine Environments.
W74-08626 5

Hydrocarbon Biodegradation in Alaska Waters.
W74-08627 5

Microbial Ecology and the Problem of Petrol um Degradation in Chesapeake Bay.
W74-08628 5

Alkane Degradation in Beach Sands.
W74-08629 5

The Relative Changes in n-Alkane Composition in Surface Water Slicks.
W74-08633 5

Estuarine Microbes and Organochlorine Pes cides (A Brief Review).
W74-08634 5

Inhibition of Bacterial Chemoreception Hydrocarbons.
W74-08638 5

Effects of Some Commercial Oil Herde Dispersants and Bacterial Inocula Biodegradation of Oil in Seawater.
W74-08640 5

Bacterial Seeding to Enhance Biodegradati of Oil Slicks.
W74-08641 5

MICROCLIMATOLOGY

Evaporation from Bare Soil in a Coastal E vironment,
W74-08305 2D

MICROORGANISMS

Studies on the Degradation of Petroleum Filamentous Fungi.
W74-08619 5

Heterotrophic Potential for Amino Acid U take in a Naturally Eutrophic Lake.
W74-08678 5

MINE ACIDS

Control of Mine Drainage from Coal M Mineral Wastes: Phase II. Pollution Abatem and Monitoring,
W74-08661 5G

MINE DRAINAGE

Evaluation of Ion Exchange Processes Treatment of Mine Drainage Waters,
W74-08341 5D

MINE WASTES

Mining Act of 1971.
W74-08575 6E

Operation of Mines.
W74-08580 6E

aboratory Flotation Studies of Tennessee hosphates in the Presence of Slimes,
/74-08588 5D

ecovery of Phosphates and Metals from hosphate Sludge by Solvent Extraction,
/74-08590 5D

lectrophoresis and Coagulation Studies of ome Florida Phosphate Slimes,
/74-08591 5D

NERAL INDUSTRY
he Deep Seabed Hard Mineral Resources Act- A Negative View,
/74-08658 6E

NERAL WATERS
he Effect of Mineral Waters of the Kvasy Spa n Some Indices of Cholesterol and Sialic Acid letabolism, (In Russian),
/74-08686 5C

NERALOGY
lineralogy of Surface Sediments from the anama Basin, Eastern Equatorial Pacific,
/74-08298 2J

NING ENGINEERING
lining Act of 1971.
/74-08575 6E

NITUNNELS
mall Tunnels, Large Potentials,
/74-08358 8A

NNESOTA
he Citizen and Water Management: An Atlas f Water Attitudes in Southern Minnesota,
/74-08288 6B

REX
Residues of Mirex and Other Chlorinated Pesti- ides in Commercially Raised Catfish,
/74-08347 5C

SSISSIPPI
Residues of Mirex and Other Chlorinated Pesti- ides in Commercially Raised Catfish,
/74-08347 5C

Water Resources Council Report on the Pearl River Comprehensive Basin Study Mississippi nd Louisiana.
/74-08522 4A

Air and Water Pollution Control Permit Board.
/74-08579 6E

SSOURI
Rainfall Frequency Atlas for Missouri,
/74-08174 7C

Estimating Low-Flow Frequency for Perennial Missouri Ozarks Streams,
/74-08599 4A

SSOURI RIVER
Progress Evaluation Meeting in the Matter of Pollution of the Interstate Waters of the Missouri River, Omaha, Nebraska Area (Nebraska-Iowa-Missouri-Kansas).
/74-08529 5G

ODEL STUDIES
A Parametric Study of Water Resource Variables in a Delta Region of South Louisiana...Bayou Lafourche Volume I - Technical Discussion, Volume II - Appendices,
/74-08289 5B

Model Studies on Reactions Occurring in Oxidations of Lignin with Molecular Oxygen in Alkaline Media,
W74-08359 5B

Flow Characteristics of Sloping Channel Jumps,
W74-08387 8B

Concepts of Pollution and Its Control,
W74-08422 5G

Systems Planning Design: Case Studies in Modeling, Optimization, and Evaluation,
W74-08506 6A

MOLECULAR STRUCTURE
Self-Diffusion Coefficients and Rotational Correlation Times in Polar Liquids. VI. Water,
W74-08439 1A

MOLECULAR WEIGHT
Chemical Composition and Molecular Weight Distribution of Dissolved Organic Matter Produced by Bacterial Degradation of Green Algae,
W74-08494 5C

MOLYBDATE
Retention and Release of Applied Molybdenum to Soils Under Permanent Water-Logged Condition,
W74-08209 2G

MOLYBDENUM
Retention and Release of Applied Molybdenum to Soils Under Permanent Water-Logged Condition,
W74-08209 2G

MONITORING
Measurement and Monitoring Units for Waste Water (Mess-und Ueberwwachungsgeraete fuer Abwasser),
W74-08219 5A

Recipient Capacity to Limit Discharge of Pollutants to Receiving Waters,
W74-08351 5B

Water Quality Monitoring Experience in the Somerset River Authority Area, 1968-1972,
W74-08360 5A

Chemical Dosage Control for Phosphorus Removal.
W74-08400 5D

Test and Evaluation of Oil Pollution Abatement Devices for Shipboard Use, Phase 1,
W74-08450 5G

Toxicity Control of Industrial Wastewaters and Pesticide-Polluted Waters in Vietnam,
W74-08480 5C

Summary of Environmental Monitoring at Philadelphia, 1958-1971,
W74-08648 5B

Tritium Burdens in Two Arctic Villages,
W74-08649 5B

MONTANA
Saline-Seep Development in Dryland Soils of Northeastern Montana,
W74-08300 3C

Manual for Calculation of Conventional Water Treatment Costs,
W74-08333 3A

Clarks Fork Yellowstone River Remote Sensing Study,
W74-08386 2J

MONTMORILLONITE
Thermodynamics of Soil Water: IV. Chemical Potential of Soil Water,
W74-08191 2G

MOZAMBIQUE
Available Water in Some Great Groups of Mozambique Soils,
W74-08313 2G

MULTIPHASE FLOW
Two-Phase Flows in Porous Media,
W74-08303 2F

MULTIPLE-PURPOSE PROJECTS
Multiobjective Analysis in Water Resource Planning,
W74-08514 4A

Multiobjective Redesign of the Big Walnut Project,
W74-08515 4A

MULTIPLE-PURPOSE RESERVOIRS
Probabilistic Models in the Design and Operation of a Multi-Purpose Reservoir System,
W74-08153 4A

Determination of the Discharge Policy for Existing Reservoir Networks,
W74-08513 4A

Water Resources Council Report on the Pearl River Comprehensive Basin Study Mississippi and Louisiana.
W74-08522 4A

MUNICIPAL WASTES
The Chemical Treatment of Municipal Waste Water (Zur Chemischen Behandlung von Staedtischen Abwassern),
W74-08199 5D

Water Resources: Key to Western Future.
W74-08204 5G

Chemical Dosage Control for Phosphorus Removal.
W74-08400 5D

Automatic Waste Sludge Sampler,
W74-08442 5A

Report on the Second Session of the Conference in the Matter of Pollution of the South Platte River Basin.
W74-08530 5G

MUNICIPAL WATER
Manual for Calculation of Conventional Water Treatment Costs,
W74-08333 3A

Problems Arising from Over Exploitation of the Natural Water Reservoir in the Urban District of Milan (I Problemi Posti Dal Sovrasfruttamento Idrico Del Serbatoio Naturale Nella Conurbazione Milanese),
W74-08354 4B

Development of Water Supply in Vietnam,
W74-08460 5G

Municipal Wastewater Reclamation and Reuse,
W74-08461 5D

Difficulties in Planning Water Supply Schemes in West Malaysia,
W74-08462 6B

Detection and Quantitative Determination of Salmonellae in Surface Waters and in the Water of a Municipal Water Supply System, (In Russian),
W74-08693 5A

MUSSELS
Research on the Culture of Certain Common Marine Organisms in Singapore Waters,
W74-08477 3F

NARRAGANSETT BAY (R
Bacterial Degradation of Petroleum Materials in Low Temperature Marine Environments,
W74-08626 5B

NATIONAL ENVIRONMENTAL POLICY ACT
Environmental Law--Water Pollution--Conflict Between Refuse Act Permit Program and National Environmental Policy Act,
W74-08550 5G

NATURAL RESOURCES
A Guide to Natural Resource Information of Georgia.
W74-08487 10C

NAVIGABLE WATERS
What are Powers of Local Governmental Authorities Under Florida Law to Dispose of Derelict and Abandoned Vessels Found in or Near Local Navigable Waters,
W74-08533 6E

In Re Chinese Maritime Trust, Ltd. (Limitation on Liability for Sunken Vessel).
W74-08657 6E

NAVIGATION
Project of the Agricultural and Marine Pollution Control Section, March 1973,
W74-08237 5G

Submerged and Submersible Lands of Oregon.
W74-08516 6E

NEBRASKA
Gated Pipe and Reuse System.
W74-08284 3F

A Programmed Sampler for Runoff and Bedloads,
W74-08361 5A

Groundwater Levels in Nebraska, 1973,
W74-08367 4B

Floods in the Vicinity of Crete, Nebraska,
W74-08444 7C

NEMATODES
Studies on the Development of the Nematode Rhabdochona (Filochona) ergensi Moravec, 1968,
W74-08684 2I

NETWORK DESIGN
A Plan for the Improvement of the Low Flow Data Network in Alabama,
W74-08175 7A

NEUROLOGICAL DISTURBANCES (CATS)
Neurological Changes in Cats Following Long-Term Diet of Mercury Contaminated Tuna,
W74-08200 5C

NEUTROLOSIS
Application of Reverse Osmosis to Acid Mine Drainage Treatment,
W74-08155 5D

NEVADA
Limnological Studies and Remote Sensing of the Upper Truckee River Sediment Plume in Lake Tahoe, California-Nevada,
W74-08302 2J

Use of Hydrochemistry for Interpreting Ground-Water Flow Systems in Central Nevada,
W74-08453 2F

Water Surveillance Programs, November 1972
W74-08651 5B

Water Surveillance Programs, February 1973 and 1972, Special Analyses.
W74-08652 5B

Water Surveillance Programs, April-May 1973
W74-08655 5B

NEW JERSEY
A Summary of Peak Stages and Discharges for the Flood of August 1973 in New Jersey,
W74-08374 2E

Pollution and Obstruction of Waters.
W74-08569 6E

Joint Flood Control Commission.
W74-08570 6E

Water and Sewerage Disposal Agencies,
W74-08571 6E

Flood Hazard Areas.
W74-08572 6E

NEW LONDON HARBOR
Radiological Survey of New London Harbor, Thames River, Conn., and Environs,
W74-08645 5B

NEW MEXICO
Considering Irrigated Grass. Take a Tip from New Mexico.
W74-08282 3F

Brackish Water Desalting Testing and Field Evaluation with Reverse Osmosis and Electrodialysis Pilot Plants,
W74-08339 3A

Design and Construction of a Large Brackish Water Desalination Module,
W74-08343 3A

NEW YORK
Nitrate Removed at Water Treatment Plant,
W74-08317 5F

Ground-Water Resources, Allegheny River Basin and Part of The Lake Erie Basin, New York,
W74-08380 2F

Spur Channel to Astoria Waterfront, East River, New York (Final Environmental Statement).
W74-08519 8A

State V Bishop (Action for Public Nuisance and Trepass in Filling Area Below High Water Mark of Bay).
W74-08573 6E

Marine Fisheries.
W74-08574 6E

Radioactivity in New York State Surface Water, July-December 1971.
W74-08654 5B

NEW YORK CITY
Systems Analysis of Large Scale Public Facilities: New York City's Water Supply Network as a Case Study.
W74-08507 3D

NEW ZEALAND (TARAWERA RIVER)
Simulation of Water Quality in Tarawera River
W74-08308 5B

NIGERIA
Hydrolysis and Availability of Pyrophosphate in Tropical Soils.
W74-08498 2G

NITRATES
A Computer Model for Predicting Nitrate and Other Solutes of Agricultural Drain Water
W74-08280 5B

Nitrate Removed at Water Treatment Plant.
W74-08317 5F

Fate of Nitrate from Manure and Inorganic Nitrogen in A Clay Soil Cropped to Continuous Corn,
W74-08321 5B

Increased Denitrification in Soils by Additions of Sulfur as an Energy Source.
W74-08322 5B

Determination of Nitrate in Water with a New Construction of Ion-Selective Electrode.
W74-08420 5A

NITRIFICATION
The Share Taken by Nitrification Processes in the Biochemical Oxygen Demand (BOD) in the Water of the River Elbe. (In German).
W74-08695 5A

NITRIFYING BACTERIA
Determination of the Activity of Nitrifying Bacteria in Surface Waters by a Modified Bod-Test. (In German).
W74-08694 5B

NITROGEN
Recovery of N15-Labeled Fertilizers in Field Experiments,
W74-08315 5B

Concentrations of Nitrogen, Phosphorus, Potassium, and Total Soluble Salts in Soil Solution Samples from Fertilized and Unfertilized Histosols.
W74-08319 5B

Fate of Nitrate from Manure and Inorganic Nitrogen in A Clay Soil Cropped to Continuous Corn,
W74-08321 5B

A Simple Digestion Procedure for Estimation of Total Nitrogen in Soils and Sediments.
W74-08324 5B

Agricultural Chemicals in Relation to Environmental Quality: Chemical Fertilizers, Present and Future,
W74-08325 5B

Chemical and Biochemical Considations for Maximizing the Efficiency of Fertilizer Nitrogen,
W74-08326 5B

Recycling and Recovery of Nitrogen, Phosphorus, and Potassium by Coastal Bermudagrass: I. Effect of Sources and Rates of Nitrogen Under a Clipping System,
W74-08327 5B

Recycling and Recovery of Nitrogen, Phosphorus, and Potassium by Coastal Bermudagrass: II. Under Grazing Conditions with Two Stocking Rates,
W74-08328 5B

Movement of Nitrate Nitrogen in Some Grassland Soils of Southern Alberta,
W74-08329 5B

Chemical Distribution of Residual Fertilizer Nitrogen in Soil as Revealed by Nitrogen-15 Studies,
W74-08332 5B

NON-STRUCTURAL ALTERNATIVES
The Use of Questionnaires in Collecting Information for Urban Flood Control Planning,
W74-08151 6F

NON-STRUCTURAL DESIGN
The Use of Questionnaires in Collecting Information for Urban Flood Control Planning,
W74-08151 6F

NONLINEAR PROGRAMMING
A Cofferdam Design Optimization,
W74-08511 8A

NORTH CAROLINA
Flood Plain Information; Grants Creek - Town Creek, City of Salisbury, North Carolina.
W74-08490 4A

Mining Act of 1971.
W74-08575 6E

An Appraisal of the Groundwater Resources of the Upper Cape Fear River Basin, North Carolina,
W74-08605 4B

NORTH SEA
Distribution and Abundance of Oil-Oxidizing Bacteria in the North Sea,
W74-08622 5B

NORWAY
Studies of the Helminth Fauna of Norway, XXVI: The Distribution of Cyathocephalus Truncatus (Pallas) in the Intestine of Brown Trout (Salmo Trutta L.),
W74-08699 2I

NORWAY (DRAMMENS RIVER)
Pollution of the Drammens River by the Wood-Processing Industry (Treforedlingsindustriens utslipp til Drammensvassdraget),
W74-08428 5B

NORWAY (RIVER SULDALSLAGEN)
Notes on the Feeding Relationships of Trout (Salmo trutta L.) and Salmon (Salmo salar L.) in the River Suldalslagen, West Norway,
W74-08680 2I

NORWAY (SULDALSLAGEN)
An Investigation of the Food of One- to Four-Month-Old Salmon Fry (Salmo salar L.) in the Suldalslagen, West Norway,
W74-08679 2I

NUCLEAR POWERPLANTS
Environmental Radioactivity in Illinois, 1970,
W74-08646 5B

NUCLEAR WASTES
Interim Policy Statement on Implementation, Federal Water Pollution Control Act Amendments of 1972.
W74-08563 6E

Memorandum of Understanding Regarding Implementation of Certain Complementary Responsibilities--Notice.
W74-08566 6E

Tritium Surveillance System, April-June 1973.
W74-08656 5B

NUISANCE (LEGAL ASPECTS)
Operation of Mines.
W74-08580 6E

NUMERICAL ANALYSIS
Comparison of Numerical Methods Solving Flow Through Porous Media (Ein Vergleich Von Numerischen Verfahren Zur Loesung Von Sickerstroemungen),
W74-08194 2G

Investigations of the Response of an Unconfined Aquifer to Localized Recharge,
W74-08234 2F

NUTRIENT REMOVAL
Recovery of N15-Labeled Fertilizers in Field Experiments,
W74-08315 5B

Fate of Nitrate from Manure and Inorganic Nitrogen in A Clay Soil Cropped to Continuous Corn,
W74-08321 5B

NUTRIENTS
Considerations in Application of Microorganisms to the Environment for Degradation of Petroleum Products,
W74-08618 5B

OAHU (HAWAII)
Floods in Punaluu-Hauula Area, Oahu, Hawaii,
W74-08310 7C

OCEANOGRAPHIC DATA
User's Guide to NODC's Data Services.
W74-08311 10A

Trends and Variability of Yearly Mean Sea Level 1893-1972,
W74-08643 2B

OCEANOGRAPHY
User's Guide to NODC's Data Services.
W74-08311 10A

OCEANS
The Surprise Factor in Marine Pollution Studies,
W74-08252 5B

OCONEE RIVER (GEO)
Measurement of Baseline Levels of Enteric Bacterial Activity in River Water,
W74-08635 5B

ODOR
Small Balls Repeal Smell,
W74-08201 5D

Sludge Incineration and Afterburning,
W74-08441 5D

OIL
Oil Pollution Prohibited Zones--Regulations.
W74-08555 6E

Vessels in Foreign and Domestic Trades--Pollution of Coastal and Navigable Waters.
W74-08556 6E

OIL DEGRADATION
Utilization of Crude Oil Hydrocarbons by Mixed Cultures of Marine Bacteria,
W74-08616 5B

Microbial Decomposition Patterns Using Crude Oil,
W74-08617 5B

Considerations in Application of Microorganisms to the Environment for Degradation of Petroleum Products,
W74-08618 5B

OIL FIELDS
Quality of Surface Water in the Vicinity of Oil Exploration Sites, Big Cypress Area, South Florida,
W74-08596 5A

OIL INDUSTRY
Pollution Control of Discharges into Rivers, Streams and Sea,
W74-08469 5G

Petroleum Refinery Effluent Quality Control,
W74-08473 5D

OIL POLLUTION
Oil Pollution Prohibited Zones--Regulations.
W74-08555 6E

Vessels in Foreign and Domestic Trades--Pollution of Coastal and Navigable Waters.
W74-08556 6E

Pollution Prevention Inspection of Vessels and Deck and Engineer Officers' Licenses.
W74-08559 6E

Oil Pollution Prevention--Non-Transportation-Related Onshore and Offshore Facilities--Proposed Rules.
W74-08561 6E

Pollution of Coastal and Navigable Waters (CFR Title 19, Part 4).
W74-08562 6E

National Oil and Hazardous Substances Pollution Contingency Plan.
W74-08564 6E

The Microbial Degradation of Oil Pollutants,
W74-08609 5B

Microbial-Facilitated Degradation of Oil: A Prospectus,
W74-08610 5B

Microbial Degradation of Oil: Present Status, Problems, and Perspectives,
W74-08611 5B

A Threnody Concerning the Biodegradation of Oil in Natural Waters,
W74-08612 5B

Hydrocarbon Utilization by Cladosporium resinae,
W74-08613 5B

Microbial Degradation of Aromatic Hydrocarbons,
W74-08614 5B

Microbial Degradation of Oil and Hydrocarbons in Continuous Culture,
W74-08615 5B

Utilization of Crude Oil Hydrocarbons by Mixed Cultures of Marine Bacteria,
W74-08616 5B

Microbial Decomposition Patterns Using Crude Oil,
W74-08617 5B

OIL POLLUTION

Considerations in Application of Microorganisms to the Environment for Degradation of Petroleum Products,
W74-08618 5B

Studies on the Degradation of Petroleum by Filamentous Fungi,
W74-08619 5B

Microbial Degradation of Crude Oil and the Various Hydrocarbon Derivatives,
W74-08620 5B

Microbes and Petroleum: Perspectives and Implications,
W74-08621 5B

Distribution and Abundance of Oil-Oxidizing Bacteria in the North Sea,
W74-08622 5B

Marine Hydrocarbonoclastic Bacteria: Types and Range of Oil Degradation,
W74-08623 5B

Biodegradation of Oil in Seawater: Limiting Factors and Artificial Stimulation,
W74-08624 5B

Bacterial Degradation of Mineral Oils at Low Temperatures,
W74-08625 5B

Bacterial Degradation of Petroleum Materials in Low Temperature Marine Environments,
W74-08626 5B

Hydrocarbon Biodegradation in Alaskan Waters,
W74-08627 5B

Microbial Ecology and the Problem of Petroleum Degradation in Chesapeake Bay,
W74-08628 5B

Alkane Degradation in Beach Sands,
W74-08629 5B

Hydrocarbons of Suspected Pollutant Origin in Aquatic Organisms of San Francisco Bay: Methods and Preliminary Results,
W74-08630 5B

The Impact of Oil on Marshland Microbial Ecosystems,
W74-08631 5C

Production and Characterization of Emulsifying Factors from Hydrocarbonoclastic Yeast and Bacteria,
W74-08632 5B

The Relative Changes in n-Alkane Composition in Surface Water Slicks,
W74-08633 5B

Measurement of Baseline Levels of Enteric Bacterial Activity in River Water,
W74-08635 5B

Sublethal Effects of the Water Soluble Component of Oil: Chemical Communication in the Marine Environment,
W74-08636 5C

Some Acute Effects of Low-Boiling Petroleum Fractions on the Cellular Structure of Fish Gills Under Field Conditions,
W74-08637 5C

Inhibition of Bacterial Chemoreception by Hydrocarbons,
W74-08638 5C

Degradation of Crude Oil by Yeasts and its Effects on Lesbistes reticulatus,
W74-08639 5C

Effects of Some Commercial Oil Herders, Dispersants and Bacterial Inocula on Biodegradation of Oil in Seawater,
W74-08640 5C

Bacterial Seeding to Enhance Biodegradation of Oil Slicks,
W74-08641 5B

In Re Chinese Maritime Trust, Ltd. (Limitation on Liability for Sunken Vessel).
W74-08657 6E

OIL SLICKS

Distribution and Abundance of Oil-Oxidizing Bacteria in the North Sea,
W74-08622 5B

The Relative Changes in n-Alkane Composition in Surface Water Slicks,
W74-08633 5B

OIL SPILLS

Determination of Oil Loss Rates from a High Seas Oil Containment Barrier,
W74-08290 5G

Test and Evaluation of Oil Pollution Abatement Devices for Shipboard Use, Phase 1,
W74-08450 5G

The Slop Oil Problem in Singapore,
W74-08471 5G

The Control of Wastewater and Oil Discharges to the Sea with Particular Regard to Studies Recently Carried Out in Singapore's Southern Coastal Waters,
W74-08472 5G

The Handling of Oil Spills,
W74-08474 5G

Sea Pollution in Singapore,
W74-08475 5B

Sea Pollution--Some Aspects and the Need to Fight It,
W74-08485 5B

Oil Pollution Prohibited Zones--Regulations.
W74-08555 6E

Vessels in Foreign and Domestic Trades--Pollution of Coastal and Navigable Waters.
W74-08556 6E

Oil Pollution Prevention--Non-Transportation-Related Onshore and Offshore Facilities--Proposed Rules.
W74-08561 6E

National Oil and Hazardous Substances Pollution Contingency Plan.
W74-08564 6E

The Microbial Degradation of Oil Pollutants,
W74-08609 5B

Microbial-Facilitated Degradation of Oil: A Prospectus,
W74-08610 5B

Microbial Degradation of Oil: Present Status, Problems, and Perspectives,
W74-08611 5B

A Threnody Concerning the Biodegradation of Oil in Natural Waters,
W74-08612 5B

Hydrocarbon Utilization by Cladosporium resinae.
W74-08613 5B

Microbial Degradation of Aromatic Hydrocarbons.
W74-08614 5B

Microbial Degradation of Oil and Hydrocarbons in Continuous Culture.
W74-08615 5B

Utilization of Crude Oil Hydrocarbons by Mixed Cultures of Marine Bacteria
W74-08616 5B

Microbial Decomposition Patterns Using Crude Oil.
W74-08617 5B

Microbial Degradation of Crude Oil and the Various Hydrocarbon Derivatives.
W74-08620 5B

Microbes and Petroleum: Perspectives and Implications,
W74-08621 5B

Marine Hydrocarbonoclastic Bacteria: Types and Range of Oil Degradation.
W74-08623 5B

Bacterial Degradation of Petroleum Materials in Low Temperature Marine Environments.
W74-08626 5B

Hydrocarbon Biodegradation in Alaskan Waters.
W74-08627 5B

The Impact of Oil on Marshland Microbial Ecosystems,
W74-08631 5C

Production and Characterization of Emulsifying Factors from Hydrocarbonoclastic Yeast and Bacteria.
W74-08632 5B

The Relative Changes in n-Alkane Composition in Surface Water Slicks.
W74-08633 5B

Sublethal Effects of the Water Soluble Component of Oil: Chemical Communication in the Marine Environment.
W74-08636 5C

Some Acute Effects of Low-Boiling Petroleum Fractions on the Cellular Structure of Fish Gills Under Field Conditions.
W74-08637 5C

Degradation of Crude Oil by Yeasts and its Effects on Lesbistes reticulatus.
W74-08639 5C

Effects of Some Commercial Oil Herders, Dispersants and Bacterial Inocula on Biodegradation of Oil in Seawater,
W74-08640 5C

Effects of Some Commercial Oil Herders, Dispersants and Bacterial Inocula on Biodegradation of Oil in Seawater,
W74-08640 5C

Bacterial Seeding to Enhance Biodegradation of Oil Slicks,
W74-08641 5B

In Re Chinese Maritime Trust, Ltd. (Limitation on Liability for Sunken Vessel).
W74-08657 6E

IL TANKERS
Sea Pollution in Singapore,
W74-08475 5B

IL WASTES
Pollution Control of Discharges into Rivers, Streams and Sea,
W74-08469 5G

Pollution Prevention Vessel and Oil Transfer Facilities.
W74-08558 6E

Oil Pollution Act Amendments of 1973--Legislative History.
W74-08567 6E

Pollution and Obstruction of Waters.
W74-08569 6E

ILED ROADS
Runoff of Oils from Rural Roads Treated to Suppress Dust,
W74-08236 5B

ILY WATER
Runoff of Oils from Rural Roads Treated to Suppress Dust,
W74-08236 5B

New Methods to Dispose of Used Metalworking Emulsions, (Neue Verfahren Zur Beseitigung Gebraughter Metall-Bearbeitungs-Emulsionen),
W74-08247 5D

Determination of Oil Loss Rates from a High Seas Oil Containment Barrier,
W74-08290 5G

Test and Evaluation of Oil Pollution Abatement Devices for Shipboard Use, Phase 1,
W74-08450 5G

The Slop Oil Problem in Singapore,
W74-08471 5G

Petroleum Refinery Effluent Quality Control,
W74-08473 5D

The Handling of Oil Spills,
W74-08474 5G

Sea Pollution--Some Aspects and the Need to Fight It,
W74-08485 5B

Oil Pollution Prohibited Zones--Regulations.
W74-08555 6E

Vessels in Foreign and Domestic Trades--Pollution of Coastal and Navigable Waters.
W74-08556 6E

Oil Pollution Act Amendments of 1973--Legislative History.
W74-08567 6E

OKLAHOMA
Floodflows from Small Drainage Areas in Oklahoma: Progress Report and Data Compilation,
W74-08292 2E

OLEOPHILIC FERTILIZER
Biodegradation of Oil in Seawater: Limiting Factors and Artificial Stimulation,
W74-08624 5B

ON-SITE DATA COLLECTIONS
Tritium Surveillance System, April-June 1973.
W74-08656 5B

ON-SITE INVESTIGATIONS
Results of Examinations of Hospital Waste Water (Ergebnisse der Untersuchungen von Krankenhausabwaessern),
W74-08286 5B

Recipient Capacity to Limit Discharge of Pollutants to Receiving Waters,
W74-08351 5B

ONCORHYNCHUS-NERKA
Structure of Oncorhynchus nerka (Walb.) Isolated Population of the Azabachye Lake, (In Russian),
W74-08548 2H

OPEN CHANNEL FLOW
Turbulence Characteristics in a Smooth Open Channel of Circular Cross-Section (Caracteristiques de la Turbulence au Sein d'un Ecoulement a Surface Libre En Conduite Lisse De Section Circulaire,
W74-08192 8B

Instrumentation in Full Scale Self-Aerated Flows (Appareils de Mesure Des Concentrations et Des Vitesses Dans un Courant Mixte d'air Et D'Eau en Grandeur Nature),
W74-08196 8B

Hydrodynamics of Surface Irrigation-Advance Phase,
W74-08384 8B

Flow Characteristics of Sloping Channel Jumps,
W74-08387 8B

Mechanism for Streamflow Meandering,
W74-08388 8B

Enhanced Dispersion in Drag Reducing Open Channel Flow,
W74-08390 5B

OPERATING COSTS
Activated Sludge Disposal in a Subarctic Environment,
W74-08443 5E

OPERATION AND MAINTENANCE
Operation and Maintenance of Irrigation and Drainage Systems: Section III--Operation.
W74-08318 4A

How Safe are Sewers for Construction and Maintenance Crews,
W74-08440 5G

OPTIMAL DEVELOPMENT PLANS
Probabilistic Models in the Design and Operation of a Multi-Purpose Reservoir System,
W74-08153 4A

OPTIMIZATION
Optimization of the Assimilative Waste Capacity of the Unsaturated and Saturated Zones of an Unconfined Aquifer System,
W74-08152 5B

Economic Optimization of the Avco Crystallization Process,
W74-08337 3A

System Optimization for Pulp and Paper Industrial Wastewater Treatment Design,
W74-08418 5D

Systems Planning Design: Case Studies in Modeling, Optimization, and Evaluation,
W74-08506 6A

The Combined Use of Optimization and Simulation Models in River Basin Planning.,
W74-08512 4A

ORANGE COUNTY (FLORIDA)
Effective Use of High Water Table Areas for Sanitary Landfill.
W74-08486 5E

OREGON
Submerged and Submersible Lands of Oregon.
W74-08516 6E

Technical and Economic Issues in the Water Quality Management of Yaquina Bay,
W74-08672 2L

Heterotrophic Potential for Amino Acid Uptake in a Naturally Eutrophic Lake,
W74-08678 5C

ORGANIC COMPOUNDS
Bacterial Degradation of Cyclohexane Participation of a Co-Oxidation Reaction.
W74-08244 5B

Microbial Degradation of Crude Oil and the Various Hydrocarbon Derivatives,
W74-08620 5B

Hydrocarbons of Suspected Pollutant Origin in Aquatic Organisms of San Francisco Bay: Methods and Preliminary Results,
W74-08630 5B

ORIFICES
Uniform Irrigation with Low-Pressure Trickle Systems,
W74-08323 3F

OUTLET WORKS
Outlet Works, Warm Springs Dam, Dry Creek, Russian River Basin, Sonoma County, California,
W74-08584 8A

OVERFLOW
Relief Concept Concerning Mixed Sewers (Entlastungs-Konzeptionen im Mischsystem),
W74-08246 5D

OVERLAND FLOW
Time of Concentration--A Kinematic Wave Approach,
W74-08593 2E

OWNERSHIP OF BEDS
Submerged and Submersible Lands of Oregon.
W74-08516 6E

The Atlantic States' Claim to Offshore Oil Rights: United States v. Maine,
W74-08538 6E

Sinclair Oil Co. V. Delacroix Corp. (Determination of Mineral Rights Allocable to Water Bottoms.
W74-08578 6E

OXAMIDE
Recovery of N15-Labeled Fertilizers in Field Experiments,
W74-08315 5B

OXIDATION
Advanced Waste Treatment Process Selection, Part Two,
W74-08245 5D

Model Studies on Reactions Occurring in Oxidations of Lignin with Molecular Oxygen in Alkaline Media,
W74-08359 5B

OXIDATION LAGOONS
Virus Removal in Waste Stabilisation Ponds,
W74-08352 5D

OXYGEN DEMAND
Simulation of Water Quality in Tarawera River,
W74-08308 5B

OXYGEN DIFFUSION
Oxygenation System for Accelerated Sewage Treatment,
W74-08207 5D

OXYGENATION
Oxygenation System for Accelerated Sewage Treatment,
W74-08207 5D

OYSTERS
The Accumulation of Organic and Inorganic Mercury Compounds by the Eastern Oyster (Crassostrea virginica),
W74-08346 5C

Research on the Culture of Certain Common Marine Organisms in Singapore Waters,
W74-08477 3F

OZARKS REGION (MISSOURI)
Estimating Low-Flow Frequency for Perennial Missouri Ozarks Streams,
W74-08599 4A

OZONE
Advanced Waste Treatment Process Selection, Part Two,
W74-08245 5D

Salinity-Ozone Interactions on Pinto Bean: Integrated Response to Ozone Concentration and Duration,
W74-08330 3C

PACIFIC OCEAN
Mineralogy of Surface Sediments from the Panama Basin, Eastern Equatorial Pacific,
W74-08298 2J

PALM BEACH COUNTY (FLA)
Appraisal of the Water Resources of Eastern Palm Beach County, Florida,
W74-08445 4B

PANAMA BASIN
Mineralogy of Surface Sediments from the Panama Basin, Eastern Equatorial Pacific,
W74-08298 2J

PANAMA CANAL
In Re Chinese Maritime Trust, Ltd. (Limitation on Liability for Sunken Vessel).
W74-08657 6E

PARAMECIUM
A Bioassay of Toxicity Using Protozoa in the Study of Aquatic Environment Pollution and Its Prevention,
W74-08221 5A

PARTICLE SIZE
Radial Particle-Size Segregation During Packing of Particulates into Cylindrical Containers,
W74-08447 2J

PASSIVE DIFFUSER SYSTEM
Oxygenation System for Accelerated Sewage Treatment,
W74-08207 5D

PATH OF POLLUTANTS
Ground Water Pollution from Subsurface Excavations.
W74-08185 5

Water Transport of Heavy Metals in Solution and by Different Sizes of Particulate Solids,
W74-08238 5B

The Surprise Factor in Marine Pollution Studies,
W74-08252 5B

A Computer Model for Predicting Nitrate and Other Solutes of Agricultural Drain Water,
W74-08280 5B

Chemical Distribution of Residual Fertilizer Nitrogen in Soil as Revealed by Nitrogen-15 Studies,
W74-08332 5B

Tracer Simulation of Soluble Waste Concentration,
W74-08377 5B

Transverse Dispersion in Ocillatory Channel Flow,
W74-08389 5B

Enhanced Dispersion in Drag Reducing Open Channel Flow,
W74-08390 5B

Model Study of the Dilution of Soluble Liquids Discharge from Tankers,
W74-08451 5B

Distribution of Fluoride in Waters of Tokyo Bay,
W74-08549 5B

Richardson Bay Effluent Dilution Study--A Working Paper.
W74-08604 5B

Richardson Bay Effluent Dilution Study--A Working Paper.
W74-08604 5B

PATHOGENIC BACTERIA
Results of Examinations of Hospital Waste Water (Ergebnisse der Untersuchungen von Krankenhausabwaessern),
W74-08286 5B

PEAK DISCHARGE
A Summary of Peak Stages and Discharges for the Flood of August 1973 in New Jersey.
W74-08374 2E

PEARL RIVER (MISS)
Water Resources Council Report on the Pearl River Comprehensive Basin Study Mississippi and Louisiana.
W74-08522 4A

PEAT
Concentrations of Nitrogen, Phosphorus, Potassium, and Total Soluble Salts in Soil Solution Samples from Fertilized and Unfertilized Histosols,
W74-08319 5B

PENALTIES (LEGAL)
Drainage--Miscellaneous Provisions; Penalties.
W74-08576 6E

PENNSYLVANIA
Application of Reverse Osmosis to Acid Mine Drainage Treatment,
W74-08155 5D

Transient Response of a Layered, Sloping Soil to Natural Rainfall in the Presence of a Shallow Water Table: Experimental Results.
W74-08375 2A

Operation of Mines.
W74-08580 6E

Summary of Environmental Monitoring at Philadelphia, 1958-1971.
W74-08648 5B

PERMEABILITY
Permeability of High Ash Papermill Sludge.
W74-08425 5D

Industrial Processing with Membranes
W74-08664 5D

PERMITS
Environmental Law--Water Pollution--Conflict Between Refuse Act Permit Program and National Environmental Policy Act.
W74-08550 5G

State Program Elements Necessary for Participation in the National Pollutant Discharge Elimination System.
W74-08560 6E

Mining Act of 1971.
W74-08575 6E

Air and Water Pollution Control Permit Board.
W74-08579 6E

Operation of Mines.
W74-08580 6E

PERMSELECTIVE MEMBRANES
In-Situ Formed Condensation Polymers for Reverse Osmosis Membranes.
W74-08504 3A

PERSONNEL
A Worldwide Directory of Stream Ecologists.
W74-08235 10C

PESTICIDE DEGRADATION
Estuarine Microbes and Organochlorine Pesticides (A Brief Review),
W74-08634 5B

PESTICIDE RESIDUES
Residues of Mirex and Other Chlorinated Pesticides in Commercially Raised Catfish,
W74-08347 5C

PESTICIDES
The Microbial Degradation of Oil Pollutants.
W74-08609 5B

PETROLEUM DEGRADATION
Studies on the Degradation of Petroleum by Filamentous Fungi.
W74-08619 5B

PETROLEUM HYDROCARBONS
Microbial Degradation of Oil and Hydrocarbons in Continuous Culture,
W74-08615 5B

Microbial Decomposition Patterns Using Crude Oil,
W74-08617 5B

PHILADELPHIA
Summary of Environmental Monitoring at Philadelphia, 1958-1971,
W74-08648 5B

PHILIPPINES
Water Resources, Environment and National Development--Volume I: Summary of Proceedings, and Volume II: Selected Papers.
W74-08454 5G

Improved Water Management for Paddy Rice Production in the Philippines,
W74-08464 3F

Improvement of Soil Cover for Water Conservation, Prevention of Sedimentation and Pollution Control in the Philippines,
W74-08481 5G

Pollution Control of Discharge Into Rivers, Lakes and Coastal Waters in the Philippines,
W74-08482 5G

PHOSPHATES
Automated Method for Ortho-, Ortho-plus Hydrolyzable and Total Phosphate in Surface and Wastewaters,
W74-08208 5A

Those Nasty Phosphatic Clay Ponds.
W74-08227 5D

Surface Water Pollution Contract Studies: Adsorption of Complex Organic Molecules by Suspended Clay,
W74-08239 5B

Adsorption Studies at Solid-Solution Interfaces,
W74-08240 5B

Effect of Exchange Cations on Adsorption of Lysozyme and Ovalbumin by Smectite,
W74-08241 5B

Effect of Salt Content of Equilibrium-Solution on Formation and Stability of Smectite-Protein Complexes,
W74-08242 5B

The Measurement of the Heat of Reaction Between Proteins and Montmorillonite by Microcalorimetry,
W74-08243 5B

Effect of Phosphate Salts as Saturating Solutions in Cation-Exchange Capacity Determinations,
W74-08285 2G

Nutrient Control in Sewage Lagoons.
W74-08395 5D

Phosphorus in Waste Water.
W74-08438 5A

Indications of the Relationship Between Phyto-Plankton Distribution and Phosphate Levels,
W74-08476 5C

Hydrolysis and Availability of Pyrophosphate in Tropical Soils,
W74-08498 2G

Laboratory Flotation Studies of Tennessee Phosphates in the Presence of Slimes,
W74-08588 5D

Recovery of Phosphates and Metals from Phosphate Sludge by Solvent Extraction,
W74-08590 5D

Electrophoresis and Coagulation Studies of Some Florida Phosphate Slimes,
W74-08591 5D

PHOSPHORIC ACID
Controlling Soil Crusting with Phosphoric Acid to Enhance Seedling Emergence,
W74-08279 3F

PHOSPHORUS
Advanced Waste Treatment Process Selection, Part Two,
W74-08245 5D

Inorganic Transformation of Added Phosphorus in Soil Relation to Soil Characteristics and Moisture Regime,
W74-08258 2G

Concentrations of Nitrogen, Phosphorus, Potassium, and Total Soluble Salts in Soil Solution Samples from Fertilized and Unfertilized Histosols,
W74-08319 5B

Agricultural Chemicals in Relation to Environmental Quality: Chemical Fertilizers, Present and Future,
W74-08325 5B

Recycling and Recovery of Nitrogen, Phosphorus, and Potassium by Coastal Bermudagrass: I. Effect of Sources and Rates of Nitrogen Under a Clipping System,
W74-08327 5B

Recycling and Recovery of Nitrogen, Phosphorus, and Potassium by Coastal Bermudagrass: II. Under Grazing Conditions with Two Stocking Rates,
W74-08328 5B

PHOSPHORUS COMPOUNDS
Utilization of Industrial Wastes and Waste By-Products for Phosphorus Removal: An Inventory and Assessment,
W74-08394 5D

Nutrient Control in Sewage Lagoons.
W74-08395 5D

Integration of Physico-Chemical and Biological Waste-Water Treatment Processes,
W74-08399 5D

Chemical Dosage Control for Phosphorus Removal.
W74-08400 5D

Phosphorus in Waste Water.
W74-08438 5A

PHOTOGRAMMETRY
Measurement of Dye Concentrations by Photography,
W74-08376 2E

PHREATOPHYTES
Woody Phreatophytes Along the Colorado River From Southeast Runnels County to the Headwaters in Borden County, Texas,
W74-08371 3B

PHYSIOLOGICAL ECOLOGY
The Brackish Water Clam Rangia Cuneata as Indicator of Ecological Effects of Salinity Changes in Coastal Waters,
W74-08676 5C

PHYTOPLANKTON
Indications of the Relationship Between Phyto-Plankton Distribution and Phosphate Levels,
W74-08476 5C

PILOT PLANTS
An Experimental Irradiation Facility for the Sterilization of Sewage Sludge (Eine Versuchsbestrahlungsanlage Zur Hygienisierung Von Klaerschlamm),
W74-08198 5D

Development of High-Pressure Spiral Membrane Elements for Seawater Desalination,
W74-08336 3A

Development of Large Spiral Membrane Reverse Osmosis Elements for Low-Cost Water Purification and Reclamation,
W74-08338 3A

Brackish Water Desalting Testing and Field Evaluation with Reverse Osmosis and Electrodialysis Pilot Plants,
W74-08339 3A

Evaluation of Ion Exchange Processes for Treatment of Mine Drainage Waters,
W74-08341 5D

Integration of Physico-Chemical and Biological Waste-Water Treatment Processes,
W74-08399 5D

Operation of Pilot Plant Equipment for Purification of Effluents from the Stefan Kiradzhiev Pulp and Paper Mill in Novi Krichim (Syzlavane rezhim na rabota na poluproizvodstvena prechistvatelna stantsiya za promishleni otpadychni v odi ot KTsKh 'Stefan Kiradzhiev' gr. Novi Krichim),
W74-08417 5D

PINCH VALVES
Pinch Valves Take Hold on the Industry,
W74-08363 8A

PIPE FLOW
The Friction Factors of Oscillating Pipe Flows,
W74-08259 8B

PIPELINES
Problems and SCS Specifications for Low Head PVC Pipelines,
W74-08278 8B

PIPES
Gated Pipe and Reuse System.
W74-08284 3F

PLANNING
The Citizen and Water Management: An Atlas of Water Attitudes in Southern Minnesota,
W74-08288 6B

Difficulties in Planning Water Supply Schemes in West Malaysia,
W74-08462 6B

Water Resources Development in West Malaysia,
W74-08463 3B

Planning for Water Reuse,
W74-08465 5D

Rational Use of Water,
W74-08466 6B

Riverfront Development: The Politics of Master Planning,
W74-08495 3D

Water and Sewer Supply Decisions: A Case Study of the Washington Suburban Sanitary Commission,
W74-08497 5G

PLANNING

Systems Planning Design: Case Studies in Modeling, Optimization, and Evaluation,
W74-08506 6A

The Combined Use of Optimization and Simulation Models in River Basin Planning.,
W74-08512 4A

Multiobjective Redesign of the Big Walnut Project,
W74-08515 4A

Environmental Impact Statements.
W74-08517 6G

The Impact of Growth on the Environment.
W74-08523 6G

PLANT DESIGN

Best Effluent the Goal,
W74-08214 5D

PLANT GROWTH

Computer Simulation of Crop Production - Potential and Hazards,
W74-08331 3F

PLASTIC PIPES

Problems and SCS Specifications for Low Head PVC Pipelines,
W74-08278 8B

POLAND

Pollution Abatement in Effluents from Constructional Fiberboard Manufacture (Z badan nad redukcja obcizenia sciekow w przemysle plyt pilsniowych),
W74-08426 3E

POLAND (POZNAN)

Free-Living Amoebae Isolated from Waters Frequented by People in the Vicinity of Poznan: Poland: Experimental Studies in Mice on the Pathogenicity of the Isolates,
W74-08687 5C

POLARITY

Self-Diffusion Coefficients and Rotational Correlation Times in Polar Liquids. VI. Water,
W74-08439 1A

POLAROGRAPHIC ANALYSIS

Electroanalytical Studies of Methylmercury in Aqueous Solution,
W74-08362 5A

POLITICAL ASPECTS

Riverfront Development: The Politics of Master Planning,
W74-08495 3D

POLITICAL CONSTRAINTS

Riverfront Development: The Politics of Master Planning,
W74-08495 3D

POLLUTANT IDENTIFICATION

Automated Method for Ortho-, Ortho-plus Hydrolyzable and Total Phosphate in Surface and Wastewaters,
W74-08208 5A

Measurement and Monitoring Units for Waste Water (Mess-und Ueberwwachungsgeraete fuer Abwasser),
W74-08219 5A

A Bioassay of Toxicity Using Protozoa in the Study of Aquatic Environment Pollution and Its Prevention,
W74-08221 5A

Water Quality Monitoring Experience in the Somerset River Authority Area, 1968-1972,
W74-08360 5A

A Programmed Sampler for Runoff and Bedloads,
W74-08361 5A

Determination of the Alkalinity of Mill Effluents (Opredelenie shchelochnosti stochnykh vod),
W74-08411 5A

Simple Apparatus for On-Site Continuous Liquid-Liquid Extraction of Organic Compounds from Natural Waters,
W74-08414 5A

Quantitative Measurements of Inorganic Mercury and Organomercurials in Water and Biological Media by Gas-Liquid Chromatography,
W74-08415 5A

Determination of Nitrate in Water with a New Construction of Ion-Selective Electrode,
W74-08420 5A

Determination of Total Hydrocarbons in Sea Water at the Microgram Level with a Flow Calorimeter,
W74-08430 5A

The Gas-Chromatographic Determination of Some Lignin Compounds in Surface Waters (Die gaschromatographische Bestimmung einiger Ligninverbindungen in Oberflaechengewaessern),
W74-08433 5A

Analyses of Tars, Chars, Gases, and Water Found in Effluents from the Synthane Process,
W74-08592 5A

Quality of Surface Water in the Vicinity of Oil Exploration Sites, Big Cypress Area, South Florida,
W74-08596 5A

Tritium Surveillance System, October-December 1972.
W74-08650 5B

Water Surveillance Programs, November 1972.
W74-08651 5B

Potentiostatic Coulometric Determination of Vanadium, Vanadium-Manganese and Vanadium-Iron Mixtures and the Influence of Chromium on the Process,
W74-08674 5A

Biological Methods for the Assessment of Water Quality. A Symposium Presented at the Seventy-Fifth Annual Meeting, June 26-29, 1972.
W74-08675 5A

Detection and Quantitative Determination of Salmonellae in Surface Waters and in the Water of a Municipal Water Supply System, (In Russian),
W74-08693 5A

POLLUTION ABATEMENT

Environmental Research in 1973--Annual Report.
W74-08309 5G

Pulp, Paper, and Board in the Environment -- Part 8: Environmental Problems of the West German Pulp, Paper, and Board Industry.
W74-08405 5G

Pulp, Paper, and Board in the Environment -- Part 9. Pollution Abatement in the Finnish Pulp and Paper Industry.
W74-08406 5G

Pollution Abatement at the Venizel Mill of La Rochette-Cenpa (Lutte anti-pollution a l'usine de Venizel de la Rochette-Cenpa),
W74-08416 5D

Concepts of Pollution and Its Control.
W74-08422 5G

Pollution Abatement in Effluents from Constructional Fiberboard Manufacture (Z badan nad redukcja obcizenia sciekow w przemysle plyt pilsniowych),
W74-08426 3E

New Laws: Clean Waters in the Next Decade.
W74-08542 5G

Oil Pollution Act Amendments of 1973--Legislative History.
W74-08567 6E

Water Pollution Control Facilities--Tax Exemption.
W74-08577 6E

The Microbial Degradation of Oil Pollutants.
W74-08609 5B

Microbial-Facilitated Degradation of Oil: A Prospectus,
W74-08610 5B

Distribution and Abundance of Oil-Oxidizing Bacteria in the North Sea,
W74-08622 5B

Marine Hydrocarbonoclastic Bacteria: Types and Range of Oil Degradation,
W74-08623 5B

Biodegradation of Oil in Seawater: Limiting Factors and Artificial Stimulation.
W74-08624 5B

Bacterial Degradation of Petroleum Materials in Low Temperature Marine Environments.
W74-08626 5B

Microbial Ecology and the Problem of Petroleum Degradation in Chesapeake Bay.
W74-08628 5B

Alkane Degradation in Beach Sands.
W74-08629 5B

The Impact of Oil on Marshland Microbial Ecosystems,
W74-08631 5C

Production and Characterization of Emulsifying Factors from Hydrocarbonoclastic Yeast and Bacteria,
W74-08632 5B

Measurement of Baseline Levels of Enteric Bacterial Activity in River Water.
W74-08635 5B

POLYCHLORINATED BIPHENYLS

Simple Apparatus for On-Site Continuous Liquid-Liquid Extraction of Organic Compounds from Natural Waters,
W74-08414 5A

POLYELECTROLYTES

Potable-Water Supply by Means of Upflow Filtration (L'Eau Claire Process),
W74-08210 5F

POPULATION
The Impact of Growth on the Environment.
W74-08523 6G

POROUS MEDIA
Comparison of Numerical Methods Solving Flow Through Porous Media (Ein Vergleich Von Numerischen Verfahren Zur Loesung Von Sickerstroemungen),
W74-08194 2G

Two-Phase Flows in Porous Media,
W74-08303 2F

PORTS
Radiological Survey of New London Harbor, Thames River, Conn., and Environs,
W74-08645 5B

POTABLE WATER
Potable-Water Supply by Means of Upflow Filtration (L'Eau Claire Process),
W74-08210 5F

Development of Water Supply in Vietnam,
W74-08460 5G

Tritium Surveillance System, October-December 1972.
W74-08650 5B

POTASSIUM
Concentrations of Nitrogen, Phosphorus, Potassium, and Total Soluble Salts in Soil Solution Samples from Fertilized and Unfertilized Histosols,
W74-08319 5B

Recycling and Recovery of Nitrogen, Phosphorus, and Potassium by Coastal Bermudagrass: I. Effect of Sources and Rates of Nitrogen Under a Clipping System,
W74-08327 5B

Recycling and Recovery of Nitrogen, Phosphorus, and Potassium by Coastal Bermudagrass: II. Under Grazing Conditions with Two Stocking Rates,
W74-08328 5B

Soil Potassium Forms in Relation to Agroclimatic Conditions in Maharashtra,
W74-08378 2G

POTOMAC RIVER
Suspended Solids Analysis Using ERTS-A Data,
W74-08301 2J

Some Rates of Geomorphological Processes,
W74-08304 2J

POWDER RIVER BASIN (WYO)
Records of Water Wells, Springs, Oil- and Gas-Test Holes, and Chemical Analyses of Water for the Madison Limestone and Equivalent Rocks in the Powder River Basin and Adjacent Areas, Northeastern Wyoming,
W74-08296 4B

PRECIPITATION (ATMOSPHERIC)
Average Weekly Rainfall and Probabilities During the Planting-Growing-Harvesting Period in South Carolina,
W74-08295 2B

PREFERENCES (WATER RIGHTS)
Municipal Water Preference Statutes: The Texas Wagstaff Act,
W74-08546 6E

PRICING
Potential for Marginal Cost Pricing in Water Resource Management,
W74-08496 6C

Water and Sewer Supply Decisions: A Case Study of the Washington Suburban Sanitary Commission,
W74-08497 5G

PRIMARY PRODUCTIVITY
Preliminary Papers for UNESCO-IBP Symposium on Productivity Problems of Freshwaters.
W74-08673 5C

PRIOR APPROPRIATION
A Model Water Use Act for a Riparian State--The Florida Experience,
W74-08545 6E

PROBABILITY
Average Weekly Rainfall and Probabilities During the Planting-Growing-Harvesting Period in South Carolina,
W74-08295 2B

PRODUCTIVITY
Preliminary Papers for UNESCO-IBP Symposium on Productivity Problems of Freshwaters.
W74-08673 5C

PROJECT PLANNING
Cost Effectiveness in Sewage Treatment,
W74-08263 5D

Port Everglades Harbor, Broward County, Florida (Final Environmental Statement).
W74-08518 8A

Louisiana Moves Toward Coastal Zone Management.
W74-08537 6E

PROJECT PURPOSES
Spur Channel to Astoria Waterfront, East River, New York (Final Environmental Statement).
W74-08519 8A

Final Report Analyzing Coastal and Marine Law to Develop an Authority for Coastal Zone Management,
W74-08544 6E

PROJECTS
Project of the Agricultural and Marine Pollution Control Section, March 1973,
W74-08237 5G

PROTECTION
Difficulties Ahead for Oregon Regarding Estuary Regulations, Control and Protection,
W74-08670 2L

PROTEINS
Surface Water Pollution Contract Studies: Adsorption of Complex Organic Molecules by Suspended Clay,
W74-08239 5B

Adsorption Studies at Solid-Solution Interfaces,
W74-08240 5B

Effect of Exchange Cations on Adsorption of Lysozyme and Ovalbumin by Smectite,
W74-08241 5B

Effect of Salt Content of Equilibrium-Solution on Formation and Stability of Smectite-Protein Complexes,
W74-08242 5B

The Measurement of the Heat of Reaction Between Proteins and Montmorillonite by Microcalorimetry,
W74-08243 5B

PROTOZOA
A Bioassay of Toxicity Using Protozoa in the Study of Aquatic Environment Pollution and Its Prevention,
W74-08221 5A

PSEUDOMONAS
Bacterial Degradation of Cyclohexane Participation of a Co-Oxidation Reaction,
W74-08244 5B

Sanitary-Microbiological Investigations in Preventing Infections of Bacterial and Viral Etiology, (In Russian),
W74-08692 5C

PUBLIC ACCESS
Easements: Judicial and Legislative Protection of the Public's Rights in Florida's Beaches,
W74-08540 6E

PUBLIC HEALTH
Neurological Changes in Cats Following Long-Term Diet of Mercury Contaminated Tuna,
W74-08200 5C

Aims of Water Pollution Control,
W74-08470 5G

Flood Hazard Areas.
W74-08572 6E

State Environmental Radioactivity Surveillance Programs, 1972,
W74-08647 5B

Radioactivity in New York State Surface Water, July-December 1971.
W74-08654 5B

PUBLIC RIGHTS
Easements: Judicial and Legislative Protection of the Public's Rights in Florida's Beaches,
W74-08540 6E

PUBLICATIONS
Environmental Information Sources -- Engineering and Industrial Applications: A Selected Annotated Bibliography.
W74-08401 10C

State of Washington, 1973 Annual Report, Natural Resources and Recreation Agencies.
W74-08536 6E

PULP AND PAPER INDUSTRY
Pulp, Paper, and Board in the Environment -- Part 8: Environmental Problems of the West German Pulp, Paper, and Board Industry.
W74-08405 5G

Pulp, Paper, and Board in the Environment -- Part 9. Pollution Abatement in the Finnish Pulp and Paper Industry.
W74-08406 5G

Operation of Pilot Plant Equipment for Purification of Effluents from the Stefan Kiradzhiev Pulp and Paper Mill in Novi Krichim (Syzlavane rezhim na rabota na poluproizvodstvena prechistvatelna stantsiya za promishleni

otpadychni v odi ot KTsKh 'Stefan Kiradzhiev' gr. Novi Krichim),
W74-08417 5D

A 6000 Gallon/Ton Fine Paper Machine Water System,
W74-08424 5D

PULP WASTES

Recent Developments in Treatment of Papermaking Effluents in France (Developpements recents du traitement des effluents de papeterie en France),
W74-08402 5D

The Toxicity of Sulphate Pulp Bleaching Effluents,
W74-08403 5C

A New Aspect of Pollution: Increase in the Salinity of Water During Its Use in Mills (Un nouvel aspect de la pollution: la salinite ajoutee a l'eau au cours de son utilisation dans les usines),
W74-08404 5B

Pulp, Paper, and Board in the Environment -- Part 9. Pollution Abatement in the Finnish Pulp and Paper Industry.
W74-08406 5G

Treatment System Handles Flexo Ink and Starch Waste in Single Operation,
W74-08409 5D

Process of Physical-Chemical Purification for Waste Waters from Paper and Board Mills (Procede de nettoyage chimico-physique pour les restes d'eaux usees des fabriques de papier et carton),
W74-08410 5D

Determination of the Alkalinity of Mill Effluents (Opredelenie shchelochnosti stochnykh vod),
W74-08411 5A

Purification of Sulfite Mill Effluents from Lignosulfonates (Ochistka promstokov sulfitno-tsellyuloznogo proizvodstva ot lignosul'fonatov),
W74-08412 5D

Aeration of Effluents in Aeration Tanks (Aeratsiya stochnykh vod v aerotenkakh-vytesnitelyakh),
W74-08413 5D

Pollution Abatement at the Venizel Mill of La Rochette-Cenpa (Lutte anti-pollution a l'usine de Venizel de la Rochette-Cenpa),
W74-08416 5D

Operation of Pilot Plant Equipment for Purification of Effluents from the Stefan Kiradzhiev Pulp and Paper Mill in Novi Krichim (Syzlavane rezhim na rabota na poluproizvodstvena prechistvatelna stantsiya za promishleni otpadychni v odi ot KTsKh 'Stefan Kiradzhiev' gr. Novi Krichim),
W74-08417 5D

System Optimization for Pulp and Paper Industrial Wastewater Treatment Design,
W74-08418 5D

Examples of the Use of the 'Seclar' Decanter in Treating Paper Industry Effluents (Exemples d'application du decanteur 'Seclar' au traitement d'effluents de l'industrie papetiere),
W74-08419 5D

Cellulosic Deposits in Benthal Environments: Occurrence, Evolution, and Decomposition,
W74-08423 5B

Permeability of High Ash Papermill Sludge,
W74-08425 5D

Pollution Abatement in Effluents from Constructional Fiberboard Manufacture (Z badan nad redukcja obcizenia sciekow w przemysle plyt pilsniowych),
W74-08426 3E

Voith Circular Clarifying Basin for Baiersbronn (Voith-Rundklaerbecken fuer Baiersbronn),
W74-08427 5D

Pollution of the Drammens River by the Wood-Processing Industry (Treforedlingsindustriens utslipp til Drammensvassdraget),
W74-08428 5B

The Gas-Chromatographic Determination of Some Lignin Compounds in Surface Waters (Die gaschromatographische Bestimmung einiger Ligninverbindungen in Oberflaechengewaessern),
W74-08433 5A

Pulp Industry and Environmental Protection (Zellstoff-Industrie und Umweltschutz),
W74-08436 5D

Lamellar Sedimentation of Fiber-Carrying Waste Waters (Lamellsedimentering av fiberholdig vann),
W74-08437 5D

PUMP TESTINGS

Definition of Reverse Osmosis Pump Requirements for Space Vehicle Requirements,
W74-08340 8C

PUMPING

Definition of Reverse Osmosis Pump Requirements for Space Vehicle Requirements,
W74-08340 8C

PUMPS

Definition of Reverse Osmosis Pump Requirements for Space Vehicle Requirements,
W74-08340 8C

QUATERNARY DEPOSITS

Characteristic Use of Genetic Principles in the Classification of North Kazakhstan Forests on the Ancient Crusts of Wheathering and on Quaternary Deposits, (In Russian),
W74-08182 2I

RADIOACTIVE WASTE DISPOSAL

Improved Control of Radioactive Wastes,
W74-08255 5D

Applications of Waste Processing Systems for Pressurized Water Reactors,
W74-08349 5D

Interim Policy Statement on Implementation, Federal Water Pollution Control Act Amendments of 1972.
W74-08563 6E

Rates of Salt Solution in the Permian Basin,
W74-08608 2K

RADIOACTIVE WASTES

Improved Control of Radioactive Wastes,
W74-08255 5D

Estimation and Evaluation of Radioactive Contamination Through a Food Web in an Aquatic Ecosystem (1), An Application of the Compartment Model to Transfer of Radioactive Substances Through a Food Chain,
W74-08365 5B

RADIOACTIVITY

State Environmental Radioactivity Surveillance Programs, 1972,
W74-08647 5B

Summary of Environmental Monitoring at Philadelphia, 1958-1971,
W74-08648 5B

Tritium Burdens in Two Arctic Villages,
W74-08649 5B

Water Surveillance Programs, February 1973 and 1972, Special Analyses.
W74-08652 5B

Radioactivity in Washington Surface Water July 1970-June 1971.
W74-08653 5B

Water Surveillance Programs, April-May 1973.
W74-08655 5B

RADIOACTIVITY MEASUREMENT

Radiological Survey of New London Harbor, Thames River, Conn., and Environs,
W74-08645 5B

RADIOCHEMICAL ANALYSIS

Water Surveillance Programs, February 1973 and 1972, Special Analyses.
W74-08652 5B

Radioactivity in Washington Surface Water July 1970-June 1971.
W74-08653 5B

Radioactivity in New York State Surface Water, July-December 1971.
W74-08654 5B

Water Surveillance Programs, April-May 1973.
W74-08655 5B

RADIOISOTOPES

Estimation and Evaluation of Radioactive Contamination Through a Food Web in an Aquatic Ecosystem (1), An Application of the Compartment Model to Transfer of Radioactive Substances Through a Food Chain,
W74-08365 5B

RAINFALL

Rainfall Frequency Atlas for Missouri,
W74-08174 7C

Relief Concept Concerning Mixed Sewers (Entlastungs-Konzeptionen im Mischsystem),
W74-08246 5D

Average Weekly Rainfall and Probabilities During the Planting-Growing-Harvesting Period in South Carolina,
W74-08295 2B

Some Factors Affecting the Annual Railfall of Singapore,
W74-08459 2B

Residence Time of Sulfurous Air Pollutants from a Local Source During Precipitation,
W74-08690 5A

RAINFALL INTENSITY

Time of Concentration--A Kinematic Wave Approach,
W74-08593 2E

RAINFALL-RUNOFF RELATIONSHIPS
Floodflows from Small Drainage Areas in Oklahoma: Progress Report and Data Compilation,
W74-08292 2E

Transient Response of a Layered, Sloping Soil to Natural Rainfall in the Presence of a Shallow Water Table: Experimental Results,
W74-08375 2A

RANGE GRASSES
Considering Irrigated Grass. Take a Tip from New Mexico.
W74-08282 3F

RANGIA CUNEATA
The Brackish Water Clam Rangia Cuneata as Indicator of Ecological Effects of Salinity Changes in Coastal Waters,
W74-08676 5C

REACTORS
Applications of Waste Processing Systems for Pressurized Water Reactors,
W74-08349 5D

REAERATION
Predicting Reaeration Coefficients for Polluted Estuary,
W74-08307 5B

RECIRCULATED WATER
Treatment System Handles Flexo Ink and Starch Waste in Single Operation,
W74-08409 5D

RECLAIMED WATER
A 6000 Gallon/Ton Fine Paper Machine Water System,
W74-08424 5D

The Reuse of Sewage Effluent for Industrial Purposes in Singapore,
W74-08458 5D

Municipal Wastewater Reclamation and Reuse,
W74-08461 5D

Planning for Water Reuse,
W74-08465 5D

RECREATION FACILITIES
The Metropolitan Toronto and Region Waterfront Plan, 1972-1976.
W74-08489 6B

RECYCLING
Recycling and Recovery of Nitrogen, Phosphorus, and Potassium by Coastal Bermudagrass: I. Effect of Sources and Rates of Nitrogen Under a Clipping System,
W74-08327 5B

Development of a Reverse Osmosis Module for Wash Water Recycling in a Space Environment at 165 deg F,
W74-08344 5D

Applications of Waste Processing Systems for Pressurized Water Reactors,
W74-08349 5D

Concepts of Pollution and Its Control,
W74-08422 5G

Laboratory Flotation Studies of Tennessee Phosphates in the Presence of Slimes,
W74-08588 5D

Recovery of Phosphates and Metals from Phosphate Sludge by Solvent Extraction,
W74-08590 5D

REFLECTANCE
Reflectance Discrimination of Cotton and Corn at Four Growth Stages,
W74-08269 3F

REFUSE ACT
Environmental Law--Water Pollution--Conflict Between Refuse Act Permit Program and National Environmental Policy Act,
W74-08550 5G

REGIONAL ANALYSIS
Multiobjective Analysis in Water Resource Planning,
W74-08514 4A

REGIONAL DEVELOPMENT
Water Resources, Environment and National Development--Volume I: Summary of Proceedings, and Volume II: Selected Papers.
W74-08454 5G

REGIONAL FLOOD
Flood Plain Information; Grants Creek - Town Creek, City of Salisbury, North Carolina.
W74-08490 4A

Flood Plain Information; Peters Creek and Lick Run, Roanoke, Virginia.
W74-08491 4A

REGRESSION ANALYSIS
Estimating Low-Flow Frequency for Perennial Missouri Ozarks Streams,
W74-08599 4A

REGULATION
The Use of Questionnaires in Collecting Information for Urban Flood Control Planning,
W74-08151 6F

Probabilistic Models in the Design and Operation of a Multi-Purpose Reservoir System,
W74-08153 4A

Pulp, Paper, and Board in the Environment -- Part 8: Environmental Problems of the West German Pulp, Paper, and Board Industry.
W74-08405 5G

Effluent Charges on Air and Water pollution,
W74-08524 5G

Utah Environmental Problems and Legislative Response: II, Legislative Response,
W74-08535 5G

Boundary and Land Development Regulation Recommendations for the Big Cypress Area of Critical State Concern.
W74-08543 4A

Vessels in Foreign and Domestic Trades--Pollution of Coastal and Navigable Waters.
W74-08556 6E

Conservation of Marine Life--Use of Liberty Ships by States as Offshore Artificial Reefs.
W74-08557 6E

Pollution Prevention Vessel and Oil Transfer Facilities.
W74-08558 6E

Pollution Prevention Inspection of Vessels and Deck and Engineer Officers' Licenses.
W74-08559 6E

State Program Elements Necessary for Participation in the National Pollutant Discharge Elimination System.
W74-08560 6E

Sinclair Oil Co. V. Delacroix Corp. (Determination of Mineral Rights Allocable to Water Bottoms.
W74-08578 6E

State Environmental Radioactivity Surveillance Programs, 1972,
W74-08647 5B

REMOTE SENSING
Survey of the Seasonal Snow Cover in Alaska,
W74-08179 2C

The Potential Application of Satellites in River Regulation,
W74-08206 4A

Reflectance Discrimination of Cotton and Corn at Four Growth Stages,
W74-08269 3F

Satellite Views of Hurricane Camille,
W74-08291 2B

Monitoring Flood Damage with Satellite Imagery,
W74-08294 4A

Suspended Solids Analysis Using ERTS-A Data,
W74-08301 2J

Limnological Studies and Remote Sensing of the Upper Truckee River Sediment Plume in Lake Tahoe, California-Nevada,
W74-08302 2J

Clarks Fork Yellowstone River Remote Sensing Study,
W74-08386 2J

The Use of ERTS-1 for Relaying Hydrologic Data in the Delaware River Basin,
W74-08583 7B

Application of ERTS-1 Imagery to the Study of Caribou Movements and Winter Dispersal in Relation to Prevailing Snowcover,
W74-08602 2C

REPRODUCTION
Sublethal Effects of the Water Soluble Component of Oil: Chemical Communication in the Marine Environment,
W74-08636 5C

Biology of Arctodiaptomus acutilobatus Sars (Copepoda, Crustacea) in the Mingechaur Water Reservoir, (In Russian),
W74-08683 2H

RESEARCH AND DEVELOPMENT
A Knowledge Crisis in Solid-Fluid Separation.
W74-08202 5D

Environmental Research and Highways,
W74-08251 5B

Environmental Research in 1973--Annual Report.
W74-08309 5G

National Sea Grant College and Program--Extension.
W74-08568 6E

RESEARCH FACILITIES
Environmental Research in 1973--Annual Report.
W74-08309 5G

RESEARCH PRIORITIES
Hydrological Effects of Urbanization,
W74-08257 4C

RESERVOIR DESIGN
Probabilistic Models in the Design and Operation of a Multi-Purpose Reservoir System,
W74-08153 4A

RESERVOIR OPERATION
Probabilistic Models in the Design and Operation of a Multi-Purpose Reservoir System,
W74-08153 4A

RESERVOIR RELEASES
Determination of the Discharge Policy for Existing Reservoir Networks,
W74-08513 4A

Selective Withdrawal from Man-Made Lakes,
W74-08585 4A

RESERVOIRS
The Potential Application of Satellites in River Regulation,
W74-08206 4A

Flood Control and Water Conservation Works in Bukit Timah Catchment, Singapore,
W74-08456 4A

Indications of the Relationship Between Phyto-Plankton Distribution and Phosphate Levels,
W74-08476 5C

RESINS
Waste Water Problems of the Textile Industry. Part I. Oxygen Demand of Printing Paste Thickeners. (Problemi inerenti le acque di scarico nell'industria tessile. Io. La domanda di ossigeno di addensanti da stampa),
W74-08421 5B

RESOURCE ALLOCATION
Multiobjective Analysis in Water Resource Planning,
W74-08514 4A

REVERSE OSMOSIS
Application of Reverse Osmosis to Acid Mine Drainage Treatment,
W74-08155 5D

Reverse Osmosis and Ultrafiltration - A Survey of Auxiliary Apparatuses Available in this Field (Umgekehrte Osmose und Ultrafiltration - Ein Ueberblick Ueber die auf Diesem Gebiet Verfuegbaren Apparativen Hilfsmittel),
W74-08218 5D

Reverse Osmosis Membrane Filters for Seawater Pretreatment,
W74-08334 3A

Development of High-Pressure Spiral Membrane Elements for Seawater Desalination,
W74-08336 3A

Development of Large Spiral Membrane Reverse Osmosis Elements for Low-Cost Water Purification and Reclamation,
W74-08338 3A

Brackish Water Desalting Testing and Field Evaluation with Reverse Osmosis and Electrodialysis Pilot Plants,
W74-08339 3A

Definition of Reverse Osmosis Pump Requirements for Space Vehicle Requirements,
W74-08340 8C

Development of a One-Pass Hollow Fiber Seawater Desalination Module Having a Capacity of 2500-3000 GPD,
W74-08342 3A

Design and Construction of a Large Brackish Water Desalination Module,
W74-08343 3A

Development of a Reverse Osmosis Module for Wash Water Recycling in a Space Environment at 165 deg F,
W74-08344 5D

Role of Ultrafiltration in Industrial Effluent Problems,
W74-08408 5D

Brine Concentration by Electrodialysis, Phase II,
W74-08501 3A

High Rejection Hollow Fiber Membranes for Desalination of Sea Water,
W74-08502 3A

Development of a Production Technique for Porous Stainless Steel Tubes,
W74-08503 8G

In-Situ Formed Condensation Polymers for Reverse Osmosis Membranes,
W74-08504 3A

Industrial Processing with Membranes.
W74-08664 5D

REVERSE OSMOSIS PUMPS
Definition of Reverse Osmosis Pump Requirements for Space Vehicle Requirements,
W74-08340 8C

REVIEWS
Direct Measurement of Water Movement in the Zone of Aeration,
W74-08256 2G

Environmental Information Sources -- Engineering and Industrial Applications: A Selected Annotated Bibliography.
W74-08401 10C

Estuarine Microbes and Organochlorine Pesticides (A Brief Review),
W74-08634 5B

Water: A Comprehensive Treatise. Volume 1. Physics and Physical Chemistry of Water.
W74-08665 1A

Water: A Comprehensive Treatise. Volume 2. Water in Crystalline Hydrates: Aqueous Solutions of Simple Nonelectrolytes.
W74-08666 1B

Water: A Comprehensive Treatise. Volume 3. Aqueous Solutions of Simple Electrolytes.
W74-08667 1B

REYNOLDS NUMBER
The Friction Factors of Oscillating Pipe Flows,
W74-08259 8B

RHODE ISLAND
Bacterial Degradation of Petroleum Materials in Low Temperature Marine Environments,
W74-08626 5B

RHODOPHYTA
Research on the Culture of Certain Common Marine Organisms in Singapore Waters,
W74-08477 3F

RICE
Improved Water Management for Paddy Rice Production in the Philippines,
W74-08464 3F

RICHLAND (WASH)
Improved Control of Radioactive Wastes,
W74-08255 5D

RIO GRANDE RIVER
Reconnaissance of the Chemical Quality of Surface Waters of the Rio Grande Basin, Texas,
W74-08373 5B

Lower Rio Grande Flood Control Project, Texas
W74-08521 8A

RIO GRANDE RIVER (TEX
Lower Rio Grande Flood Control Project, Texas.
W74-08521 8A

RIPARIAN RIGHTS
Submerged and Submersible Lands of Oregon
W74-08516 6E

Municipal Powers Under Flirida Law with Respect to Protection of Environmentally Endangered Riparian Land,
W74-08534 6E

A Model Water Use Act for a Riparian State--The Florida Experience,
W74-08545 6E

RIVER BASIN DEVELOPMENT
Multiobjective Analysis in Water Resource Planning,
W74-08514 4A

RIVER BASINS
Ground-Water Resources, Allegheny River Basin and Part of The Lake Erie Basin, New York,
W74-08380 2F

The Combined Use of Optimization and Simulation Models in River Basin Planning.,
W74-08512 4A

Water Resources Council Report on the Pearl River Comprehensive Basin Study Mississippi and Louisiana.
W74-08522 4A

RIVER REGULATION
The Potential Application of Satellites in River Regulation,
W74-08206 4A

RIVERFRONT DEVELOPMENT
Riverfront Development: The Politics of Master Planning,
W74-08495 3D

RIVERS
A Bill to Preserve and Promote the Resources of the Connecticut River Valley.
W74-08553 6E

Radiological Survey of New London Harbor, Thames River, Conn., and Environs,
W74-08645 5B

Tritium Surveillance System, April-June 1973.
W74-08656 5B

Preliminary Papers for UNESCO-IBP Symposium on Productivity Problems of Freshwaters.
W74-08673 5C

RIVIERE DU NORD (QUEBEC-CANADA)
Determination of the Discharge Policy for Existing Reservoir Networks,
W74-08513 4A

ROACH
Nourishment of Rutilus rutilus aralensis morpha fragmiteti Berg. of the Kayrakkum Water Reservoir, (In Russian),
W74-08663 2H

ROAD CONSTRUCTION
Erosion Control on Highway Construction.
W74-08178 4D

ROAD OIL
Runoff of Oils from Rural Roads Treated to Suppress Dust,
W74-08236 5B

ROADS
Runoff of Oils from Rural Roads Treated to Suppress Dust,
W74-08236 5B

ROUGHNESS (HYDRAULIC)
The Friction Factors of Oscillating Pipe Flows,
W74-08259 8B

RUHR RIVER
The Fish of the South Westphalian Highland Including the Moehne Dam and Ruhr,
W74-08681 2I

RUNOFF
Animal Waste Utilization for Pollution Abatement Technology and Economics. Phase II,
W74-08231 5D

Modeling Snowmelt Runoff in an Arctic Coastal Plain,
W74-08233 2C

Modleing of Land Runoff Effects on Dissolved Oxygen,
W74-08316 5B

A Programmed Sampler for Runoff and Bedloads,
W74-08361 5A

RURAL AREAS
Development of Water Supply in Vietnam,
W74-08460 5G

SAFETY
How Safe are Sewers for Construction and Maintenance Crews,
W74-08440 5G

SALINE SEEPS
Saline-Seep Development in Dryland Soils of Northeastern Montana,
W74-08300 3C

SALINE SOILS
Effects of Straw, Calcium Chloride, and Submergence on a Sodic Soil,
W74-08274 2G

Effect of Phosphate Salts as Saturating Solutions in Cation-Exchange Capacity Determinations,
W74-08285 2G

Saline-Seep Development in Dryland Soils of Northeastern Montana,
W74-08300 3C

SALINE WATER
Feasibility Study on Desalting Brackish Water from the Mt. Simon Aquifer in Northeastern Illinois.
W74-08499 3A

SALINE WATER INTRUSION
Identification and Control of Pollution from Salt Water Intrusion.
W74-08293 5B

Salt-Water Intrusion and Its Control,
W74-08662 5B

SALINITY
Drainage Observations in Latin America,
W74-08268 4A

Effects of Straw, Calcium Chloride, and Submergence on a Sodic Soil,
W74-08274 2G

Salinity-Ozone Interactions on Pinto Bean: Integrated Response to Ozone Concentration and Duration,
W74-08330 3C

A New Aspect of Pollution: Increase in the Salinity of Water During Its Use in Mills (Un nouvel aspect de la pollution: la salinite ajoutee a l'eau au cours de son utilisation dans les usines),
W74-08404 5B

The Brackish Water Clam Rangia Cuneata as Indicator of Ecological Effects of Salinity Changes in Coastal Waters,
W74-08676 5C

SALMON
Optimum Escapement Studies of Chignik Sockeye Salmon,
W74-08176 8I

Generalization of Spawning and Rearing Discharges for Several Pacific Salmon Species in Western Washington,
W74-08370 2I

1971 Puget Sound Fall Chinook Salmon Tagging Study,
W74-08452 8I

Notes on the Feeding Relationships of Trout (Salmo trutta L.) and Salmon (Salmo salar L.) in the River Suldalslagen, West Norway,
W74-08680 2I

SALMON FRY
An Investigation of the Food of One- to Four-Month-Old Salmon Fry (Salmo salar L.) in the Suldalslagen, West Norway,
W74-08679 2I

SALMONELLA
Results of Examinations of Hospital Waste Water (Ergebnisse der Untersuchungen von Krankenhausabwaessern),
W74-08286 5B

SALMONELLAE
Detection and Quantitative Determination of Salmonellae in Surface Waters and in the Water of a Municipal Water Supply System, (In Russian),
W74-08693 5A

SALT LAKE CITY (UTAH)
Analysis of Water Reuse Alternatives in an Integrated Urban and Agricultural Area,
W74-08510 5D

SALT LAKES
Preliminary Papers for UNESCO-IBP Symposium on Productivity Problems of Freshwaters.
W74-08673 5C

SALTS
Rates of Salt Solution in the Permian Basin,
W74-08608 2K

SAMPLING
A Programmed Sampler for Runoff and Bedloads,
W74-08361 5A

A Vessel for Collecting Subsurface Water Samples from Geothermal Drillholes,
W74-08366 4B

Automatic Waste Sludge Sampler,
W74-08442 5A

SAN ANTONIO (TEX
New Roller Gate Improves the River Walk.
W74-08250 8A

SAN FRANCISCO BAY
Richardson Bay Effluent Dilution Study--A Working Paper.
W74-08604 5B

SAN FRANCISCO BAY (CALIF)
Hydrocarbons of Suspected Pollutant Origin in Aquatic Organisms of San Francisco Bay: Methods and Preliminary Results,
W74-08630 5B

SAND-CLAY MIXTURE
Contribution to the Study of the Mechanism of Soil Compaction: The concept of Lubrication Potential, (In French),
W74-08700 2G

SANITARY CONDITIONS
Certain Problems of the Sanitary State of Upper Reaches of the Saratov Water Reservoir, (In Russian),
W74-08698 5B

SANTA ANA VALLEY (CALIF)
Digital Simulation of the Effects of Urbanization on Runoff in the Upper Santa Ana Valley, California,
W74-08598 4C

SATELLITES (ARTIFICIAL)
Monitoring Flood Damage with Satellite Imagery,
W74-08294 4A

The Use of ERTS-1 for Relaying Hydrologic Data in the Delaware River Basin,
W74-08583 7B

SATURATION
Carbonate Compensation Depth: Relation to Carbonate Solubility in Ocean Waters,
W74-08582 2K

SAVANNAH RIVER (SO
Environmental Effect of a Complex Nuclear Facility,
W74-08254 5D

SCENIC EASEMENTS
A Bill to Preserve and Promote the Resources of the Connecticut River Valley.
W74-08553 6E

SCREENS
Solids Separation from Industrial Waters and Effluents: Screening and Straining,
W74-08393 5D

SEA LEVEL
Trends and Variability of Yearly Mean Sea Level 1893-1972,
W74-08643 2B

SEA WATER
Reverse Osmosis Membrane Filters for Seawater Pretreatment,
W74-08334 3A

SEA WATER

Development of High-Pressure Spiral Membrane Elements for Seawater Desalination,
W74-08336 3A

Economic Optimization of the Avco Crystallization Process,
W74-08337 3A

Development of a One-Pass Hollow Fiber Seawater Desalination Module Having a Capacity of 2500-3000 GPD,
W74-08342 3A

Determination of Total Hydrocarbons in Sea Water at the Microgram Level with a Flow Calorimeter,
W74-08430 5A

High Rejection Hollow Fiber Membranes for Desalination of Sea Water,
W74-08502 3A

Carbonate Compensation Depth: Relation to Carbonate Solubility in Ocean Waters,
W74-08582 2K

SEASHORES

The National Shoreline Study,
W74-08671 2L

SEASONAL

Towards an Objective Analysis of the Seasonal Thermocline,
W74-08691 2E

SECLAR CLARIFIER

Examples of the Use of the 'Seclar' Decanter in Treating Paper Industry Effluents (Exemples d'application du decanteur 'Seclar' au traitement d'effluents de l'industrie papetiere),
W74-08419 5D

SECONDARY FLOW

Transverse Dispersion in Ocillatory Channel Flow,
W74-08389 5B

SEDIMENT CONTROL

Improvement of Soil Cover for Water Conservation, Prevention of Sedimentation and Pollution Control in the Philippines,
W74-08481 5G

SEDIMENT PLUMES

Limnological Studies and Remote Sensing of the Upper Truckee River Sediment Plume in Lake Tahoe, California-Nevada,
W74-08302 2J

SEDIMENT SORTING

Radial Particle-Size Segregation During Packing of Particulates into Cylindrical Containers,
W74-08447 2J

SEDIMENT TRANSPORT

Sediment Routing in Irrigation Canal Systems,
W74-08385 2J

Clarks Fork Yellowstone River Remote Sensing Study,
W74-08386 2J

Mechanism for Streamflow Meandering,
W74-08388 8B

SEDIMENTATION

Ecological History of Wetlands,
W74-08165 2L

Recent Developments in Treatment of Papermaking Effluents in France (Developpements recents du traitement des effluents de papeterie en France),
W74-08402 5D

Lamellar Sedimentation of Fiber-Carrying Waste Waters (Lamellsedimentering av fiberholdig vann),
W74-08437 5D

SEDIMENTATION RATES

Design and Performance Criteria for Settling Tanks for the Removal of Physical-Chemical Flocs,
W74-08396 5D

SEDIMENTOLOGY

Sedimentology and Bar Formation in the Upper Kicking Horse River, A Braided Outwash Stream,
W74-08297 2J

SEDIMENTS

Water Transport of Heavy Metals in Solution and by Different Sizes of Particulate Solids,
W74-08238 5B

Research to Determine the Environmental Response to the Deposition of Spoil on Salt Marshes Using Diked and Undiked Techniques.
W74-08677 5C

SEEPAGE

Saline-Seep Development in Dryland Soils of Northeastern Montana,
W74-08300 3C

Hydrodynamics of Surface Irrigation-Advance Phase,
W74-08384 8B

Alkane Degradation in Beach Sands,
W74-08629 5B

SEMIPERMEABLE MEMBRANES

In-Situ Formed Condensation Polymers for Reverse Osmosis Membranes,
W74-08504 3A

SEPARATION TECHNIQUES

A Knowledge Crisis in Solid-Fluid Separation.
W74-08202 5D

New Methods to Dispose of Used Metalworking Emulsions, (Neue Verfahren Zur Beseitigung Gebraughter Metall-Bearbeitungs-Emulsionen),
W74-08247 5D

Development of a Reverse Osmosis Module for Wash Water Recycling in a Space Environment at 165 deg F,
W74-08344 5D

Solids Separation from Industrial Waters and Effluents: Screening and Straining,
W74-08393 5D

Role of Ultrafiltration in Industrial Effluent Problems,
W74-08408 5D

Simple Apparatus for On-Site Continuous Liquid-Liquid Extraction of Organic Compounds from Natural Waters,
W74-08414 5A

Test and Evaluation of Oil Pollution Abatement Devices for Shipboard Use, Phase 1,
W74-08450 5G

Solubility of 1,1,2,2-Tetrabromoethane in Water as a Function of Temperature,
W74-08589 5B

SEWAGE DISPOSAL

The Control of Wastewater and Oil Discharge to the Sea with Particular Regard to Studies Recently Carried Out in Singapore's Southern Coastal Waters,
W74-08472 5

SEWAGE EFFLUENTS

Chemical Dosage Control for Phosphorus Removal
W74-08400 5

SEWAGE SLUDGE

An Experimental Irradiation Facility for the Sterilization of Sewage Sludge (Eine Versuchsbestrahlungsanlage Zur Hygienisierung Von Klaerschlamm),
W74-08198 5

Examples of Sewage Sludge Incineration in the UK,
W74-08364 5

SEWAGE TREATMENT

Optimization of the Assimilative Waste Capacity of the Unsaturated and Saturated Zones of an Unconfined Aquifer System.
W74-08152 5

Small Balls Repeal Smell,
W74-08201 5

Oxygenation System for Accelerated Sewage Treatment.
W74-08207 5

Automatic Process Control of Sewage Treatment Works,
W74-08212 5

Plant Expanded for Advanced Waste Treatment.
W74-08223 5

Automation Comes to L.A.,
W74-08225 5

Sewage Treatment and Disposal.
W74-08261 5

Utilitarian Leisure for Burnham-On-Sea.
W74-08262 5

Cost Effectiveness in Sewage Treatment.
W74-08263 5

Process Kinetics for Denitrification.
W74-08320 5

Swedish Techniques to Combat Pollution,
W74-08353 5

Solids Separation from Industrial Waters and Effluents: Screening and Straining.
W74-08393 5

Heavy Metals in Agricultural Lands Receiving Chemical Sewage Sludges,
W74-08397 5

To Establish Viable Methods of Maintaining Waste Treatment Facility Efficiencies with Reference to Flow Variations.
W74-08398 5

Chemical Dosage Control for Phosphorus Removal.
W74-08400 5

Automatic Waste Sludge Sampler,
W74-08442 5

werage; Sewage Treatment and Disposal in ngapore,
74-08467 5D

sposal of Industrial Trade Effluents from the ood Industries,
74-08468 5D

ER OVERFLOWS
elief Concept Concerning Mixed Sewers ntlastungs-Konzeptionen im Mischsystem),
74-08246 5D

ERAGE
ow Safe are Sewers for Construction and aintenance Crews,
74-08440 5G

ater and Sewer Supply Decisions: A Case udy of the Washington Suburban Sanitary ommission,
74-08497 5G

ERS
econstructing an Egg-Shaped Sewer.
74-08249 8A

tilitarian Leisure for Burnham-On-Sea.
74-08262 5D

inch Valves Take Hold on the Industry,
74-08363 8A

low Safe are Sewers for Construction and laintenance Crews,
74-08440 5G

EET RAISING
Natural Forage Reserve of Turkmen SSR and Ways of its Improvement to Develop Sheep-Raising, (In Russian),
74-08547 3F

IPS
Model Study of the Dilution of Soluble Liquids Discharge from Tankers,
74-08451 5B

The Slop Oil Problem in Singapore,
74-08471 5G

Sea Pollution in Singapore,
74-08475 5B

Oil Pollution Act Amendments of 1973--Legislative History.
74-08567 6E

ORE PROTECTION
The Metropolitan Toronto and Region Waterfront Plan, 1972-1976.
74-08489 6B

The National Shoreline Study,
74-08671 2L

RIMP
Research on the Culture of Certain Common Marine Organisms in Singapore Waters,
74-08477 3F

ALIC-ACID
The Effect of Mineral Waters of the Kvasy Spa on Some Indices of Cholesterol and Sialic Acid Metabolism, (In Russian),
74-08686 5C

EVES
Solids Separation from Industrial Waters and Effluents: Screening and Straining,
74-08393 5D

SILICA
Integration of Physico-Chemical and Biological Waste-Water Treatment Processes.
74-08399 5D

SIMULATION ANALYSIS
Simulation of Water Quality in Tarawera River,
74-08308 5B

Computer Simulation of Crop Production - Potential and Hazards,
74-08331 3F

Tracer Simulation of Soluble Waste Concentration,
74-08377 5B

Nutrient Control in Sewage Lagoons.
74-08395 5D

Systems Analysis of Large-Scale Public Facilities: New York City's Water Supply Network as a Case Study,
74-08507 3D

The Combined Use of Optimization and Simulation Models in River Basin Planning.,
74-08512 4A

Digital Simulation of the Effects of Urbanization on Runoff in the Upper Santa Ana Valley, California,
74-08598 4C

SINGAPORE
Water Resources, Environment and National Development--Volume I: Summary of Proceedings, and Volume II: Selected Papers.
74-08454 5G

Groundwater investigations in Singapore,
74-08455 4B

Flood Control and Water Conservation Works in Bukit Timah Catchment, Singapore,
74-08456 4A

Hydrological Activities in Singapore,
74-08457 7C

The Reuse of Sewage Effluent for Industrial Purposes in Singapore,
74-08458 5D

Some Factors Affecting the Annual Railfall of Singapore,
74-08459 2B

Sewerage; Sewage Treatment and Disposal in Singapore,
74-08467 5D

Disposal of Industrial Trade Effluents from the Food Industries,
74-08468 5D

The Slop Oil Problem in Singapore,
74-08471 5G

The Control of Wastewater and Oil Discharges to the Sea with Particular Regard to Studies Recently Carried Out in Singapore's Southern Coastal Waters,
74-08472 5G

Sea Pollution in Singapore,
74-08475 5B

Indications of the Relationship Between Phyto-Plankton Distribution and Phosphate Levels,
74-08476 5C

Research on the Culture of Certain Common Marine Organisms in Singapore Waters,
74-08477 3F

Development of Blue-Green Algal Blooms in Non-Alkaline Waters,
74-08478 5C

SITE SELECTION (FEEDLOTS)
Beef Cattle Feedlot Site Selection for Environmental Protection,
74-08156 5G

SLIME
Those Nasty Phosphatic Clay Ponds.
74-08227 5D

Laboratory Flotation Studies of Tennessee Phosphates in the Presence of Slimes,
74-08588 5D

Electrophoresis and Coagulation Studies of Some Florida Phosphate Slimes,
74-08591 5D

SLUDGE
All Costs Must be Counted . . . ,
74-08211 5D

Primary Sludges Produced by the Addition of Lime to Raw Waste Water,
74-08224 5D

Utilization of Industrial Wastes and Waste By-Products for Phosphorus Removal: An Inventory and Assessment,
74-08394 5D

Cellulosic Deposits in Benthal Environments: Occurrence, Evolution, and Decomposition,
74-08423 5B

SLUDGE DISPOSAL
Heavy Metals in Agricultural Lands Receiving Chemical Sewage Sludges,
74-08397 5E

Activated Sludge Disposal in a Subarctic Environment,
74-08443 5E

SLUDGE TREATMENT
An Experimental Irradiation Facility for the Sterilization of Sewage Sludge (Eine Versuchsbestrahlungsanlage Zur Hygienisierung Von Klaerschlamm),
74-08198 5D

All Costs Must be Counted . . . ,
74-08211 5D

The Automatic Filter Press FPAKM (Die Auotomatische Filterpress FPAKM),
74-08217 5D

Examples of Sewage Sludge Incineration in the UK,
74-08364 5D

Permeability of High Ash Papermill Sludge,
74-08425 5D

Centrifugal Dewatering of Secondary Waste Sludges,
74-08431 5D

Sludge Incineration and Afterburning,
74-08441 5D

Automatic Waste Sludge Sampler,
74-08442 5A

SMALL DIAMETER TUNNELING
Small Tunnels, Large Potentials,
W74-08358 8A

SMALL WATERSHEDS
Floodflows from Small Drainage Areas in Oklahoma: Progress Report and Data Compilation,
W74-08292 2E

SNOW COVER
Survey of the Seasonal Snow Cover in Alaska,
W74-08179 2C

Application of ERTS-1 Imagery to the Study of Caribou Movements and Winter Dispersal in Relation to Prevailing Snowcover,
W74-08602 2C

SNOW REMOVAL
Water Pollution and Associated Effects from Street Salting,
W74-08306 5B

SNOWMELT
Survey of the Seasonal Snow Cover in Alaska,
W74-08179 2C

Modeling Snowmelt Runoff in an Arctic Coastal Plain,
W74-08233 2C

SOCIAL ASPECTS
The Use of Questionnaires in Collecting Information for Urban Flood Control Planning,
W74-08151 6F

A Bill to Provide for a National Program of Disaster Insurance.
W74-08552 6E

SOCIAL PARTICIPATION
The Citizen and Water Management: An Atlas of Water Attitudes in Southern Minnesota,
W74-08288 6B

SOCIAL VALUES
Environmental Policies as a Congressional Requirement for Social Efficacy,
W74-08539 6E

SOCKEYE SALMON
Optimum Escapement Studies of Chignik Sockeye Salmon,
W74-08176 8I

SODIUM CHLORIDE
Rates of Salt Solution in the Permian Basin,
W74-08608 2K

SOIL AGGREGATES
Controlling Soil Crusting with Phosphoric Acid to Enhance Seedling Emergence,
W74-08279 3F

SOIL AMENDMENTS
Increased Denitrification in Soils by Additions of Sulfur as an Energy Source,
W74-08322 5B

SOIL ANALYSIS
Chemical Distribution of Residual Fertilizer Nitrogen in Soil as Revealed by Nitrogen-15 Studies,
W74-08332 5B

SOIL CHEMISTRY
Surface Water Pollution Contract Studies: Adsorption of Complex Organic Molecules by Suspended Clay,
W74-08239 5B

Adsorption Studies at Solid-Solution Interfaces,
W74-08240 5B

Effect of Exchange Cations on Adsorption of Lysozyme and Ovalbumin by Smectite,
W74-08241 5B

Effect of Salt Content of Equilibrium-Solution on Formation and Stability of Smectite-Protein Complexes,
W74-08242 5B

The Measurement of the Heat of Reaction Between Proteins and Montmorillonite by Microcalorimetry,
W74-08243 5B

A New Approach to Soil Testing: II. Ionic Equilibria Involving H, K, Ca, Mg, Mn, Fe, Cu, Zn, Na, P, and S,
W74-08281 2G

Effect of Phosphate Salts as Saturating Solutions in Cation-Exchange Capacity Determinations,
W74-08285 2G

A Simple Digestion Procedure for Estimation of Total Nitrogen in Soils and Sediments,
W74-08324 5B

SOIL CLASSIFICATION
The Connecticut Tidal Wetlands Survey,
W74-08159 6E

Inland Wetland Soils,
W74-08160 2G

SOIL COMPACTION
Contribution to the Study of the Mechanism of Soil Compaction: The concept of Lubrication Potential, (In French),
W74-08700 2G

SOIL CONSERVATION
Concepts of Conservation Tillage Systems Using Surface Mulches,
W74-08277 3F

SOIL CONSERVATION SERVICE
The Soil Conservation and Its Role in Wetland Management for Connecticut,
W74-08169 6E

SOIL CONTAMINATION
Vertical Distribution of Fallout Cesium-137 in Cultivated Soils,
W74-08644 5B

SOIL DISPOSAL FIELDS
Heavy Metals in Agricultural Lands Receiving Chemical Sewage Sludges,
W74-08397 5E

SOIL ENVIRONMENT
State of Washington, 1973 Annual Report, Natural Resources and Recreation Agencies.
W74-08536 6E

SOIL INVESTIGATIONS
Radial Particle-Size Segregation During Packing of Particulates into Cylindrical Containers,
W74-08447 2J

SOIL MOISTURE
Direct Measurement of Water Movement in the Zone of Aeration,
W74-08256 2G

Inorganic Transformation of Added Phosphorus in Soil Relation to Soil Characteristics and Moisture Regime,
W74-08258 2G

Water Relations and Growth of Cotton in Drying Soil.
W74-08272 2G

Soil Moisture Profile Under Steady Infiltration
W74-08273 2G

The Effect of Soil Moisture on the Free Amino Acid Level in Winter Wheat. (In Russian).
W74-08541 3F

SOIL PACKING
Radial Particle-Size Segregation During Packing of Particulates into Cylindrical Containers,
W74-08447 2J

SOIL PHYSICS
Controlling Soil Crusting with Phosphoric Acid to Enhance Seedling Emergence,
W74-08279 3F

SOIL POTASH
Soil Potassium Forms in Relation to Agroclimatic Conditions in Maharashtra.
W74-08378 2G

SOIL SURVEYS
The Soil Conservation and Its Role in Wetland Management for Connecticut,
W74-08169 6E

SOIL TESTS
A New Approach to Soil Testing: II. Ionic Equilibria Involving H, K, Ca, Mg, Mn, Fe, Cu, Zn, Na, P, and S,
W74-08281 2G

SOIL TYPES
Retention and Release of Applied Molybdenum to Soils Under Permanent Water-Logged Condition,
W74-08209 2G

SOIL WATER
Thermodynamics of Soil Water: IV. Chemical Potential of Soil Water,
W74-08191 2G

Soil Moisture Profile Under Steady Infiltration,
W74-08273 2G

SOIL WATER MOVEMENT
Direct Measurement of Water Movement in the Zone of Aeration,
W74-08256 2G

Transient Response of a Layered, Sloping Soil to Natural Rainfall in the Presence of a Shallow Water Table: Experimental Results,
W74-08375 2A

SOILS
Determination of Water Intake Rate of Advance,
W74-08275 3F

A Computer Model for Predicting Nitrate and Other Solutes of Agricultural Drain Water,
W74-08280 5B

SOILS (REGOSOL)
Utilization Patterns of the Deep Water by a Weeping Lovegrass Crop (Eragrostis curvula Nees), in a Regosol Soil of the Pampean Semiarid Region, (In Spanish),
W74-08682 2I

SOILS TYPES
Available Water in Some Great Groups of Mozambique Soils,
W74-08313 2G

SOLID WASTES
Effective Use of High Water Table Areas for Sanitary Landfill.
W74-08486 5E

SOLUTES
Model Study of the Dilution of Soluble Liquids Discharge from Tankers,
W74-08451 5B

SOLVENT EXTRACTIONS
Recovery of Phosphates and Metals from Phosphate Sludge by Solvent Extraction,
W74-08590 5D

SORPTION
Applications of Growth and Sorption Algal Assays,
W74-08154 5C

SOUTH AMERICA
Drainage Observations in Latin America,
W74-08268 4A

SOUTH CAROLINA
Environmental Effect of a Complex Nuclear Facility,
W74-08254 5D

Average Weekly Rainfall and Probabilities During the Planting-Growing-Harvesting Period in South Carolina,
W74-08295 2B

SOUTH PLATTE RIVER (COLO)
Report on the Second Session of the Conference in the Matter of Pollution of the South Platte River Basin.
W74-08530 5G

SOUTH VIETNAM
Development of Water Supply in Vietnam,
W74-08460 5G

SOUTHWEST U
Computer Simulation of Crop Production - Potential and Hazards,
W74-08331 3F

SPAWNING
Generalization of Spawning and Rearing Discharges for Several Pacific Salmon Species in Western Washington,
W74-08370 2I

SPECTROMETERS
A Simply Constructed and Adjustable Mercury Vapor Cell Mount,
W74-08379 7B

SPECTROPHOTOMETRY
A Simply Constructed and Adjustable Mercury Vapor Cell Mount,
W74-08379 7B

SPRINKLER IRRIGATION
Center Pivot Problems.
W74-08283 3F

SPRINKLING
Crop Cooling with Sprinklers,
W74-08271 3F

STANDARDS
Problems and SCS Specifications for Low Head PVC Pipelines,
W74-08278 8B

STATE GOVERNMENT
State Environmental Radioactivity Surveillance Programs, 1972,
W74-08647 5B

STATE GOVERNMENTS
State of Washington, 1973 Annual Report, Natural Resources and Recreation Agencies.
W74-08536 6E

Louisiana Moves Toward Coastal Zone Management.
W74-08537 6E

State Program Elements Necessary for Participation in the National Pollutant Discharge Elimination System.
W74-08560 6E

STATISTICAL METHODS
Stochastic Analysis of Groundwater Level Time Series in the Western United States,
W74-08368 2F

STATISTICAL MODELS
Estimating Low-Flow Frequency for Perennial Missouri Ozarks Streams,
W74-08599 4A

STEAM
Water: A Comprehensive Treatise. Volume 1. Physics and Physical Chemistry of Water.
W74-08665 1A

STEEL TUBING
Development of a Production Technique for Porous Stainless Steel Tubes,
W74-08503 8G

STOCHASTIC PROCESSES
Stochastic Analysis of Groundwater Level Time Series in the Western United States,
W74-08368 2F

STORM RUNOFF
Relief Concept Concerning Mixed Sewers (Entlastungs-Konzeptionen im Mischsystem),
W74-08246 5D

Time of Concentration--A Kinematic Wave Approach,
W74-08593 2E

STORM WATER
Grangemouth Tunnel Sewer,
W74-08197 8A

STRAINERS
Solids Separation from Industrial Waters and Effluents: Screening and Straining,
W74-08393 5D

STRATIFIED FLOW
Selective Withdrawal from Man-Made Lakes,
W74-08585 4A

STREAM ECOLOGISTS
A Worldwide Directory of Stream Ecologists,
W74-08235 10C

STREAM GAGES
A Plan for the Improvement of the Low Flow Data Network in Alabama,
W74-08175 7A

STREAMS
A Worldwide Directory of Stream Ecologists,
W74-08235 10C

Water Transport of Heavy Metals in Solution and by Different Sizes of Particulate Solids,
W74-08238 5B

Preliminary Papers for UNESCO-IBP Symposium on Productivity Problems of Freshwaters.
W74-08673 5C

STRUCTURAL DESIGN
A Cofferdam Design Optimization.
W74-08511 8A

SUBARCTIC
Ground Water Quality Effects on Domestic Water Utilization.
W74-08287 5B

Activated Sludge Disposal in a Subarctic Environment.
W74-08443 5E

SUBMERGED LANDS ACT
The Atlantic States' Claim to Offshore Oil Rights: United States v. Maine.
W74-08538 6E

SUBSURFACE DRAINAGE
Automated Flow-Recording System for Field Drainage Monitoring--Direct Data Compilation of Surface and Subsurface Drain Flow,
W74-08267 4A

Drainage Observations in Latin America.
W74-08268 4A

SUBSURFACE IRRIGATION
Infiltration and Root Extraction from Subsurface Irrigation Laterals,
W74-08270 3F

SUGAR BEETS
Controlling Soil Crusting with Phosphoric Acid to Enhance Seedling Emergence,
W74-08279 3F

SULFITE LIQUORS
Pulp, Paper, and Board in the Environment -- Part 9. Pollution Abatement in the Finnish Pulp and Paper Industry.
W74-08406 5G

Purification of Sulfite Mill Effluents from Lignosulfonates (Ochistka promstokov sulfitno-tsellyuloznogo proizvodstva ot lignosul'fonatov),
W74-08412 5D

Pollution Abatement at the Venizel Mill of La Rochette-Cenpa (Lutte anti-pollution a l'usine de Venizel de la Rochette-Cenpa),
W74-08416 5D

The Gas-Chromatographic Determination of Some Lignin Compounds in Surface Waters (Die gaschromatographische Bestimmung einiger Ligninverbindungen in Oberflaechengewaessern),
W74-08433 5A

Pulp Industry and Environmental Protection (Zellstoff-Industrie und Umweltschutz),
W74-08436 5D

SULFONATES
Purification of Sulfite Mill Effluents from Lignosulfonates (Ochistka promstokov sulfitno-tsellyuloznogo proizvodstva ot lignosul'fonatov),
W74-08412 5D

The Gas-Chromatographic Determination of Some Lignin Compounds in Surface Waters (Die gaschromatographische Bestimmung einiger Ligninverbindungen in Oberflaechengewaessern),
W74-08433 5A

SULFUR
Increased Denitrification in Soils by Additions of Sulfur as an Energy Source,
W74-08322 5B

SULFUR COMPOUNDS
Pulp Industry and Environmental Protection (Zellstoff-Industrie und Umweltschutz),
W74-08436 5D

SULFUR DIOXIDE
Air-Borne Acid,
W74-08689 5A

SULFUROUS AIR POLLUTION
Residence Time of Sulfurous Air Pollutants from a Local Source During Precipitation,
W74-08690 5A

SUPERCRITICAL FLOW
Flow Characteristics of Sloping Channel Jumps,
W74-08387 8B

SUPPLY CURVE
Supply Curve for Thermal Efficiency,
W74-08509 6A

SURFACE DRAINAGE
Drainage Observations in Latin America,
W74-08268 4A

SURFACE-GROUNDWATER RELATIONSHIPS
Digital-Model Study of Ground-Water Hydrology, Columbia Basin Irrigation Project Area, Washington,
W74-08382 2F

SURFACE IRRIGATION
Determination of Water Intake Rate of Advance,
W74-08275 3F

Maximum Corn Yields With Minimum Water.
W74-08312 3F

Hydrodynamics of Surface Irrigation-Advance Phase,
W74-08384 8B

SURFACE WATER
Water Surveillance Programs, February 1973 and 1972, Special Analyses.
W74-08652 5B

Radioactivity in Washington Surface Water July 1970-June 1971.
W74-08653 5B

Radioactivity in New York State Surface Water, July-December 1971.
W74-08654 5B

Water Surveillance Programs, April-May 1973.
W74-08655 5B

SURFACE WATERS
Surface-Water Availability, Colbert County, Alabama.
W74-08187 4A

Water Availability, Coosa County, Alabama,
W74-08188 4A

Surface-Water Availability, Limestone County, Alabama,
W74-08189 4A

Surface-Water Availability, Etowah County, Alabama,
W74-08190 4A

SURGES
Galveston Bay Hurricane Surge Study: Report 1. Effects of Proposed Barriers on Hurricane Surge Heights--Appendix A, Calibration Tests,
W74-08586 8B

SURVEILLANCE PROGRAM
State Environmental Radioactivity Surveillance Programs, 1972,
W74-08647 5B

SURVEY
State Environmental Radioactivity Surveillance Programs, 1972,
W74-08647 5B

SURVEYS
The Connecticut Tidal Wetlands Survey,
W74-08158 6E

The Connecticut Tidal Wetlands Survey,
W74-08159 6E

Inland Wetland Soils,
W74-08160 2G

Reverse Osmosis and Ultrafiltration - A Survey of Auxiliary Apparatuses Available in this Field (Umgekehrte Osmose und Ultrafiltration - Ein Ueberblick Ueber die auf Diesem Gebiet Verfuegbaren Apparativen Hilfsmittel),
W74-08218 5D

The Citizen and Water Management: An Atlas of Water Attitudes in Southern Minnesota,
W74-08288 6B

Radiological Survey of New London Harbor, Thames River, Conn., and Environs,
W74-08645 5B

SUSPENDED LOAD
Suspended Solids Analysis Using ERTS-A Data,
W74-08301 2J

SWEDEN
The Chemical Treatment of Municipal Waste Water (Zur Chemischen Behandlung von Staedtischen Abwassern),
W74-08199 5D

Swedish Techniques to Combat Pollution,
W74-08353 5D

Air-Borne Acid,
W74-08689 5A

SWIMMING POOLS
The Role of Disinfection in the Optimum Environment,
W74-08205 5F

Disinfection of Water Using Chlorine Dioxide,
W74-08253 5D

SWITZERLAND
Water Quality and Water Pollution Control in Switzerland,
W74-08697 5G

SYNOPTIC ANALYSIS
Satellite Views of Hurricane Camille,
W74-08291 2B

SYNTHANE PROCESS
Analyses of Tars, Chars, Gases, and Water Found in Effluents from the Synthane Process,
W74-08592 5A

SYSTEMS ANALYSIS
System Optimization for Pulp and Paper Industrial Wastewater Treatment Design,
W74-08418 5D

Systems Planning Design Case Studies in Modeling, Optimization, and Evaluation.
W74-08506 6A

Systems Analysis of Large-Scale Public Facilities: New York City's Water Supply Network as a Case Study.
W74-08507 3D

TAMARISK
Woody Phreatophytes Along the Colorado River From Southeast Runnels County to the Headwaters in Borden County, Texas.
W74-08371 3B

TELEMETRY
The Use of ERTS-1 for Relaying Hydrologic Data in the Delaware River Basin.
W74-08583 7B

TEMPERATURE
Water Quality Monitoring Experience in the Somerset River Authority Area, 1968-1972.
W74-08360 5A

TEMPERATURE CONTROL
Crop Cooling with Sprinklers,
W74-08271 3F

TENNESSEE
Water Transport of Heavy Metals in Solution and by Different Sizes of Particulate Solids,
W74-08238 5B

The Sevier County Water Plan,
W74-08493 6D

Laboratory Flotation Studies of Tennessee Phosphates in the Presence of Slimes.
W74-08588 5D

TERRE HAUTE (IND)
Final Environmental Statement, West Terre Haute Levee, Wabash River, Indiana, Wabash River Basin.
W74-08660 8D

TERTIARY TREATMENT
Plant Expanded for Advanced Waste Treatment,
W74-08223 5D

New Tertiary Sewage Process Needs No Chlorine to Disinfect.
W74-08229 5D

TEST WELLS
Brackish Water Desalting, Testing and Evaluation Procedures with Mobile Test Facility,
W74-08335 3A

TETRABROMOETHANE
Solubility of 1,1,2,2-Tetrabromoethane in Water as a Function of Temperature,
W74-08589 5B

TEXAS
Plant Expanded for Advanced Waste Treatment,
W74-08223 5D

New Roller Gate Improves the River Walk.
W74-08250 8A

Grow Wheat and Grain Sorghum with Less Water.
W74-08265 3F

Predicting Reaeration Coefficients for Polluted Estuary,
W74-08307 5B

Woody Phreatophytes Along the Colorado River From Southeast Runnels County to the Headwaters in Borden County, Texas,
W74-08371 3B

Ground-Water Resources of Duval County, Texas,
W74-08372 4B

Reconnaissance of the Chemical Quality of Surface Waters of the Rio Grande Basin, Texas,
W74-08373 5B

Lower Rio Grande Flood Control Project, Texas.
W74-08521 8A

Final Report Analyzing Coastal and Marine Law to Develop an Authority for Coastal Zone Management,
W74-08544 6E

Galveston Bay Hurricane Surge Study: Report 1. Effects of Proposed Barriers on Hurricane Surge Heights--Appendix A, Calibration Tests,
W74-08586 8B

Some Acute Effects of Low-Boiling Petroleum Fractions on the Cellular Structure of Fish Gills Under Field Conditions,
W74-08637 5C

TEXTILES
Waste Water Problems of the Textile Industry. Part I. Oxygen Demand of Printing Paste Thickeners. (Problemi inerenti le acque di scarico nell'industria tessile. Io. La domanda di ossigeno di addensanti da stampa),
W74-08421 5B

Some Results of Water Purification at Viscose Rayon Factories (Nekotorye itogi raboty vodoochistnykh sooruzhennii predpriyatii viskoznykh volokon),
W74-08429 5D

THAILAND
Water Pollution in Thailand,
W74-08483 5G

THAMES RIVER
Radiological Survey of New London Harbor, Thames River, Conn., and Environs,
W74-08645 5B

THERMAL EFFICIENCY
Supply Curve for Thermal Efficiency,
W74-08509 6A

THERMAL POWERPLANTS
Supply Curve for Thermal Efficiency,
W74-08509 6A

THERMAL STRATIFICATION
Towards an Objective Analysis of the Seasonal Thermocline,
W74-08691 2E

THERMOCLINE
Towards an Objective Analysis of the Seasonal Thermocline,
W74-08691 2E

THERMODYNAMICS
Thermodynamics of Soil Water: IV. Chemical Potential of Soil Water,
W74-08191 2G

TIDAL MARSHES
Proceedings: First Wetlands Conference, June 20, 1973,
W74-08157 2L

The Connecticut Tidal Wetlands Survey,
W74-08158 6E

State V Bishop (Action for Public Nuisance and Trepass in Filling Area Below High Water Mark of Bay).
W74-08573 6E

TIME OF CONCENTRATION
Time of Concentration--A Kinematic Wave Approach,
W74-08593 2E

TORONTO (CANADA)
Erosion Control and Bank Stabilization in Metropolitan Toronto--10 Year Programme and 5 Year Project.
W74-08488 4D

TOWBOATS
Economics of Inland Water Transport,
W74-08508 4A

TOXICITY
Neurological Changes in Cats Following Long-Term Diet of Mercury Contaminated Tuna,
W74-08200 5C

A Bioassay of Toxicity Using Protozoa in the Study of Aquatic Environment Pollution and Its Prevention,
W74-08221 5A

Heavy Metals in Agricultural Lands Receiving Chemical Sewage Sludges,
W74-08397 5E

The Toxicity of Sulphate Pulp Bleaching Effluents,
W74-08403 5C

Toxicity Control of Industrial Wastewaters and Pesticide-Polluted Waters in Vietnam,
W74-08480 5C

Considerations in Application of Microorganisms to the Environment for Degradation of Petroleum Products,
W74-08618 5B

Sublethal Effects of the Water Soluble Component of Oil: Chemical Communication in the Marine Environment,
W74-08636 5C

TOXINS
The Use of the Dilution Water Effect as a Water Quality Criterion,
W74-08356 5A

TRACERS
Tracer Simulation of Soluble Waste Concentration,
W74-08377 5B

TRANS-ALASKA PIPELINE
Aquatic Organisms from Selected Sites Along the Proposed Trans-Alaska Pipeline Corridor, September 1970 to September 1972,
W74-08369 2I

TRANSPORTATION
Activated Sludge Disposal in a Subarctic Environment,
W74-08443 5E

Economics of Inland Water Transport,
W74-08508 4A

TRAVEL TIME
Discharge and Travel Time for Ground-Water Conduits,
W74-08383 8B

TREATMENT FACILITIES
Automatic Process Control of Sewage Treatment Works,
W74-08212 5D

Rippon Squashes Central Waste Treatment Precedent,
W74-08213 5E

The River Itchen Scheme of the Portsmouth Water Company.
W74-08216 8A

Plant Expanded for Advanced Waste Treatment,
W74-08223 5D

Furnace Constructions for Incineration (Ofenkonstruktionen Fuer Die Abfallverbrennung).
W74-08248 5D

Letchworth Water Pollution Control Works,
W74-08260 5D

Virus Removal in Waste Stabilisation Ponds,
W74-08352 5D

Swedish Techniques to Combat Pollution,
W74-08353 5D

Examples of Sewage Sludge Incineration in the UK,
W74-08364 5D

Design and Performance Criteria for Settling Tanks for the Removal of Physical-Chemical Flocs,
W74-08396 5D

To Establish Viable Methods of Maintaining Waste Treatment Facility Efficiencies with Reference to Flow Variations.
W74-08398 5D

Recent Developments in Treatment of Papermaking Effluents in France (Developpements recents du traitement des effluents de papeterie en France),
W74-08402 5D

Treatment System Handles Flexo Ink and Starch Waste in Single Operation,
W74-08409 5D

Process of Physical-Chemical Purification for Waste Waters from Paper and Board Mills (Procede de nettoyage chimico-physique pour les restes d'eaux usees des fabriques de papier et carton),
W74-08410 5D

Aeration of Effluents in Aeration Tanks (Aeratsiya stochnykh vod v aerotenkakhvytesnitelyakh),
W74-08413 5D

Pollution Abatement at the Venizel Mill of La Rochette-Cenpa (Lutte anti-pollution a l'usine de Venizel de la Rochette-Cenpa),
W74-08416 5D

Operation of Pilot Plant Equipment for Purification of Effluents from the Stefan Kiradzhiev Pulp and Paper Mill in Novi Krichim (Syzlavane rezhim na rabota na poluproizvodstvena prechistvatelna stantsiya za promishleni otpadychni v odi ot KTsKh 'Stefan Kiradzhiev' gr. Novi Krichim),
W74-08417 5D

Centrifugal Dewatering of Secondary Waste Sludges,
W74-08431 5D

Media Filtration in Effluent and Waste Water Treatment,
W74-08432 5D

Lamellar Sedimentation of Fiber-Carrying Waste Waters (Lamellsedimentering av fiberholdig vann),
W74-08437 5D

How Safe are Sewers for Construction and Maintenance Crews,
W74-08440 5G

TRICKLE IRRIGATION
Uniform Irrigation with Low-Pressure Trickle Systems,
W74-08323 3F

TRICKLING FILTERS
Plant Expanded for Advanced Waste Treatment,
W74-08223 5D

TRITIUM
Tritium Burdens in Two Arctic Villages,
W74-08649 5B

Tritium Surveillance System, October-December 1972.
W74-08650 5B

Tritium Surveillance System, April-June 1973.
W74-08656 5B

TROPICAL REGIONS
Development of Blue-Green Algal Blooms in Non-Alkaline Waters,
W74-08478 5C

TROPICAL SOILS
Hydrolysis and Availability of Pyrophosphate in Tropical Soils,
W74-08498 2G

TROUT
The Toxicity of Sulphate Pulp Bleaching Effluents,
W74-08403 5C

Notes on the Feeding Relationships of Trout (Salmo trutta L.) and Salmon (Salmo salar L.) in the River Suldalslagen, West Norway,
W74-08680 2I

TUBES
Development of a Production Technique for Porous Stainless Steel Tubes,
W74-08503 8G

TUNA
Neurological Changes in Cats Following Long-Term Diet of Mercury Contaminated Tuna,
W74-08200 5C

TUNDRA
Bacterial Degradation of Mineral Oils at Low Temperatures,
W74-08625 5B

TUNNELING
Small Tunnels, Large Potentials,
W74-08358 8A

TUNNELING MACHINES
Small Tunnels, Large Potentials,
W74-08358 8A

TUNNELS
Grangemouth Tunnel Sewer,
W74-08197 8A

Water Resources: Key to Western Future.
W74-08204 5G

TURBIDITY
Suspended Solids Analysis Using ERTS-A Data,
W74-08301 2J

Limnological Studies and Remote Sensing of the Upper Truckee River Sediment Plume in Lake Tahoe, California-Nevada,
W74-08302 2J

TURBULENCE
Turbulence Characteristics in a Smooth Open Channel of Circular Cross-Section (Caracteristiques de la Turbulence au Sein d'un Ecoulement a Surface Libre En Conduite Lisse De Section Circulaire,
W74-08192 8B

Transverse Dispersion in Ocillatory Channel Flow,
W74-08389 5B

TURBULENT FLOW
The Friction Factors of Oscillating Pipe Flows,
W74-08259 8B

ULTRAFILTRATION
Reverse Osmosis and Ultrafiltration - A Survey of Auxiliary Apparatuses Available in this Field (Umgekehrte Osmose und Ultrafiltration - Ein Ueberblick Ueber die auf Diesem Gebiet Verfuegbaren Apparativen Hilfsmittel),
W74-08218 5D

Role of Ultrafiltration in Industrial Effluent Problems,
W74-08408 5D

Industrial Processing with Membranes.
W74-08664 5D

ULTRAHIGH FREQUENCY SOUND
New Tertiary Sewage Process Needs No Chlorine to Disinfect.
W74-08229 5D

UNITED KINGDOM
Examples of Sewage Sludge Incineration in the UK,
W74-08364 5D

UNITED KINGDOM (SOMERSET RIVER)
Water Quality Monitoring Experience in the Somerset River Authority Area, 1968-1972,
W74-08360 5A

UNITED STATES
A Bill to Amend the Soil Conservation and Domestic Allotment Act.
W74-08554 6E

Pollution Prevention Vessel and Oil Transfer Facilities.
W74-08558 6E

Trends and Variability of Yearly Mean Sea Level 1893-1972,
W74-08643 2B

Tritium Surveillance System, October-December 1972.
W74-08650 5B

Tritium Surveillance System, April-June 1973.
W74-08656 5B

Water Atlas of the United States,
W74-08668 7C

Range Extensions of Corbicula manilensis (Philippi) in the Atlantic Drainage of the United States,
W74-08685 2I

UNIVERSITIES
Ninth Annual Report, Fiscal Year 1973.
W74-08232 9D

UNSATURATED FLOW
Two-Phase Flows in Porous Media.
W74-08303 2F

URBAN HYDROLOGY
Hydrological Effects of Urbanization.
W74-08257 4C

Digital Simulation of the Effects of Urbanization on Runoff in the Upper Santa Ana Valley, California.
W74-08598 4C

URBAN RUNOFF
Water Pollution and Associated Effects from Street Salting.
W74-08306 5B

Digital Simulation of the Effects of Urbanization on Runoff in the Upper Santa Ana Valley, California.
W74-08598 4C

URBANIZATION
Hydrological Effects of Urbanization.
W74-08257 4C

Difficulties in Planning Water Supply Schemes in West Malaysia,
W74-08462 6B

Summary Report on Pollution Control in Indonesia,
W74-08484 5G

Digital Simulation of the Effects of Urbanization on Runoff in the Upper Santa Ana Valley, California,
W74-08598 4C

UREAS
Recovery of N15-Labeled Fertilizers in Field Experiments,
W74-08315 5B

USSR
Some Results of Water Purification at Viscose Rayon Factories (Nekotorye itogi raboty vodoochistnykh sooruzhennii predpriyatii viskoznykh volokon),
W74-08429 5D

USSR (AZABACHYE LAKE)
Structure of Oncorhynchus nerka (Walb.) Isolated Population of the Azabachye Lake, (In Russian),
W74-08548 2H

USSR (KAYRAKKUM RESERVOIR)
Nourishment of Rutilus rutilus aralensis morpha fragmiteti Berg. of the Kayrakkum Water Reservoir, (In Russian),
W74-08663 2H

USSR (KAZAKHSTAN)
Characteristic Use of Genetic Principles in the Classification of North Kazakhstan Forests on the Ancient Crusts of Wheathering and on Quaternary Deposits, (In Russian),
W74-08182 2I

USSR (KHARKOV RESERVOIR)
Changes of the Number of Bacterial Cells of Different Morphological Groups in the Water and Bottom Deposits of the Khakon Reservoir as a Function of the Intensity of Development of Blue-Green Algae, (In Ukrainian),
W74-08505 5C

USSR (KOMMUNAR PAPER MILL)
Replacement of the Anthracite Sublayer in Anion-Exchange Filters of Water Purification Equipment (Zamena antratsitovogo podsloya v anionitovykh fil'trakh vodoochistnykh ustanovok),
W74-08407 5D

USSR (KVASY REGION)
The Effect of Mineral Waters of the Kvasy Spa on Some Indices of Cholesterol and Sialic Acid Metabolism, (In Russian),
W74-08686 5C

USSR (MINGECHAUR RESERVOIR)
Biology of Arctodiaptomus acutilobatus Sars (Copepoda, Crustacea) in the Mingechaur Water Reservoir, (In Russian),
W74-08683 2H

USSR (SARATOV RESERVOIR)
Certain Problems of the Sanitary State of Upper Reaches of the Saratov Water Reservoir, (In Russian),
W74-08698 5B

USSR SOLIKAMSK PULP AND PAPER MILL
Aeration of Effluents in Aeration Tanks (Aeratsiya stochnykh vod v aerotenkakh-vytesnitelyakh),
W74-08413 5D

USSR (TURKMAN)
Natural Nidi of Cutaneous Leishmaniasis in the Zone of the Kara Kum Canal (4th Stage) and Their Epidemic Significance, (In Russian),
W74-08696 5B

USSR (TURKMAN-SSR)
Natural Forage Reserve of Turkmen SSR and Ways of its Improvement to Develop Sheep-Raising, (In Russian),
W74-08547 3F

UTAH
Analysis of Water Reuse Alternatives in an Integrated Urban and Agricultural Area,
W74-08510 5D

Utah Environmental Problems and Legislative Response: II, Legislative Response,
W74-08535 5G

VALVES
Pinch Valves Take Hold on the Industry,
W74-08363 8A

VANADIUM
Potentiostatic Coulometric Determination of Vanadium, Vanadium-Manganese and Vanadium-Iron Mixtures and the Influence of Chromium on the Process,
W74-08674 5A

VARIABILITY
The Brackish Water Clam Rangia Cuneata as Indicator of Ecological Effects of Salinity Changes in Coastal Waters,
W74-08676 5C

VEGETATION ESTABLISHMENT
Control of Mine Drainage from Coal Mine Mineral Wastes: Phase II. Pollution Abatement and Monitoring,
W74-08661 5G

VELOCITY
Instrumentation in Full Scale Self-Aerated Flows (Appareils de Mesure Des Concentrations et Des Vitesses Dans un Courant Mixte d'air Et D'Eau en Grandeur Nature),
W74-08196 8B

VERTICAL MIGRATION
Vertical Distribution of Fallout Cesium-137 in Cultivated Soils,
W74-08644 5B

VIETNAM
Toxicity Control of Industrial Wastewaters and Pesticide-Polluted Waters in Vietnam,
W74-08480 5C

VIRAL ETIOLOGY
Sanitary-Microbiological Investigations in Preventing Infections of Bacterial and Viral Etiology, (In Russian),
W74-08692 5C

VIRGINIA
Flood Plain Information; Peters Creek and Lick Run, Roanoke, Virginia.
W74-08491 4A

Water and Sewer Supply Decisions: A Case Study of the Washington Suburban Sanitary Commission,
W74-08497 5G

VIRUS REMOVAL
Virus Removal by Diatomaceous-Earth Filtration - Part 1,
W74-08215 5F

Virus Removal in Waste Stabilisation Ponds,
W74-08352 5D

VIRUSES
Virus Removal by Diatomaceous-Earth Filtration - Part 1,
W74-08215 5F

Virus Removal in Waste Stabilisation Ponds,
W74-08352 5D

VOLTAMMETRY
Potentiostatic Coulometric Determination of Vanadium, Vanadium-Manganese and Vanadium-Iron Mixtures and the Influence of Chromium on the Process,
W74-08674 5A

VORTICES
Mechanism for Streamflow Meandering,
W74-08388 8B

WARNING SYSTEMS
Preliminary System Development--Chemical Hazards Response Information System (CHRIS), Appendix VII--Supporting Information.
W74-08181 5B

WASH WATER
Development of a Reverse Osmosis Module for Wash Water Recycling in a Space Environment at 165 deg F,
W74-08344 5D

WASHINGTON
Improved Control of Radioactive Wastes,
W74-08255 5D

Generalization of Spawning and Rearing Discharges for Several Pacific Salmon Species in Western Washington,
W74-08370 2I

Digital-Model Study of Ground-Water Hydrology, Columbia Basin Irrigation Project Area, Washington,
W74-08382 2F

State of Washington, 1973 Annual Report, Natural Resources and Recreation Agencies.
W74-08536 6E

Radioactivity in Washington Surface Water July 1970-June 1971.
W74-08653 5B

WASTE ASSIMILATIVE CAPACITY
Optimization of the Assimilative Waste Capacity of the Unsaturated and Saturated Zones of an Unconfined Aquifer System,
W74-08152 5B

Recipient Capacity to Limit Discharge of Pollutants to Receiving Waters,
W74-08351 5B

WASTE DILUTION
The Toxicity of Sulphate Pulp Bleaching Effluents,
W74-08403 5C

WASTE DISPOSAL
Rippon Squashes Central Waste Treatment Precedent,
W74-08213 5E

Environmental Effect of a Complex Nuclear Facility,
W74-08254 5D

Electrophoresis and Coagulation Studies of Some Florida Phosphate Slimes,
W74-08591 5D

Technical and Economic Issues in the Water Quality Management of Yaquina Bay,
W74-08672 2L

WASTE DISPOSAL WELLS
Ground Water Pollution From Subsurface Excavations: Part III. More on Pollution from Wells.
W74-08184 5B

WASTE TREATMENT
Primary Sludges Produced by the Addition of Lime to Raw Waste Water,
W74-08224 5D

Furnace Constructions for Incineration (Ofenkonstruktionen Fuer Die Abfallverbrennung).
W74-08248 5D

Applications of Waste Processing Systems for Pressurized Water Reactors,
W74-08349 5D

Virus Removal in Waste Stabilisation Ponds,
W74-08352 5D

Some Useful Ideas on Waste Water Reduction,
W74-08355 5D

Laboratory Flotation Studies of Tennessee Phosphates in the Presence of Slimes,
W74-08588 5D

Recovery of Phosphates and Metals from Phosphate Sludge by Solvent Extraction,
W74-08590 5D

Electrophoresis and Coagulation Studies of Some Florida Phosphate Slimes,
W74-08591 5D

WASTE WATER DISPOSAL
Sewerage; Sewage Treatment and Disposal in Singapore,
W74-08467 5D

Waste Disposal Systems from a Groundwater Hydrology and Pollution Point of View,
W74-08594 5E

WASTE WATER (POLLUTION)
A New Aspect of Pollution: Increase in the Salinity of Water During Its Use in Mills (Un nouvel aspect de la pollution: la salinite ajoutee a l'eau au cours de son utilisation dans les usines),
W74-08404 5B

Determination of the Alkalinity of Mill Effluents (Opredelenie shchelochnosti stochnykh vod),
W74-08411 5A

Pollution Abatement in Effluents from Constructional Fiberboard Manufacture (Z badan nad redukcja obcizenia sciekow w przemysle plyt pilsniowych),
W74-08426 3E

WASTE WATER TREATMENT
Application of Reverse Osmosis to Acid Mine Drainage Treatment,
W74-08155 5D

An Experimental Irradiation Facility for the Sterilization of Sewage Sludge (Eine Versuchsbestrahlungsanlage Zur Hygienisierung Von Klaerschlamm),
W74-08198 5D

The Chemical Treatment of Municipal Waste Water (Zur Chemischen Behandlung von Staedtischen Abwassern),
W74-08199 5D

Small Balls Repeal Smell,
W74-08201 5D

A Knowledge Crisis in Solid-Fluid Separation.
W74-08202 5D

Water Resources: Key to Western Future.
W74-08204 5G

The Role of Disinfection in the Optimum Environment,
W74-08205 5F

Oxygenation System for Accelerated Sewage Treatment,
W74-08207 5D

Potable-Water Supply by Means of Upflow Filtration (L'Eau Claire Process),
W74-08210 5F

All Costs Must be Counted . . . ,
W74-08211 5D

Automatic Process Control of Sewage Treatment Works,
W74-08212 5D

Rippon Squashes Central Waste Treatment Precedent,
W74-08213 5E

Best Effluent the Goal,
W74-08214 5D

Virus Removal by Diatomaceous-Earth Filtration - Part 1,
W74-08215 5F

The Automatic Filter Press FPAKM (Die Auotomatische Filterpress FPAKM),
W74-08217 5D

Reverse Osmosis and Ultrafiltration - A Survey of Auxiliary Apparatuses Available in this Field (Umgekehrte Osmose und Ultrafiltration - Ein Ueberblick Ueber die auf Diesem Gebiet Verfuegbaren Apparativen Hilfsmittel),
W74-08218 5D

Measurement and Monitoring Units for Waste Water (Mess-und Ueberwwachungsgeraete fuer Abwasser),
W74-08219 5A

Plant Expanded for Advanced Waste Treatment,
W74-08223 5D

Primary Sludges Produced by the Addition of Lime to Raw Waste Water,
W74-08224 5D

Automation Comes to L.A.,
W74-08225 5D

The Pros and Cons of Automated Filters.
W74-08226 5D

Those Nasty Phosphatic Clay Ponds
W74-08227 5D

Countercurrent Washing Turns the Tide Against Rising Effluent Costs,
W74-08228 5D

New Tertiary Sewage Process Needs No Chlorine to Disinfect.
W74-08229 5D

Advanced Waste Treatment Process Selection, Part Two,
W74-08245 5D

Disinfection of Water Using Chlorine Dioxide.
W74-08253 5D

Letchworth Water Pollution Control Works,
W74-08260 5D

Sewage Treatment and Disposal.
W74-08261 5D

Utilitarian Leisure for Burnham-On-Sea.
W74-08262 5D

Cost Effectiveness in Sewage Treatment,
W74-08263 5D

Results of Examinations of Hospital Waste Water (Ergebnisse der Untersuchungen von Krankenhausabwaessern),
W74-08286 5B

Process Kinetics for Denitrification,
W74-08320 5D

Evaluation of Ion Exchange Processes for Treatment of Mine Drainage Waters,
W74-08341 5D

Development of a Reverse Osmosis Module for Wash Water Recycling in a Space Environment at 165 deg F,
W74-08344 5D

Applications of Waste Processing Systems for Pressurized Water Reactors,
W74-08349 5D

Bituminous Coal - A Substitute for Anthracite Filter Media in Two-Layer Filtration of Water,
W74-08350 5F

Virus Removal in Waste Stabilisation Ponds,
W74-08352 5D

Swedish Techniques to Combat Pollution,
W74-08353 5D

Some Useful Ideas on Waste Water Reduction,
W74-08355 5D

Solids Separation from Industrial Waters and Effluents Screening and Straining
W74-08393 5D

Utilization of Industrial Wastes and Waste By-Products for Phosphorus Removal An Inventory and Assessment.
W74-08394 5D

Nutrient Control in Sewage Lagoons
W74-08395 5D

Design and Performance Criteria for Settling Tanks for the Removal of Physical-Chemical Flocs.
W74-08396 5D

Integration of Physico-Chemical and Biological Waste-Water Treatment Processes.
W74-08399 5D

Chemical Dosage Control for Phosphorus Removal.
W74-08400 5D

Recent Developments in Treatment of Papermaking Effluents in France (Developpements recents du traitement des effluents de papeterie en France),
W74-08402 5D

Pulp, Paper, and Board in the Environment – Part 8: Environmental Problems of the West German Pulp, Paper, and Board Industry.
W74-08405 5G

Pulp, Paper, and Board in the Environment – Part 9 Pollution Abatement in the Finnish Pulp and Paper Industry.
W74-08406 5G

Replacement of the Anthracite Sublayer in Anion-Exchange Filters of Water Purification Equipment (Zamena antratsitovogo podsloya v anionitovykh fil'trakh vodoochistnykh ustanovok),
W74-08407 5D

Role of Ultrafiltration in Industrial Effluent Problems,
W74-08408 5D

Treatment System Handles Flexo Ink and Starch Waste in Single Operation,
W74-08409 5D

Process of Physical-Chemical Purification for Waste Waters from Paper and Board Mills (Procede de nettoyage chimico-physique pour les restes d'eaux usees des fabriques de papier et carton),
W74-08410 5D

Purification of Sulfite Mill Effluents from Lignosulfonates (Ochistka promstokov sulfitno-tsellyuloznogo proizvodstva ot lignosul'fonatov),
W74-08412 5D

Aeration of Effluents in Aeration Tanks (Aeratsiya stochnykh vod v aerotenkakhvytesnitelyakh),
W74-08413 5D

Pollution Abatement at the Venizel Mill of La Rochette-Cenpa (Lutte anti-pollution a l'usine de Venizel de la Rochette-Cenpa),
W74-08416 5D

Operation of Pilot Plant Equipment for Purification of Effluents from the Stefan Kiradzhiev Pulp and Paper Mill in Novi Krichim

zlavane rezhim na rabota na poluproizvodst-
ia prechistvatelna stantsiya za promishleni
adychni v odi ot KTsKh 'Stefan Kiradzhiev'
Novi Krichim),
4-08417 5D

stem Optimization for Pulp and Paper Indus-
l Wastewater Treatment Design,
4-08418 5D

amples of the Use of the 'Seclar' Decanter
Treating Paper Industry Effluents (Exemples
pplication du decanteur 'Seclar' au traite-
nt d'effluents de l'industrie papetiere),
4-08419 5D

ith Circular Clarifying Basin for Baiersbronn
oith-Rundklaerbecken fuer Baiersbronn).
4-08427 5D

llution of the Drammens River by the Wood-
ocessing Industry (Treforedlingsindustriens
lipp til Drammensvassdraget),
4-08428 5B

me Results of Water Purification at Viscose
yon Factories (Nekotorye itogi raboty
doochistnykh sooruzhennii predpriyatii
koznykh volokon),
4-08429 5D

ntrifugal Dewatering of Secondary Waste
udges,
4-08431 5D

edia Filtration in Effluent and Waste Water
eatment,
4-08432 5D

n Evaluation of the Adsorptive Properties of
y Ash and Bark-Derived Activated Char,
4-08435 5D

amellar Sedimentation of Fiber-Carrying
aste Waters (Lamellsedimentering av
erholdig vann),
4-08437 5D

utomatic Waste Sludge Sampler,
4-08442 5A

naerobic Biological Stabilization of Sanitary
andfill Leachate,
4-08448 5D

iological, Physical and Chemical Treatment of
ood Soaking Vat Wastewater,
4-08449 5D

he Reuse of Sewage Effluent for Industrial
urposes in Singapore,
4-08458 5D

lunicipal Wastewater Reclamation and Reuse,
4-08461 5D

isposal of Industrial Trade Effluents from the
ood Industries,
4-08468 5D

etroleum Refinery Effluent Quality Control,
4-08473 5D

lew Laws: Clean Waters in the Next Decade,
4-08542 5G

nalyses of Tars, Chars, Gases, and Water
ound in Effluents from the Synthane Process,
4-08592 5A

ontrol of Mine Drainage from Coal Mine
lineral Wastes: Phase II. Pollution Abatement
nd Monitoring,
4-08661 5G

Industrial Processing with Membranes.
W74-08664 5D

WASTES
Pollution of Coastal and Navigable Waters (CFR Title 19, Part 4).
W74-08562 6E

WATER ALLOCATION
The Sevier County Water Plan,
W74-08493 6D

WATER ALLOCATION (POLICY)
Estimation of Outdoor Recreational Values,
W74-08392 6B

Analysis of Water Reuse Alternatives in an Integrated Urban and Agricultural Area,
W74-08510 5D

WATER ANALYSIS
Determination of the Alkalinity of Mill Effluents (Opredelenie shchelochnosti stochnykh vod),
W74-08411 5A

Quantitative Measurements of Inorganic Mercury and Organomercurials in Water and Biological Media by Gas-Liquid Chromatography,
W74-08415 5A

Determination of Nitrate in Water with a New Construction of Ion-Selective Electrode,
W74-08420 5A

Determination of Total Hydrocarbons in Sea Water at the Microgram Level with a Flow Calorimeter,
W74-08430 5A

WATER BALANCE
Water Resources Development in West Malaysia,
W74-08463 3B

WATER CHEMISTRY
Use of Hydrochemistry for Interpreting Ground-Water Flow Systems in Central Nevada,
W74-08453 2F

Carbonate Compensation Depth: Relation to Carbonate Solubility in Ocean Waters,
W74-08582 2K

WATEQ, A Computer Program for Calculating Chemical Equilibria of Natural Waters,
W74-08606 2K

Water: A Comprehensive Treatise. Volume 1. Physics and Physical Chemistry of Water.
W74-08665 1A

WATER CONSERVATION
Water Resources: Key to Western Future.
W74-08204 5G

Treatment System Handles Flexo Ink and Starch Waste in Single Operation,
W74-08409 5D

Pollution Abatement in Effluents from Constructional Fiberboard Manufacture (Z badan nad redukcja obcizenia sciekow w przemysle plyt pilsniowych),
W74-08426 3E

Pollution of the Drammens River by the Wood-Processing Industry (Treforedlingsindustriens utslipp til Drammensvassdraget),
W74-08428 5B

Final Report Analyzing Coastal and Marine Law to Develop an Authority for Coastal Zone Management,
W74-08544 6E

WATER CONSUMPTION
Utilization Patterns of the Deep Water by a Weeping Lovegrass Crop (Eragrostis curvula Nees), in a Regosol Soil of the Pampean Semiarid Region, (In Spanish),
W74-08682 2I

WATER CONTROL
New Roller Gate Improves the River Walk.
W74-08250 8A

Navigation and Navigable Waters--Flood Control Regulations.
W74-08551 4A

WATER COSTS
Ground Water Quality Effects on Domestic Water Utilization,
W74-08287 5B

Manual for Calculation of Conventional Water Treatment Costs,
W74-08333 3A

Honolulu Board of Water Supply Annual Report for the Year Ended June 30, 1973.
W74-08492 5G

WATER DELIVERY
Honolulu Board of Water Supply Annual Report for the Year Ended June 30, 1973.
W74-08492 5G

WATER DEMAND
The Sevier County Water Plan,
W74-08493 6D

Analysis of Water Reuse Alternatives in an Integrated Urban and Agricultural Area,
W74-08510 5D

National Water Commission Report,
W74-08527 6B

Municipal Water Preference Statutes: The Texas Wagstaff Act,
W74-08546 6E

WATER DEVELOPMENT
Honolulu Board of Water Supply Annual Report for the Year Ended June 30, 1973.
W74-08492 5G

WATER DISTRIBUTION (APPLIED)
Planning for Water Reuse,
W74-08465 5D

WATER DISTRIBUTION SYSTEMS
The Sevier County Water Plan,
W74-08493 6D

WATER LAW
Legal Aspects of Wetlands Protection--Limits of the Police Power,
W74-08167 6E

Inland Wetlands from the Administrators Viewpoint--Based on Experiences with Connecticut's Inland Wetlands and Water Courses Act,
W74-08168 6E

The Soil Conservation and Its Role in Wetland Management for Connecticut,
W74-08169 6E

Federal Policy Towards Wetlands,
W74-08170 5G

WATER LAW

Industrial Aspects of Wetland Uses,
W74-08171 6E

Panel Review and Commentary,
W74-08172 6E

Sinclair Oil Co. V. Delacroix Corp. (Determination of Mineral Rights Allocable to Water Bottoms.
W74-08578 6E

WATER LEVEL FLUCTUATIONS

Investigations of the Response of an Unconfined Aquifer to Localized Recharge,
W74-08234 2F

Stochastic Analysis of Groundwater Level Time Series in the Western United States,
W74-08368 2F

WATER LEVELS

Groundwater Levels in Nebraska, 1973,
W74-08367 4B

Water-Level Records for the Northern High Plains of Colorado, 1970-74,
W74-08381 4B

WATER MANAGEMENT (APPLIED)

Operation and Maintenance of Irrigation and Drainage Systems: Section III--Operation.
W74-08318 4A

Improved Water Management for Paddy Rice Production in the Philippines,
W74-08464 3F

Effective Use of High Water Table Areas for Sanitary Landfill.
W74-08486 5E

Erosion Control and Bank Stabilization in Metropolitan Toronto--10 Year Programme and 5 Year Project.
W74-08488 4D

The Metropolitan Toronto and Region Waterfront Plan, 1972-1976.
W74-08489 6B

The Sevier County Water Plan,
W74-08493 6D

Potential for Marginal Cost Pricing in Water Resource Management,
W74-08496 6C

Water Pollution: Economic Aspects and Research Needs,
W74-08525 5G

Municipal Water Preference Statutes: The Texas Wagstaff Act,
W74-08546 6E

WATER POLICY

National Water Commission Report,
W74-08527 6B

WATER POLLUTION

A Bibliography on the Pollution Aspects of Coke Ovens,
W74-08183 5B

Water Transport of Heavy Metals in Solution and by Different Sizes of Particulate Solids,
W74-08238 5B

The Citizen and Water Management: An Atlas of Water Attitudes in Southern Minnesota,
W74-08288 6B

Environmental Research in 1973--Annual Report.
W74-08309 5G

Concepts of Pollution and Its Control,
W74-08422 5G

Report on the Second Session of the Conference in the Matter of Pollution of the South Platte River Basin.
W74-08530 5G

Pollution Control--Who Puts the Dirt in the Drinking Water.
W74-08565 6E

Memorandum of Understanding Regarding Implementation of Certain Complementary Responsibilities--Notice.
W74-08566 6E

Bacterial Degradation of Mineral Oils at Low Temperatures,
W74-08625 5B

Environmental Radioactivity in Illinois, 1970,
W74-08646 5B

In Re Chinese Maritime Trust, Ltd. (Limitation on Liability for Sunken Vessel).
W74-08657 6E

WATER POLLUTION CONTROL

Beef Cattle Feedlot Site Selection for Environmental Protection,
W74-08156 5G

Ground Water Pollution From Subsurface Excavations: Part III. More on Pollution from Wells.
W74-08184 5B

The Control of Pollution From Hydrographic Modifications.
W74-08186 5G

Project of the Agricultural and Marine Pollution Control Section, March 1973,
W74-08237 5G

Improved Control of Radioactive Wastes,
W74-08255 5D

Determination of Oil Loss Rates from a High Seas Oil Containment Barrier,
W74-08290 5G

Identification and Control of Pollution from Salt Water Intrusion.
W74-08293 5B

Chemical and Biochemical Considations for Maximizing the Efficiency of Fertilizer Nitrogen,
W74-08326 5B

Pulp, Paper, and Board in the Environment -- Part 8: Environmental Problems of the West German Pulp, Paper, and Board Industry.
W74-08405 5G

Process of Physical-Chemical Purification for Waste Waters from Paper and Board Mills (Procede de nettoyage chimico-physique pour les restes d'eaux usees des fabriques de papier et carton),
W74-08410 5D

Pollution of the Drammens River by the Wood-Processing Industry (Treforedlingsindustriens utslipp til Drammensvassdraget),
W74-08428 5B

Anaerobic Biological Stabilization of Sanitary Landfill Leachate,
W74-08448 5D

Water Resources, Environment and National Development--Volume I: Summary of Proceedings, and Volume II: Selected Papers.
W74-08454 5G

Pollution Control of Discharges into Rivers, Streams and Sea,
W74-08469 5G

Aims of Water Pollution Control,
W74-08470 5G

The Slop Oil Problem in Singapore,
W74-08471 5G

The Control of Wastewater and Oil Discharges to the Sea with Particular Regard to Studies Recently Carried Out in Singapore's Southern Coastal Waters,
W74-08472 5G

Petroleum Refinery Effluent Quality Control,
W74-08473 5D

Water Pollution and Environmental Health,
W74-08479 5G

Toxicity Control of Industrial Wastewaters and Pesticide-Polluted Waters in Vietnam,
W74-08480 5C

Improvement of Soil Cover for Water Conservation, Prevention of Sedimentation and Pollution Control in the Philippines,
W74-08481 5G

Pollution Control of Discharge Into Rivers, Lakes and Coastal Waters in the Philippines,
W74-08482 5G

Water Pollution in Thailand,
W74-08483 5G

Summary Report on Pollution Control in Indonesia,
W74-08484 5G

Utah Environmental Problems and Legislative Response: II, Legislative Response,
W74-08535 5G

Pollution Prevention Vessel and Oil Transfer Facilities.
W74-08558 6E

Oil Pollution Prevention--Non-Transportation-Related Onshore and Offshore Facilities--Proposed Rules.
W74-08561 6E

Oil Pollution Act Amendments of 1973--Legislative History.
W74-08567 6E

Pollution and Obstruction of Waters.
W74-08569 6E

Water and Sewerage Disposal Agencies,
W74-08571 6E

Marine Fisheries.
W74-08574 6E

Air and Water Pollution Control Permit Board.
W74-08579 6E

Waste Disposal Systems from a Groundwater Hydrology and Pollution Point of View,
W74-08594 5E

The Microbial Degradation of Oil Pollutants,
W74-08609 5B

Microbial-Facilitated Degradation of Oil: A Prospectus,
W74-08610 5B

Biodegradation of Oil in Seawater: Limiting Factors and Artificial Stimulation,
W74-08624 5B

Bacterial Seeding to Enhance Biodegradation of Oil Slicks,
W74-08641 5B

Inland Lakes.
W74-08659 6E

Control of Mine Drainage from Coal Mine Mineral Wastes: Phase II. Pollution Abatement and Monitoring,
W74-08661 5G

Salt-Water Intrusion and Its Control,
W74-08662 5B

Water Quality and Water Pollution Control in Switzerland,
W74-08697 5G

ATER POLLUTION CONTROL ACT

New Laws: Clean Waters in the Next Decade,
W74-08542 5G

ATER POLLUTION EFFECTS

The Surprise Factor in Marine Pollution Studies,
W74-08252 5B

The Toxicity of Sulphate Pulp Bleaching Effluents,
W74-08403 5C

Some Acute Effects of Low-Boiling Petroleum Fractions on the Cellular Structure of Fish Gills Under Field Conditions,
W74-08637 5C

Inhibition of Bacterial Chemoreception by Hydrocarbons,
W74-08638 5C

Research to Determine the Environmental Response to the Deposition of Spoil on Salt Marshes Using Diked and Undiked Techniques.
W74-08677 5C

ATER POLLUTION SOURCES

Preliminary System Development--Chemical Hazards Response Information System (CHRIS), Appendix VII--Supporting Information.
W74-08181 5B

Ground Water Pollution from Subsurface Excavations.
W74-08185 5

Animal Waste Utilization for Pollution Abatement Technology and Economics. Phase II,
W74-08231 5D

Runoff of Oils from Rural Roads Treated to Suppress Dust,
W74-08236 5B

Water Pollution and Associated Effects from Street Salting,
W74-08306 5B

Modleing of Land Runoff Effects on Dissolved Oxygen,
W74-08316 5B

Concentrations of Nitrogen, Phosphorus, Potassium, and Total Soluble Salts in Soil Solution Samples from Fertilized and Unfertilized Histosols,
W74-08319 5B

Fate of Nitrate from Manure and Inorganic Nitrogen in A Clay Soil Cropped to Continuous Corn,
W74-08321 5B

Increased Denitrification in Soils by Additions of Sulfur as an Energy Source,
W74-08322 5B

Agricultural Chemicals in Relation to Environmental Quality: Chemical Fertilizers, Present and Future,
W74-08325 5B

Chemical and Biochemical Considations for Maximizing the Efficiency of Fertilizer Nitrogen,
W74-08326 5B

Recycling and Recovery of Nitrogen, Phosphorus, and Potassium by Coastal Bermudagrass: I. Effect of Sources and Rates of Nitrogen Under a Clipping System,
W74-08327 5B

Recycling and Recovery of Nitrogen, Phosphorus, and Potassium by Coastal Bermudagrass: II. Under Grazing Conditions with Two Stocking Rates,
W74-08328 5B

Movement of Nitrate Nitrogen in Some Grassland Soils of Southern Alberta,
W74-08329 5B

Waste Water Problems of the Textile Industry. Part I. Oxygen Demand of Printing Paste Thickeners. (Problemi inerenti le acque di scarico nell'industria tessile. Io. La domanda di ossigeno di addensanti da stampa),
W74-08421 5B

Pollution Abatement in Effluents from Constructional Fiberboard Manufacture (Z badan nad redukcja obcizenia sciekow w przemysle plyt pilsniowych),
W74-08426 3E

Pollution of the Drammens River by the Wood-Processing Industry (Treforedlingsindustriens utslipp til Drammensvassdraget),
W74-08428 5B

Sea Pollution in Singapore,
W74-08475 5B

Water Pollution in Thailand,
W74-08483 5G

Summary Report on Pollution Control in Indonesia,
W74-08484 5G

Effluent Charges on Air and Water pollution,
W74-08524 5G

Adverse Effects of Coal Mining on Federal Reservoir Projects.
W74-08528 5G

Pollution Prevention Vessel and Oil Transfer Facilities.
W74-08558 6E

Oil Pollution Prevention--Non-Transportation-Related Onshore and Offshore Facilities--Proposed Rules.
W74-08561 6E

Interim Policy Statement on Implementation, Federal Water Pollution Control Act Amendments of 1972.
W74-08563 6E

National Oil and Hazardous Substances Pollution Contingency Plan.
W74-08564 6E

Pollution Control--Who Puts the Dirt in the Drinking Water.
W74-08565 6E

Pollution and Obstruction of Waters.
W74-08569 6E

Solubility of 1,1,2,2-Tetrabromoethane in Water as a Function of Temperature,
W74-08589 5B

Quality of Surface Water in the Vicinity of Oil Exploration Sites, Big Cypress Area, South Florida,
W74-08596 5A

Environmental Radioactivity in Illinois, 1970.
W74-08646 5B

Tritium Surveillance System, October-December 1972.
W74-08650 5B

Water Surveillance Programs, November 1972.
W74-08651 5B

WATER POLLUTION TREATMENT

Absorption of Mercuric Cation by Tannins in Agricultural Residues,
W74-08314 5G

Test and Evaluation of Oil Pollution Abatement Devices for Shipboard Use, Phase 1,
W74-08450 5G

The Handling of Oil Spills,
W74-08474 5G

Progress Evaluation Meeting in the Matter of Pollution of the Interstate Waters of the Missouri River, Omaha, Nebraska Area (Nebraska-Iowa-Missouri-Kansas).
W74-08529 5G

New Laws: Clean Waters in the Next Decade.
W74-08542 5G

WATER PROPERTIES

Self-Diffusion Coefficients and Rotational Correlation Times in Polar Liquids. VI. Water.
W74-08439 1A

Water: A Comprehensive Treatise. Volume 1. Physics and Physical Chemistry of Water.
W74-08665 1A

Water: A Comprehensive Treatise. Volume 2. Water in Crystalline Hydrates: Aqueous Solutions of Simple Nonelectrolytes.
W74-08666 1B

Water: A Comprehensive Treatise. Volume 3. Aqueous Solutions of Simple Electrolytes.
W74-08667 1B

WATER PURIFICATION

The Role of Disinfection in the Optimum Environment.
W74-08205 5F

Development of Large Spiral Membrane Reverse Osmosis Elements for Low-Cost Water Purification and Reclamation,
W74-08338 3A

WATER PURIFICATION

Replacement of the Anthracite Sublayer in Anion-Exchange Filters of Water Purification Equipment (Zamena antratsitovogo podsloya v anionitovykh fil'trakh vodoochistnykh ustanovok),
W74-08407 5D

Industrial Processing with Membranes.
W74-08664 5D

WATER QUALITY

A Parametric Study of Water Resource Variables in a Delta Region of South Louisiana...Bayou Lafourche Volume I - Technical Discussion, Volume II - Appendices,
W74-08289 5B

Simulation of Water Quality in Tarawera River,
W74-08308 5B

Nitrate Removed at Water Treatment Plant,
W74-08317 5F

The Use of the Dilution Water Effect as a Water Quality Criterion,
W74-08356 5A

Reconnaissance of the Chemical Quality of Surface Waters of the Rio Grande Basin, Texas,
W74-08373 5B

A New Aspect of Pollution: Increase in the Salinity of Water During Its Use in Mills (Un nouvel aspect de la pollution: la salinite ajoutee a l'eau au cours de son utilisation dans les usines),
W74-08404 5B

Development of Water Supply in Vietnam,
W74-08460 5G

Biological Methods for the Assessment of Water Quality. A Symposium Presented at the Seventy-Fifth Annual Meeting, June 26-29, 1972.
W74-08675 5A

Water Quality and Water Pollution Control in Switzerland,
W74-08697 5G

WATER QUALITY ACT

Pollution of Coastal and Navigable Waters (CFR Title 19, Part 4).
W74-08562 6E

WATER QUALITY CONTROL

Recipient Capacity to Limit Discharge of Pollutants to Receiving Waters,
W74-08351 5B

New Laws: Clean Waters in the Next Decade,
W74-08542 5G

A Bill to Amend the Soil Conservation and Domestic Allotment Act.
W74-08554 6E

Microbial-Facilitated Degradation of Oil: A Prospectus,
W74-08610 5B

Biodegradation of Oil in Seawater: Limiting Factors and Artificial Stimulation,
W74-08624 5B

WATER QUALITY STANDARDS

Phosphorus in Waste Water.
W74-08438 5A

Report on the Second Session of the Conference in the Matter of Pollution of the South Platte River Basin.
W74-08530 5G

WATER REQUIREMENTS

Water Pollution: Economic Aspects and Research Needs,
W74-08525 5G

WATER RESOURCES

Problems Arising from Over Exploitation of the Natural Water Reservoir in the Urban District of Milan (I Problemi Posti Dal Sovrasfruttamento Idrico Del Serbatoio Naturale Nella Conurbazione Milanese),
W74-08354 4B

Ground-Water Resources, Allegheny River Basin and Part of The Lake Erie Basin, New York,
W74-08380 2F

Appraisal of the Water Resources of Eastern Palm Beach County, Florida,
W74-08445 4B

A Guide to Natural Resource Information of Georgia.
W74-08487 10C

Potential for Marginal Cost Pricing in Water Resource Management,
W74-08496 6C

Water Pollution: Economic Aspects and Research Needs,
W74-08525 5G

State of Washington, 1973 Annual Report, Natural Resources and Recreation Agencies.
W74-08536 6E

Louisiana Moves Toward Coastal Zone Management.
W74-08537 6E

Final Report Analyzing Coastal and Marine Law to Develop an Authority for Coastal Zone Management,
W74-08544 6E

A Model Water Use Act for a Riparian State--The Florida Experience,
W74-08545 6E

Radioactivity in New York State Surface Water, July-December 1971.
W74-08654 5B

Water Surveillance Programs, April-May 1973.
W74-08655 5B

Water Atlas of the United States,
W74-08668 7C

WATER RESOURCES DEVELOPMENT

Flood Control and Water Conservation Works in Bukit Timah Catchment, Singapore,
W74-08456 4A

Difficulties in Planning Water Supply Schemes in West Malaysia,
W74-08462 6B

Water Resources Development in West Malaysia,
W74-08463 3B

Supply Curve for Thermal Efficiency,
W74-08509 6A

National Water Commission Report,
W74-08527 6B

Louisiana Moves Toward Coastal Zone Management
W74-08537 6E

Boundary and Land Development Regulation Recommendations for the Big Cypress Area of Critical State Concern.
W74-08543 4A

Final Report Analyzing Coastal and Marine Law to Develop an Authority for Coastal Zone Management,
W74-08544 6E

National Sea Grant College and Program--Extension
W74-08568 6E

WATER RESOURCES INSTITUTE

Ninth Annual Report, Fiscal Year 1973,
W74-08232 9D

WATER RESOURCES RESEARCH ACT

Ninth Annual Report, Fiscal Year 1973,.
W74-08232 9D

WATER REUSE

Water Resources: Key to Western Future.
W74-08204 5G

Best Effluent the Goal,
W74-08214 5D

Gated Pipe and Reuse System.
W74-08284 3F

A 6000 Gallon/Ton Fine Paper Machine Water System,
W74-08424 5D

The Reuse of Sewage Effluent for Industrial Purposes in Singapore,
W74-08458 5D

Municipal Wastewater Reclamation and Reuse.
W74-08461 5D

Planning for Water Reuse,
W74-08465 5D

Analysis of Water Reuse Alternatives in an Integrated Urban and Agricultural Area,
W74-08510 5D

WATER RIGHTS

Municipal Water Preference Statutes: The Texas Wagstaff Act,
W74-08546 6E

State V Bishop (Action for Public Nuisance and Trepass in Filling Area Below High Water Mark of Bay).
W74-08573 6E

Sinclair Oil Co. V. Delacroix Corp. (Determination of Mineral Rights Allocable to Water Bottoms.
W74-08578 6E

WATER SAMPLING

The Counting of Aerobic Actinomycetes in Water Samples (Denombrement des Actinomycetes Aerobies De L'eau),
W74-08220 5A

WATER SHORTAGE

Municipal Water Preference Statutes: The Texas Wagstaff Act,
W74-08546 6E

WATER SOURCES

Pollution Control--Who Puts the Dirt in the Drinking Water.
W74-08565 6E

adioactivity in Washington Surface Water
ly 1970-June 1971.
74-08653 5B

TER STORAGE
ational Use of Water,
74-08466 6B

TER STRUCTURE
elf-Diffusion Coefficients and Rotational Cor-
lation Times in Polar Liquids. VI. Water,
74-08439 1A

TER SUPPLY
otable-Water Supply by Means of Upflow Fil-
ation (L'Eau Claire Process),
74-08210 5F

econstructing an Egg-Shaped Sewer.
74-08249 8A

evelopment of Water Supply in Vietnam,
74-08460 5G

ims of Water Pollution Control,
74-08470 5G

onolulu Board of Water Supply Annual Re-
ort for the Year Ended June 30, 1973.
74-08492 5G

he Sevier County Water Plan,
74-08493 6D

Vater and Sewer Supply Decisions: A Case
tudy of the Washington Suburban Sanitary
ommission,
74-08497 5G

easibility Study on Desalting Brackish Water
rom the Mt. Simon Aquifer in Northeastern Il-
nois.
74-08499 3A

conomics of Inland Water Transport,
74-08508 4A

rogress Evaluation Meeting in the Matter of
ollution of the Interstate Waters of the Mis-
ouri River, Omaha, Nebraska Area (Nebraska-
owa-Missouri-Kansas).
74-08529 5G

Municipal Water Preference Statutes: The
exas Wagstaff Act,
74-08546 6E

Water and Sewerage Disposal Agencies,
74-08571 6E

Water from the Coastal Plain Aquifers in the
Washington, D.C., Metropolitan Area,
74-08597 4B

Radioactivity in Washington Surface Water
July 1970-June 1971.
74-08653 5B

Radioactivity in New York State Surface
Water, July-December 1971.
74-08654 5B

Water Surveillance Programs, April-May 1973.
74-08655 5B

Detection and Quantitative Determination of
Salmonellae in Surface Waters and in the
Water of a Municipal Water Supply System, (In
Russian),
74-08693 5A

WATER SUPPLY DEVELOPMENT
Systems Analysis of Large-Scale Public Facilities: New York City's Water Supply Network as a Case Study,
W74-08507 3D

WATER SURVEILLANCE NETWORK
Water Surveillance Programs, November 1972.
W74-08651 5B

WATER TABLE
Problems Arising from Over Exploitation of the Natural Water Reservoir in the Urban District of Milan (I Problemi Posti Dal Sovrasfruttamento Idrico Del Serbatoio Naturale Nella Conurbazione Milanese),
W74-08354 4B

Effective Use of High Water Table Areas for Sanitary Landfill.
W74-08486 5E

WATER TREATMENT
Potable-Water Supply by Means of Upflow Filtration (L'Eau Claire Process),
W74-08210 5F

Virus Removal by Diatomaceous-Earth Filtration - Part 1,
W74-08215 5F

The Counting of Aerobic Actinomycetes in Water Samples (Denombrement des Actinomycetes Aerobies De L'eau),
W74-08220 5A

Nitrate Removed at Water Treatment Plant,
W74-08317 5F

Manual for Calculation of Conventional Water Treatment Costs,
W74-08333 3A

Bituminous Coal - A Substitute for Anthracite Filter Media in Two-Layer Filtration of Water,
W74-08350 5F

Media Filtration in Effluent and Waste Water Treatment,
W74-08432 5D

WATER TREATMENT COSTS
Manual for Calculation of Conventional Water Treatment Costs,
W74-08333 3A

WATER UTILIZATION
Rational Use of Water,
W74-08466 6B

Analysis of Water Reuse Alternatives in an Integrated Urban and Agricultural Area,
W74-08510 5D

Water Pollution: Economic Aspects and Research Needs,
W74-08525 5G

WATER VAPOR
Water: A Comprehensive Treatise. Volume 1. Physics and Physical Chemistry of Water.
W74-08665 1A

WATER WELLS
Ground Water Quality Effects on Domestic Water Utilization,
W74-08287 5B

Records of Water Wells, Springs, Oil- and Gas-Test Holes, and Chemical Analyses of Water for the Madison Limestone and Equivalent Rocks in the Powder River Basin and Adjacent Areas, Northeastern Wyoming,
W74-08296 4B

WATER YIELD
Well Yields in the Bedrock Aquifers of Maryland,
W74-08446 4B

WATER YIELD IMPROVEMENT
Hydrologic Effects of Patch Cutting of Lodgepole Pine,
W74-08603 4C

WATERSHED MANAGEMENT
Water Resources Council Report on the Pearl River Comprehensive Basin Study Mississippi and Louisiana.
W74-08522 4A

WEATHER MODIFICATION
Fog Modification--A Technology Assessment.
W74-08177 3B

WEATHERING
Characteristic Use of Genetic Principles in the Classification of North Kazakhstan Forests on the Ancient Crusts of Wheathering and on Quaternary Deposits, (In Russian).
W74-08182 2I

WELLS
Ground Water Quality Effects on Domestic Water Utilization,
W74-08287 5B

WEST GERMANY
Pulp, Paper, and Board in the Environment -- Part 8: Environmental Problems of the West German Pulp, Paper, and Board Industry.
W74-08405 5G

Voith Circular Clarifying Basin for Baiersbronn (Voith-Rundklaerbecken fuer Baiersbronn).
W74-08427 5D

WEST GERMANY (ELBE RIVER)
Determination of the Activity of Nitrifying Bacteria in Surface Waters by a Modified Bod-Test, (In German),
W74-08694 5B

The Share Taken by Nitrification Processes in the Biochemical Oxygen Demand (BOD) in the Water of the River Elbe. (In German).
W74-08695 5A

WEST GERMANY (WESTPHALIA)
The Fish of the South Westphalian Highland Including the Moehne Dam and Ruhr.
W74-08681 2I

WEST VIRGINIA
Application of Reverse Osmosis to Acid Mine Drainage Treatment.
W74-08155 5D

WETLANDS
Proceedings: First Wetlands Conference, June 20, 1973.
W74-08157 2L

The Connecticut Tidal Wetlands Survey.
W74-08158 6E

The Connecticut Tidal Wetlands Survey.
W74-08159 6E

Inland Wetland Soils,
W74-08160 2G

Wetland Geology,
W74-08161 2I.

Inland Wetlands and Ground Water in Eastern Connecticut,
W74-08162 2F

WETLANDS

Wetland Hydrology,
W74-08163 2L

The Ecological Role of Inland Wetlands,
W74-08164 2L

Ecological History of Wetlands,
W74-08165 2L

Insects (Chrysops Flies) in Connecticut Salt Marshes,
W74-08166 2L

Legal Aspects of Wetlands Protection--Limits of the Police Power,
W74-08167 6E

Inland Wetlands from the Administrators Viewpoint--Based on Experiences with Connecticut's Inland Wetlands and Water Courses Act,
W74-08168 6E

The Soil Conservation and Its Role in Wetland Management for Connecticut,
W74-08169 6E

Federal Policy Towards Wetlands,
W74-08170 5G

Industrial Aspects of Wetland Uses,
W74-08171 6E

Panel Review and Commentary,
W74-08172 6E

The Impact of Oil on Marshland Microbial Ecosystems,
W74-08631 5C

WHEAT

Grow Wheat and Grain Sorghum with Less Water.
W74-08265 3F

WHEAT (WINTER)

The Effect of Soil Moisture on the Free Amino Acid Level in Winter Wheat, (In Russian),
W74-08541 3F

WILDLIFE HABITATS

State of Washington, 1973 Annual Report, Natural Resources and Recreation Agencies.
W74-08536 6E

WISCONSIN

Applications of Growth and Sorption Algal Assays,
W74-08154 5C

Cellulosic Deposits in Benthal Environments: Occurrence, Evolution, and Decomposition,
W74-08423 5B

WITHDRAWAL

Identification and Control of Pollution from Salt Water Intrusion.
W74-08293 5B

Selective Withdrawal from Man-Made Lakes,
W74-08585 4A

WOOD WASTES

An Evaluation of the Adsorptive Properties of Fly Ash and Bark-Derived Activated Char,
W74-08435 5D

WYOMING

Records of Water Wells, Springs, Oil- and Gas-Test Holes, and Chemical Analyses of Water for the Madison Limestone and Equivalent Rocks in the Powder River Basin and Adjacent Areas, Northeastern Wyoming,
W74-08296 4B

Clarks Fork Yellowstone River Remote Sensing Study,
W74-08386 2J

YEAST

Production and Characterization of Emulsifying Factors from Hydrocarbonoclastic Yeast and Bacteria,
W74-08632 5B

YEASTS

Bacterial Degradation of Mineral Oils at Low Temperatures,
W74-08625 5B

Degradation of Crude Oil by Yeasts and its Effects on Lesbistes reticulatus,
W74-08639 5C

ZINC PLATING PROCESS

Some Useful Ideas on Waste Water Reduction.
W74-08355 5D

ZONING

Definition of Critical Coastal Areas and Approaches to Standards for Management,
W74-08532 2L

AUTHOR INDEX

LES, J. H. JR.
Outlet Works, Warm Springs Dam, Dry Creek, Russian River Basin, Sonoma County, California,
W74-08584 8A

ARWAL, S. C.
Irrigation Number--A New Technique to Evaluate Irrigation Advance Distance,
W74-08266 3F

IEARN, D. G.
Degradation of Crude Oil by Yeasts and its Effects on Lesbistes reticulatus,
W74-08639 5C

The Impact of Oil on Marshland Microbial Ecosystems,
W74-08631 5C

The Microbial Degradation of Oil Pollutants,
W74-08609 5B

Microbial-Facilitated Degradation of Oil: A Prospectus,
W74-08610 5B

ILFELD, T. E.
Alkane Degradation in Beach Sands,
W74-08629 5B

The Relative Changes in n-Alkane Composition in Surface Water Slicks,
W74-08633 5B

INOFF, M.
Simple Apparatus for On-Site Continuous Liquid-Liquid Extraction of Organic Compounds from Natural Waters,
W74-08414 5A

KHMEDOV, I. A.
Biology of Arctodiaptomus acutilobatus Sars (Copepoda, Crustacea) in the Mingechaur Water Reservoir, (In Russian),
W74-08683 2H

KIYAMA, T.
Chemical Composition and Molecular Weight Distribution of Dissolved Organic Matter Produced by Bacterial Degradation of Green Algae,
W74-08494 5C

LESINA, I. G.
Determination of the Alkalinity of Mill Effluents (Opredelenie shchelochnosti stochnykh vod),
W74-08411 5A

LLEN, A. L.
Chemical Distribution of Residual Fertilizer Nitrogen in Soil as Revealed by Nitrogen-15 Studies,
W74-08332 5B

LLEN, T. J.
Development of a Production Technique for Porous Stainless Steel Tubes,
W74-08503 8G

LLEN, W. A.
Reflectance Discrimination of Cotton and Corn at Four Growth Stages,
W74-08269 3F

LLRED, E. R.
Infiltration and Root Extraction from Subsurface Irrigation Laterals,
W74-08270 3F

ALTHAUS, H.
Results of Examinations of Hospital Waste Water (Ergebnisse der Untersuchungen von Krankenhausabwaessern),
W74-08286 5B

AMAR, A. J.
Effect of Phosphate Salts as Saturating Solutions in Cation-Exchange Capacity Determinations,
W74-08285 2G

AMMONS, R. D.
Development of a One-Pass Hollow Fiber Seawater Desalination Module Having a Capacity of 2500-3000 GPD,
W74-08342 3A

ANDERSLAND, O. B.
Permeability of High Ash Papermill Sludge,
W74-08425 5D

ANDERSON, J. F.
Insects (Chrysops Flies) in Connecticut Salt Marshes,
W74-08166 2L

ANDERSON, J. W.
The Brackish Water Clam Rangia Cuneata as Indicator of Ecological Effects of Salinity Changes in Coastal Waters,
W74-08676 5C

AOYAMA, I.
Estimation and Evaluation of Radioactive Contamination Through a Food Web in an Aquatic Ecosystem (1), An Application of the Compartment Model to Transfer of Radioactive Substances Through a Food Chain,
W74-08365 5B

APOSTOL, S.
A Bioassay of Toxicity Using Protozoa in the Study of Aquatic Environment Pollution and Its Prevention,
W74-08221 5A

ARHELGER, S.
Hydrocarbon Biodegradation in Alaskan Waters,
W74-08627 5B

ARNOLD, J. W.
Field Test Evaluation of the High Temperature Electrodialysis Process at Webster, S.D.,
W74-08345 3A

ARTEMOVA, T. Z.
Sanitary-Microbiological Investigations in Preventing Infections of Bacterial and Viral Etiology, (In Russian),
W74-08692 5C

ARUNKUMAR, S.
Probabilistic Models in the Design and Operation of a Multi-Purpose Reservoir System,
W74-08153 4A

ATALLA, R. H.
Cellulosic Deposits in Benthal Environments: Occurrence, Evolution, and Decomposition,
W74-08423 5B

ATLAS, R. M.
Biodegradation of Oil in Seawater: Limiting Factors and Artificial Stimulation,
W74-08624 5B

Effects of Some Commercial Oil Herders, Dispersants and Bacterial Inocula on Biodegradation of Oil in Seawater,
W74-08640 5C

AZIZ SASMITADIHARDJA, A.
Summary Report on Pollution Control in Indonesia,
W74-08484 5G

BAGDASARYAN, G. A.
Sanitary-Microbiological Investigations in Preventing Infections of Bacterial and Viral Etiology, (In Russian),
W74-08692 5C

BAKER, D. E.
A New Approach to Soil Testing: II. Ionic Equilibria Involving H, K, Ca, Mg, Mn, Fe, Cu, Zn, Na, P, and S,
W74-08281 2G

BAKER, J. A.
Wetland Hydrology,
W74-08163 2L

BALL, J. W.
A Simply Constructed and Adjustable Mercury Vapor Cell Mount,
W74-08379 7B

BARTHA, R.
Biodegradation of Oil in Seawater: Limiting Factors and Artificial Stimulation,
W74-08624 5B

Effects of Some Commercial Oil Herders, Dispersants and Bacterial Inocula on Biodegradation of Oil in Seawater,
W74-08640 5C

BARTLETT, R. J.
Fate of Nitrate from Manure and Inorganic Nitrogen in A Clay Soil Cropped to Continuous Corn,
W74-08321 5B

BATCHELDER, D. G.
Computer Simulation of Crop Production - Potential and Hazards,
W74-08331 3F

BAUM, H. E.
Small Balls Repeal Smell,
W74-08201 5D

BEARDEN, M. D.
Brine Concentration by Electrodialysis, Phase II,
W74-08501 3A

Design and Construction of a Large Brackish Water Desalination Module,
W74-08343 3A

BEBBINGTON, W. P.
Environmental Effect of a Complex Nuclear Facility,
W74-08254 5D

BECKWITH, W. F.
Enhanced Dispersion in Drag Reducing Open Channel Flow,
W74-08390 5B

BEN-YAAKOV, S.
Carbonate Compensation Depth: Relation to Carbonate Solubility in Ocean Waters,
W74-08582 2K

BENNETT, R. R.
Water from the Coastal Plain Aquifers in the Washington, D.C., Metropolitan Area,
W74-08597 4B

BENOIT, G. R.
Automated Flow-Recording System for Field Drainage Monitoring-Direct Data Compilation of Surface and Subsurface Drain Flow,
W74-08267 4A

BENSON, C.
Survey of the Seasonal Snow Cover in Alaska,
W74-08179 2C

BENSON, L. A.
Monitoring Flood Damage with Satellite Imagery,
W74-08294 4A

BERGER, O.
Solids Separation from Industrial Waters and Effluents: Screening and Straining,
W74-08393 5D

BERNER, N.
The Impact of Oil on Marshland Microbial Ecosystems,
W74-08631 5C

BIRYUKOV, V. N.
Characteristic Use of Genetic Principles in the Classification of North Kazakhstan Forests on the Ancient Crusts of Wheathering and on Quaternary Deposits, (In Russian),
W74-08182 2I

BISHOP, A. B.
Analysis of Water Reuse Alternatives in an Integrated Urban and Agricultural Area,
W74-08510 5D

BISHOP, E.
Potentiostatic Coulometric Determination of Vanadium, Vanadium-Manganese and Vanadium-Iron Mixtures and the Influence of Chromium on the Process,
W74-08674 5A

BISWAS, E. R. I.
Changes in the Heterotrophic Bacteria of Volta Lake, 1968-1971,
W74-08434 5C

BITTINGER, M. W.
Interstate and International Aquifers,
W74-08276 6E

BLACK, A. L.
Saline-Seep Development in Dryland Soils of Northeastern Montana,
W74-08300 3C

BLACK, R. F.
Wetland Geology,
W74-08161 2L

BLANTON, W. G.
Some Acute Effects of Low-Boiling Petroleum Fractions on the Cellular Structure of Fish Gills Under Field Conditions,
W74-08637 5C

BOHAN, J. P.
Selective Withdrawal from Man-Made Lakes,
W74-08585 4A

BOLOGNA, A.
Automatic Waste Sludge Sampler,
W74-08442 5A

BONURA, M. S.
Definition of Reverse Osmosis Pump Requirements for Space Vehicle Requirements,
W74-08340 8C

BOON, TAN HUI
Disposal of Industrial Trade Effluents from the Food Industries,
W74-08468 5D

BOOR, U.
New Methods to Dispose of Used Metalworking Emulsions, (Neue Verfahren Zur Beseitigung Gebraughter Metall-Bearbeitungs-Emulsionen),
W74-08247 5D

BORNSTEIN, J.
Automated Flow-Recording System for Field Drainage Monitoring--Direct Data Compilation of Surface and Subsurface Drain Flow,
W74-08267 4A

BOSSHARD, E.
An Experimental Irradiation Facility for the Sterilization of Sewage Sludge (Eine Versuchsbestrahlungsanlage Zur Hygienisierung Von Klaerschlamm),
W74-08198 5D

BOUDREAULT, F. R.
Towards an Objective Analysis of the Seasonal Thermocline,
W74-08691 2E

BOURQUIN, A. W.
Estuarine Microbes and Organochlorine Pesticides (A Brief Review),
W74-08634 5B

BOUVENG, H. O.
The Chemical Treatment of Municipal Waste Water (Zur Chemischen Behandlung von Staedtischen Abwassern),
W74-08199 5D

BOWDOIN, W. R.
Easements: Judicial and Legislative Protection of the Public's Rights in Florida's Beaches,
W74-08540 6E

BOWEN, H. D.
Computer Simulation of Crop Production - Potential and Hazards,
W74-08331 3F

BRANTSEVYCH, L. H.
Changes of the Number of Bacterial Cells of Different Morphological Groups in the Water and Bottom Deposits of the Khakon Reservoir as a Function of the Intensity of Development of Blue-Green Algae, (In Ukrainian),
W74-08505 5C

BRINN, D. G.
A Bibliography on the Pollution Aspects of Coke Ovens,
W74-08183 5B

BRISOU, J.
Microbiological Comparison Between a Few Aquatic Mediums, (In French),
W74-08669 5C

BROOKS, D. R.
Laboratory Flotation Studies of Tennessee Phosphates in the Presence of Slimes,
W74-08588 5D

BROSSET, C.
Air-Borne Acid,
W74-08689 5A

BROWN, K. J.
Floods in the Vicinity of Crete, Nebraska,
W74-08444 7C

BROWN, T. S.
Virus Removal by Diatomaceous Earth Filtration - Part I,
W74-08215 5F

BROWNING, J. S.
Solubility of 1,1,2,2-Tetrabromoethane in Water as a Function of Temperature,
W74-08589 5B

BRUNER, R. J. III.
Biological, Physical and Chemical Treatment of Wood Soaking Vat Wastewater,
W74-08449 5D

BUCKS, D. A.
Uniform Irrigation with Low-Pressure Trickle Systems,
W74-08323 3F

BUKOVSKAYA, S. N.
Certain Problems of the Sanitary State of Upper Reaches of the Saratov Water Reservoir, (In Russian),
W74-08698 5B

BURGNER, R. L.
Optimum Escapement Studies of Chignik Sockeye Salmon,
W74-08176 8I

BURNISON, K. B.
Heterotrophic Potential for Amino Acid Uptake in a Naturally Eutrophic Lake,
W74-08678 5C

BURNITT, S. C.
Woody Phreatophytes Along the Colorado River From Southeast Runnels County to the Headwaters in Borden County, Texas,
W74-08371 3B

BUTLER, S. S.
Discharge and Travel Time for Ground-Water Conduits,
W74-08383 8B

BUTTON, D. K.
Hydrocarbon Biodegradation in Alaskan Waters,
W74-08627 5B

CADOTTE, J. E.
In-Situ Formed Condensation Polymers for Reverse Osmosis Membranes,
W74-08504 3A

CAMP, I. C.
Examples of Sewage Sludge Incineration in the UK,
W74-08364 5D

CARDENAS, R.
Reflectance Discrimination of Cotton and Corn at Four Growth Stages,
W74-08269 3F

CARLSON, D. A.
Primary Sludges Produced by the Addition of Lime to Raw Waste Water,
W74-08224 5D

CARLSON, R. F.
Modeling Snowmelt Runoff in an Arctic Coastal Plain,
W74-08233 2C

CARTER, D. L.
Controlling Soil Crusting with Phosphoric Acid to Enhance Seedling Emergence,
W74-08279 3F

CASLING, R. H.
Automatic Process Control of Sewage Treatment Works,
W74-08212 5D

CASPER, L. A.
Ground Water Quality Effects on Domestic Water Utilization,
W74-08287 5B

CASTRO, W. E.
Enhanced Dispersion in Drag Reducing Open Channel Flow,
W74-08390 5B

CERNIGLIA, C. E.
Studies on the Degradation of Petroleum by Filamentous Fungi,
W74-08619 5B

CHANG KIN KOON,
Flood Control and Water Conservation Works in Bukit Timah Catchment, Singapore,
W74-08456 4A

CHANG, L. W.
Neurological Changes in Cats Following Long-Term Diet of Mercury Contaminated Tuna,
W74-08200 5C

CHATIGNY, M. A.
Considerations in Application of Microorganisms to the Environment for Degradation of Petroleum Products,
W74-08618 5B

CHAUDHURI, M.
Virus Removal in Waste Stabilisation Ponds,
W74-08352 5D

CHAUHAN, H. S.
Determination of Water Intake Rate of Advance,
W74-08275 3F

CHEATUM, E. L.
Definition of Critical Coastal Areas and Approaches to Standards for Management,
W74-08532 2L

CHEN, FOO YEN
Indications of the Relationship Between Phyto-Plankton Distribution and Phosphate Levels,
W74-08476 5C

CHIRRICK, J. M.
Development of Large Spiral Membrane Reverse Osmosis Elements for Low-Cost Water Purification and Reclamation,
W74-08338 3A

CHITHARANJAN, K.
Sea Pollution in Singapore,
W74-08475 5B

CHOONG, CHOU TAI
Groundwater investigations in Singapore,
W74-08455 4B

CHOW SIONG KENG, D.
Flood Control and Water Conservation Works in Bukit Timah Catchment, Singapore,
W74-08456 4A

CHRISTIANSEN, J. E.
Drainage Observations in Latin America,
W74-08268 4A

CHUA, THIA ENG
Research on the Culture of Certain Common Marine Organisms in Singapore Waters,
W74-08477 3F

CLARK, J.
Coastal Ecosystems. Ecological Considerations for Management of the Coastal Zone,
W74-08642 2L

CLAUS, P.
Model Studies on Reactions Occurring in Oxidations of Lignin with Molecular Oxygen in Alkaline Media,
W74-08359 5B

COBET, A. B.
Considerations in Application of Microorganisms to the Environment for Degradation of Petroleum Products,
W74-08618 5B

Hydrocarbons of Suspected Pollutant Origin in Aquatic Organisms of San Francisco Bay: Methods and Preliminary Results,
W74-08630 5B

COCHRAN, A. A.
Recovery of Phosphates and Metals from Phosphate Sludge by Solvent Extraction,
W74-08590 5D

COHON, J. L.
Multiobjective Analysis in Water Resource Planning,
W74-08514 4A

COLLINGS, M. R.
Generalization of Spawning and Rearing Discharges for Several Pacific Salmon Species in Western Washington,
W74-08370 2I

COLWELL, R. R.
Microbial Ecology and the Problem of Petroleum Degradation in Chesapeake Bay,
W74-08628 5B

COLWICK, R. F.
Computer Simulation of Crop Production - Potential and Hazards,
W74-08331 3F

COOK, W. L.
Degradation of Crude Oil by Yeasts and its Effects on Lesbistes reticulatus,
W74-08639 5C

COONEY, J. J.
Hydrocarbon Utilization by Cladosporium resinae,
W74-08613 5B

COOTNER, P. H.
Supply Curve for Thermal Efficiency,
W74-08509 6A

COREY, J. C.
Direct Measurement of Water Movement in the Zone of Aeration,
W74-08256 2G

CORLEY, R. K.
Floodflows from Small Drainage Areas in Oklahoma: Progress Report and Data Compilation,
W74-08292 2E

COTTER, J. E.
Best Effluent the Goal,
W74-08214 5D

COURTOIS, D.
Microbiological Comparison Between a Few Aquatic Mediums, (In French),
W74-08669 5C

COWAN, D.
Municipal Powers Under Flirida Law with Respect to Protection of Environmentally Endangered Riparian Land,
W74-08534 6E

What are Powers of Local Governmental Authorities Under Florida Law to Dispose of Derelict and Abandoned Vessels Found in or Near Local Navigable Waters,
W74-08533 6E

COX, J. L.
The Use of the Dilution Water Effect as a Water Quality Criterion,
W74-08356 5A

CRAWFORD, D. D.
The Use of Questionnaires in Collecting Information for Urban Flood Control Planning,
W74-08151 6F

CROSBY, J. E.
Trends and Variability of Yearly Mean Sea Level 1893-1972,
W74-08643 2B

CROSS, O. E.
Animal Waste Utilization for Pollution Abatement Technology and Economics. Phase II,
W74-08231 5D

CROW, S.
The Impact of Oil on Marshland Microbial Ecosystems,
W74-08631 5C

CULLITON, M. A.
State Environmental Radioactivity Surveillance Programs, 1972,
W74-08647 5B

CULP, G. L.
Advanced Waste Treatment Process Selection. Part Two,
W74-08245 5D

CULVER, R. H.
Municipal Wastewater Reclamation and Reuse.
W74-08461 5D

CUMMINS, K. W.
A Worldwide Directory of Stream Ecologists.
W74-08235 10C

D'ANGIURA, L.
Waste Water Problems of the Textile Industry. Part I. Oxygen Demand of Printing Paste Thickeners. (Problemi inerenti le acque di scarico nell'industria tessile. Io. La domanda di ossigeno di addensanti da stampa),
W74-08421 5B

DAGUE, R. R.
Modleing of Land Runoff Effects on Dissolved Oxygen,
W74-08316 5B

DANCE, E. L.
High Rejection Hollow Fiber Membranes for Desalination of Sea Water,
W74-08502 3A

DAVIS, M. B.
Ecological History of Wetlands,
W74-08165 2L

DAVIS, R. K.
Potential for Marginal Cost Pricing in Water Resource Management,
W74-08496 6C

DAVIS, T. E.
High Rejection Hollow Fiber Membranes for Desalination of Sea Water,
W74-08502 3A

DAY, L. B.
Difficulties Ahead for Oregon Regarding Estuary Regulations, Control and Protection,
W74-08670 2L

DE KLERK, H.
Bacterial Degradation of Cyclohexane Participation of a Co-Oxidation Reaction,
W74-08244 5B

DE NEUFVILLE, R.
Economics of Inland Water Transport,
W74-08508 4A

Systems Analysis of Large-Scale Public Facilities: New York City's Water Supply Network as a Case Study,
W74-08507 3D

Systems Planning Design: Case Studies in Modeling, Optimization, and Evaluation,
W74-08506 6A

DEBNATH, N. C.
Inorganic Transformation of Added Phosphorus in Soil Relation to Soil Characteristics and Moisture Regime,
W74-08258 2G

DEITCHMAN, R.
Panel Review and Commentary,
W74-08172 6E

DELACHANAL, M.
Examples of the Use of the 'Seclar' Decanter in Treating Paper Industry Effluents (Exemples d'application du decanteur 'Seclar' au traitement d'effluents de l'industrie papetiere),
W74-08419 5D

DENIS, F.
Microbiological Comparison Between a Few Aquatic Mediums, (In French),
W74-08669 5C

DESHPANDE, A. W.
Bituminous Coal - A Substitute for Anthracite Filter Media in Two-Layer Filtration of Water,
W74-08350 5F

DIETRICH, T. L.
Hydrologic Effects of Patch Cutting of Lodgepole Pine,
W74-08603 4C

DINWIDDIE, G. A.
Use of Hydrochemistry for Interpreting Ground-Water Flow Systems in Central Nevada,
W74-08453 2F

DISALVO, L. H.
Hydrocarbons of Suspected Pollutant Origin in Aquatic Organisms of San Francisco Bay: Methods and Preliminary Results,
W74-08630 5B

DJINIADHIS, G.
A New Aspect of Pollution: Increase in the Salinity of Water During Its Use in Mills (Un nouvel aspect de la pollution: la salinite ajoutee a l'eau au cours de son utilisation dans les usines),
W74-08404 5B

DO, THI THUAN BICH
Toxicity Control of Industrial Wastewaters and Pesticide-Polluted Waters in Vietnam,
W74-08480 5C

DOWNEY, R. L.
Automated Method for Ortho-, Ortho-plus Hydrolyzable and Total Phosphate in Surface and Wastewaters,
W74-08208 5A

DRYMAN, W. R.
Integration of Physico-Chemical and Biological Waste-Water Treatment Processes,
W74-08399 5D

DUBLE, R. L.
Recycling and Recovery of Nitrogen, Phosphorus, and Potassium by Coastal Bermudagrass: I. Effect of Sources and Rates of Nitrogen Under a Clipping System,
W74-08327 5B

Recycling and Recovery of Nitrogen, Phosphorus, and Potassium by Coastal Bermudagrass: II. Under Grazing Conditions with Two Stocking Rates,
W74-08328 5B

DUDLEY, A. W. JR.
Neurological Changes in Cats Following Long-Term Diet of Mercury Contaminated Tuna,
W74-08200 5C

DURBIN, T. J.
Digital Simulation of the Effects of Urbanization on Runoff in the Upper Santa Ana Valley, California,
W74-08598 4C

DUTT, G. R.
A Computer Model for Predicting Nitrate and Other Solutes of Agricultural Drain Water,
W74-08280 5B

EAK-HOUR, C.
The Counting of Aerobic Actinomycetes in Water Samples (Denombrement des Actinomycetes Aerobies De L'eau),
W74-08220 5A

ECKERT, J. A.
Tritium Burdens in Two Arctic Villages,
W74-08649 5B

EHRLEN, L.
Swedish Techniques to Combat Pollution,
W74-08353 5D

ELLIS, M. J.
Groundwater Levels in Nebraska, 1973,
W74-08367 4B

ELVINS, B. J.
Water Quality Monitoring Experience in the Somerset River Authority Area, 1968-1972,
W74-08360 5A

EMMETT, W. W.
Some Rates of Geomorphological Processes,
W74-08304 2J

ENGMAN, E. T.
Transient Response of a Layered, Sloping Soil to Natural Rainfall in the Presence of a Shallow Water Table: Experimental Results,
W74-08375 2A

ENKE, C. G.
Measurement and Monitoring Units for Waste Water (Mess-und Ueberwwachungsgeraete fuer Abwasser),
W74-08219 5A

ERELI, E.
Final Report Analyzing Coastal and Marine Law to Develop an Authority for Coastal Zone Management,
W74-08544 6E

ERMAKOV, I. S.
The Automatic Filter Press FPAKM (Die Auotomatische Filterpress FPAKM),
W74-08217 5D

ESTES, J. E.
Determination of Oil Loss Rates from a High Seas Oil Containment Barner,
W74-08290 5G

EVANS, R. B.
Tritium Burdens in Two Arctic Villages,
W74-08649 5B

EVERMAN, J. S.
The Use of Questionnaires in Collecting Information for Urban Flood Control Planning,
W74-08151 6F

EWART, C. J.
Floods in Punaluu-Hauula Area, Oahu, Hawaii,
W74-08310 7C

EWOLDSEN, E.
Brackish Water Desalting, Testing and Evaluation Procedures with Mobile Test Facility,
W74-08335 3A

FAGIOLI, M.
Utilization Patterns of the Deep Water by a Weeping Lovegrass Crop (Eragrostis curvula Nees), in a Regosol Soil of the Pampean Semiarid Region, (In Spanish),
W74-08682 2I

FAURE, A.
Contribution to the Study of the Mechanism of Soil Compaction: The concept of Lubrication Potential, (In French),
W74-08700 2G

FEILER, H. D.
Evaluation of Ion Exchange Processes for Treatment of Mine Drainage Waters,
W74-08341 5D

FELD, I. L.
Laboratory Flotation Studies of Tennessee Phosphates in the Presence of Slimes,
W74-08588 5D

FIELD, R.
Water Pollution and Associated Effects from Street Salting,
W74-08306 5B

FIERO, G. W. JR.
Use of Hydrochemistry for Interpreting Ground-Water Flow Systems in Central Nevada,
W74-08453 2F

FINNERTY, W. R.
Microbes and Petroleum: Perspectives and Implications,
W74-08621 5B

FISCUS, E. L.
Water Relations and Growth of Cotton in Drying Soil,
W74-08272 2G

FISCUS, G. I.
1971 Puget Sound Fall Chinook Salmon Tagging Study,
W74-08452 8I

FISHER, C. O.
Industrial Aspects of Wetland Uses,
W74-08171 6E

FITZGERALD, G. P.
Applications of Growth and Sorption Algal Assays,
W74-08154 5C

FLANAGAN, M. J.
Automation Comes to L.A.,
W74-08225 5D

FLOODGATE, G. D.
A Threnody Concerning the Biodegradation of Oil in Natural Waters,
W74-08612 5B

FLOYD, E. O.
An Appraisal of the Groundwater Resources of the Upper Cape Fear River Basin, North Carolina,
W74-08605 4B

FOCHT, D. D.
Increased Denitrification in Soils by Additions of Sulfur as an Energy Source,
W74-08322 5B

FORBES, F.
Role of Ultrafiltration in Industrial Effluent Problems,
W74-08408 5D

FORBES, R. B.
Concentrations of Nitrogen, Phosphorus, Potassium, and Total Soluble Salts in Soil Solution Samples from Fertilized and Unfertilized Histosols,
W74-08319 5B

FORD, J.
Centrifugal Dewatering of Secondary Waste Sludges,
W74-08431 5D

FORD, J. H.
Residues of Mirex and Other Chlorinated Pesticides in Commercially Raised Catfish,
W74-08347 5C

FOREE, E. G.
Anaerobic Biological Stabilization of Sanitary Landfill Leachate,
W74-08448 5D

Biological, Physical and Chemical Treatment of Wood Soaking Vat Wastewater,
W74-08449 5D

FOREMAN, G. E.
Development of Large Spiral Membrane Reverse Osmosis Elements for Low-Cost Water Purification and Reclamation,
W74-08338 3A

Reverse Osmosis Membrane Filters for Seawater Pretreatment,
W74-08334 3A

FORNEY, A. J.
Analyses of Tars, Chars, Gases, and Water Found in Effluents from the Synthane Process,
W74-08592 5A

FOWLIE, P. J. A.
Utilization of Industrial Wastes and Waste By-Products for Phosphorus Removal: An Inventory and Assessment,
W74-08394 5D

FRASER, J. H.
Economic Optimization of the Avco Crystallization Process,
W74-08337 3A

FREESTONE, F. J.
Runoff of Oils from Rural Roads Treated to Suppress Dust,
W74-08236 5B

FRIEDE, J. D.
Production and Characterization of Emulsifying Factors from Hydrocarbonoclastic Yeast and Bacteria,
W74-08632 5B

FRIMPTER, M. H.
Ground-Water Resources, Allegheny River Basin and Part of The Lake Erie Basin, New York,
W74-08380 2F

FROMAN, C. A. JR.
The Pros and Cons of Automated Filters,
W74-08226 5D

FULLER, S. L. H.
Range Extensions of Corbicula manilensis (Philippi) in the Atlantic Drainage of the United States,
W74-08685 2I

FURUKAWA, T.
Distribution of Fluoride in Waters of Tokyo Bay,
W74-08549 5B

GADKARI, S. K.
Bituminous Coal - A Substitute for Anthracite Filter Media in Two-Layer Filtration of Water,
W74-08350 5F

GARBER, I.
Applications of Waste Processing Systems for Pressurized Water Reactors,
W74-08349 5D

GARCIA, B. N.
Pollution Control of Discharge Into Rivers, Lakes and Coastal Waters in the Philippines,
W74-08482 5G

GASIOR, S. J.
Analyses of Tars, Chars, Gases, and Water Found in Effluents from the Synthane Process,
W74-08592 5A

GAUSMAN, H. W.
Reflectance Discrimination of Cotton and Corn at Four Growth Stages,
W74-08269 3F

GERAGHTY, J. J.
Water Atlas of the United States,
W74-08668 7C

GHOLSON, R. K.
Production and Characterization of Emulsifying Factors from Hydrocarbonoclastic Yeast and Bacteria,
W74-08632 5B

GIBBS, K. C.
Estimation of Outdoor Recreational Values,
W74-08392 6B

GIBSON, D. T.
Microbial Degradation of Aromatic Hydrocarbons,
W74-08614 5B

GILLEY, J. R.
Infiltration and Root Extraction from Subsurface Irrigation Laterals,
W74-08270 3F

GOH KIAM SENG,
Difficulties in Planning Water Supply Schemes in West Malaysia,
W74-08462 6B

GOLDBERG, E. D.
The Surprise Factor in Marine Pollution Studies,
W74-08252 5B

GOLDMAN, C. R.
Limnological Studies and Remote Sensing of the Upper Truckee River Sediment Plume in Lake Tahoe, California-Nevada,
W74-08302 2J

GOOCH, J. P.
Solubility of 1,1,2,2-Tetrabromoethane in Water as a Function of Temperature,
W74-08589 5B

GOSSELIN, C.
Small Tunnels, Large Potentials,
W74-08358 8A

GRACE, J. L. JR.
Selective Withdrawal from Man-Made Lakes,
W74-08585 4A

GRATZL, J. S.
Model Studies on Reactions Occurring in Oxidations of Lignin with Molecular Oxygen in Alkaline Media,
W74-08359 5B

GREB, B. W.
Concepts of Conservation Tillage Systems Using Surface Mulches,
W74-08277 3F

GREEN, M.
Summary of Environmental Monitoring at Philadelphia, 1958-1971,
W74-08648 5B

GREGG, J. C.
Nitrate Removed at Water Treatment Plant,
W74-08317 5F

GRUNDY, R. D.
Environmental Policies as a Congressional Requirement for Social Efficacy,
W74-08539 6E

GUARD, H. E.
Considerations in Application of Microorganisms to the Environment for Degradation of Petroleum Products,
W74-08618 5B

Hydrocarbons of Suspected Pollutant Origin in Aquatic Organisms of San Francisco Bay: Methods and Preliminary Results,
W74-08630 5B

GUIRE, P. E.
Production and Characterization of Emulsifying Factors from Hydrocarbonoclastic Yeast and Bacteria,
W74-08632 5B

GUNDLACH, D. L.
Discharge and Travel Time for Ground-Water Conduits,
W74-08383 8B

GUNKEL, W.
Distribution and Abundance of Oil-Oxidizing Bacteria in the North Sea,
W74-08622 5B

HAINS, C. F.
Floods in Alabama--Magnitude and Frequency Based on Data Through September 30, 1971,
W74-08587 2E

HAJRA, J. N.
Inorganic Transformation of Added Phosphorus in Soil Relation to Soil Characteristics and Moisture Regime,
W74-08258 2G

HALLER, DOUGLAS L.
New Laws: Clean Waters in the Next Decade,
W74-08542 5G

HALVORSEN, O.
Studies of the Helminth Fauna of Norway, XXVI: The Distribution of Cyathocephalus Truncatus (Pallas) in the Intestine of Brown Trout (Salmo Trutta L.),
W74-08699 2I

HALVORSON, A. D.
Saline-Seep Development in Dryland Soils of Northeastern Montana,
W74-08300 3C

HAMANN, C. L.
Advanced Waste Treatment Process Selection, Part Two,
W74-08245 5D

HANEY, B. J.
Potable-Water Supply by Means of Upflow Filtration (L'Eau Claire Process),
W74-08210 5F

HANKE, S. H.
Potential for Marginal Cost Pricing in Water Resource Management,
W74-08496 6C

HANSEN, A. J. JR.
Digital-Model Study of Ground-Water Hydrology, Columbia Basin Irrigation Project Area, Washington,
W74-08382 2F

HARALSON, R. H.
Some Useful Ideas on Waste Water Reduction,
W74-08355 5D

HARKINS, J. R.
Surface-Water Availability, Colbert County, Alabama.
W74-08187 4A

Surface-Water Availability, Etowah County, Alabama,
W74-08190 4A

Surface-Water Availability, Limestone County, Alabama,
W74-08189 4A

HARTER, R. D.
Adsorption Studies at Solid-Solution Interfaces,
W74-08240 5B

Effect of Exchange Cations on Adsorption of Lysozyme and Ovalbumin by Smectite,
W74-08241 5B

Effect of Salt Content of Equilibrium-Solution on Formation and Stability of Smectite-Protein Complexes,
W74-08242 5B

The Measurement of the Heat of Reaction Between Proteins and Montmorillonite by Microcalorimetry,
W74-08243 5B

Surface Water Pollution Contract Studies: Adsorption of Complex Organic Molecules by Suspended Clay,
W74-08239 5B

HARTMAN, J. L.
Evaluation of Ion Exchange Processes for Treatment of Mine Drainage Waters,
W74-08341 5D

HAUCK, R. D.
Recovery of N15-Labeled Fertilizers in Field Experiments,
W74-08315 5B

HAWTHORNE, J. C.
Residues of Mirex and Other Chlorinated Pesticides in Commercially Raised Catfish,
W74-08347 5C

HAYCOCK, D. H.
Integration of Physico-Chemical and Biological Waste-Water Treatment Processes,
W74-08399 5D

HAYES, E. C.
A Plan for the Improvement of the Low Flow Data Network in Alabama,
W74-08175 7A

HAYNES, W. P.
Analyses of Tars, Chars, Gases, and Water Found in Effluents from the Synthane Process,
W74-08592 5A

HEATH, G. R.
Mineralogy of Surface Sediments from the Panama Basin, Eastern Equatorial Pacific,
W74-08298 2J

HEATON, R. E.
Electroanalytical Studies of Methylmercury in Aqueous Solution,
W74-08362 5A

HEERMANN, D. F.
Objectives of Irrigation Management Committee,
W74-08264 3F

HEINDLE, L. A.
Hydrological Effects of Urbanization,
W74-08257 4C

HEINKE, G. W.
Design and Performance Criteria for Settling Tanks for the Removal of Physical-Chemical Flocs,
W74-08396 5D

HELFGOTT, T.
Proceedings: First Wetlands Conference, June 20, 1973,
W74-08157 2L

HENDRICKS, C. W.
Measurement of Baseline Levels of Enteric Bacterial Activity in River Water,
W74-08635 5B

HENDRICKS, D. W.
Analysis of Water Reuse Alternatives in an Integrated Urban and Agricultural Area,
W74-08510 5D

HENRI, W. F.
The Atlantic States' Claim to Offshore Oil Rights: United States v Maine.
W74-08538 6E

HENRY, K.
Grangemouth Tunnel Sewer.
W74-08197 8A

HERMANSON, R. E.
Soil Moisture Profile Under Steady Infiltration,
W74-08273 2G

HERNDON, H. D.
The National Shoreline Study.
W74-08671 2L

HICKIN, E. J.
The Development of Meanders in Natural River-Channels.
W74-08357 2E

HICKS, S. D.
Trends and Variability of Yearly Mean Sea Level 1893-1972,
W74-08643 2B

HILDRETH, J. B.
The Use of Questionnaires in Collecting Information for Urban Flood Control Planning.
W74-08151 6F

HILL, D. E.
Inland Wetland Soils.
W74-08160 2G

HIRES, R. I.
Model Study of the Dilution of Soluble Liquids Discharge from Tankers.
W74-08451 5B

HIROSE, K.
The Friction Factors of Oscillating Pipe Flows,
W74-08259 8B

HITCHCOCK, P. H.
Potentiostatic Coulometric Determination of Vanadium, Vanadium-Manganese and Vanadium-Iron Mixtures and the Influence of Chromium on the Process.
W74-08674 5A

HOBBS, E. H.
Crop Cooling with Sprinklers.
W74-08271 3F

HODSON, W. G.
Records of Water Wells, Springs, Oil- and Gas-Test Holes, and Chemical Analyses of Water for the Madison Limestone and Equivalent Rocks in the Powder River Basin and Adjacent Areas, Northeastern Wyoming,
W74-08296 4B

HOFFMEISTER, J. F. III
Economics of Inland Water Transport,
W74-08508 4A

HOFSTRA, W. E.
Water-Level Records for the Northern High Plains of Colorado, 1970-74,
W74-08381 4B

HOGSTROM, U.
Residence Time of Sulfurous Air Pollutants from a Local Source During Precipitation,
W74-08690 5A

HOLMGREN, B.
Survey of the Seasonal Snow Cover in Alaska,
W74-08179 2C

HOLZER, T. L.
Inland Wetlands and Ground Water in Eastern Connecticut,
W74-08162 2F

HOPKINS, S. H.
The Brackish Water Clam Rangia Cuneata as Indicator of Ecological Effects of Salinity Changes in Coastal Waters,
W74-08676 5C

HORTENSTINE, C. C.
Concentrations of Nitrogen, Phosphorus, Potassium, and Total Soluble Salts in Soil Solution Samples from Fertilized and Unfertilized Histosols,
W74-08319 5B

HORTON, H. F.
Technical and Economic Issues in the Water Quality Management of Yaquina Bay,
W74-08672 2L

HORVATH, K.
The Brackish Water Clam Rangia Cuneata as Indicator of Ecological Effects of Salinity Changes in Coastal Waters,
W74-08676 5C

HUCK, M. G.
Water Relations and Growth of Cotton in Drying Soil,
W74-08272 2G

HULANICKI, A.
Determination of Nitrate in Water with a New Construction of Ion-Selective Electrode,
W74-08420 5A

HUNTER, L.
Hydrocarbons of Suspected Pollutant Origin in Aquatic Organisms of San Francisco Bay: Methods and Preliminary Results,
W74-08630 5B

ICE, R. D.
Summary of Environmental Monitoring at Philadelphia, 1958-1971,
W74-08648 5B

ILLIAN, J. R.
Use of Hydrochemistry for Interpreting Ground-Water Flow Systems in Central Nevada,
W74-08453 2F

INGOLS, R. S.
The Role of Disinfection in the Optimum Environment,
W74-08205 5F

INOUE, Y.
Estimation and Evaluation of Radioactive Contamination Through a Food Web in an Aquatic Ecosystem (I), An Application of the Compartment Model to Transfer of Radioactive Substances Through a Food Chain,
W74-08365 5B

INTORRE, B. J.
Evaluation of Ion Exchange Processes for Treatment of Mine Drainage Waters,
W74-08341 5D

IOFFE, A. Z.
Some Results of Water Purification at Viscose Rayon Factories (Nekotorye itogi raboty vodoochistnykh sooruzhennii predpriyatii viskoznykh volokon),
W74-08429 5D

ISGARD, E.
Swedish Techniques to Combat Pollution,
W74-08353 5D

IVANOV, A. I.
Replacement of the Anthracite Sublayer in Anion-Exchange Filters of Water Purification Equipment (Zamena antratsitovogo podsloya v anionitovykh fil'trakh vodoochistnykh ustanovok),
W74-08407 5D

IWATA, S.
Thermodynamics of Soil Water: IV. Chemical Potential of Soil Water,
W74-08191 2G

JAAG, O.
Water Quality and Water Pollution Control in Switzerland,
W74-08697 5G

JACKSON, E. G.
Improved Control of Radioactive Wastes,
W74-08255 5D

JACOBY, E. L. JR.
Transient Response of a Layered, Sloping Soil to Natural Rainfall in the Presence of a Shallow Water Table: Experimental Results,
W74-08375 2A

JACOBY, H. D.
The Combined Use of Optimization and Simulation Models in River Basin Planning.,
W74-08512 4A

JAKOBSON, K.
Project of the Agricultural and Marine Pollution Control Section, March 1973,
W74-08237 5G

JAMES, L. D.
The Use of Questionnaires in Collecting Information for Urban Flood Control Planning,
W74-08151 6F

JAMES, R. V.
Radial Particle-Size Segregation During Packing of Particulates into Cylindrical Containers,
W74-08447 2J

JAYARAMAN, R.
Improving the Accuracy of Point-Gauge Measurement in High-Velocity Flows (Amelioration de la Precision de la Pointe de Mesure Dans Les Ecoulements Rapids),
W74-08195 7B

JENNE, E. A.
A Simply Constructed and Adjustable Mercury Vapor Cell Mount,
W74-08379 7B

JEWELL, E. D.
1971 Puget Sound Fall Chinook Salmon Tagging Study,
W74-08452 8I

JOHNSON, D. S.
Development of Blue-Green Algal Blooms in Non-Alkaline Waters,
W74-08478 5C

JOHNSON, G. E.
Analyses of Tars, Chars, Gases, and Water Found in Effluents from the Synthane Process,
W74-08592 5A

JOHNSON, H. N.
Legal Aspects of Wetlands Protection--Limits of the Police Power,
W74-08167 6E

JOHNSON, W. K.
Process Kinetics for Denitrification,
W74-08320 5D

JONES, B. F.
WATEQ, A Computer Program for Calculating Chemical Equilibria of Natural Waters,
W74-08606 2K

JONES, E. B.
Interstate and International Aquifers,
W74-08276 6E

JONES, G. M.
Automation Comes to L.A.,
W74-08225 5D

JORDAN, D. R.
Brine Concentration by Electrodialysis, Phase I,
W74-08500 3A

Brine Concentration by Electrodialysis, Phase II,
W74-08501 3A

JOSEFSSON, B.
Simple Apparatus for On-Site Continuous Liquid-Liquid Extraction of Organic Compounds from Natural Waters.
W74-08414 5A

JOSEPH, H. A.
Increased Denitrification in Soils by Additions of Sulfur as an Energy Source.
W74-08322 5B

JOSHI, N. S.
Bituminous Coal - A Substitute for Anthracite Filter Media in Two-Layer Filtration of Water.
W74-08350 5F

JUDD, D. R.
Riverfront Development: The Politics of Master Planning.
W74-08495 3D

JULIAN, S. I.
Improved Water Management for Paddy Rice Production in the Philippines.
W74-08464 3F

JUO, A. S. R.
Hydrolysis and Availability of Pyrophosphate in Tropical Soils,
W74-08498 2G

KADREKAR, S. B.
Soil Potassium Forms in Relation to Agroclimatic Conditions in Maharashtra.
W74-08378 2G

KAFFKA, A.
Determination of the Activity of Nitrifying Bacteria in Surface Waters by a Modified Bod-Test, (In German),
W74-08694 5B

The Share Taken by Nitrification Processes in the Biochemical Oxygen Demand (BOD) in the Water of the River Elbe, (In German),
W74-08695 5A

KALINA, G. P.
Detection and Quantitative Determination of Salmonellae in Surface Waters and in the

KALINA, G. P.

Water of a Municipal Water Supply System, (In Russian),
W74-08693 5A

KALINSKE, A. A.
All Costs Must be Counted . . . ,
W74-08211 5D

KAMATH, P. R.
Recipient Capacity to Limit Discharge of Pollutants to Receiving Waters,
W74-08351 5B

KAPLAN, I. R.
Carbonate Compensation Depth: Relation to Carbonate Solubility in Ocean Waters,
W74-08582 2K

KASPRZAK, W.
Free-Living Amoebae Isolated from Waters Frequented by People in the Vicinity of Poznan: Poland: Experimental Studies in Mice on the Pathogenicity of the Isolates,
W74-08687 5C

KASYMOV, A. G.
Biology of Arctodiaptomus acutilobatus Sars (Copepoda, Crustacea) in the Mingechaur Water Reservoir, (In Russian),
W74-08683 2H

KATOR, H.
Utilization of Crude Oil Hydrocarbons by Mixed Cultures of Marine Bacteria,
W74-08616 5B

KAUP, E. G.
Brackish Water Desalting Testing and Field Evaluation with Reverse Osmosis and Electrodialysis Pilot Plants,
W74-08339 3A

Evaluation of Ion Exchange Processes for Treatment of Mine Drainage Waters,
W74-08341 5D

KAZARYAN, V. V.
The Problems of Increased Life-Activity of Hydroponic Plants, (In Russian),
W74-08688 3F

KEARTON, W.
Applications of Waste Processing Systems for Pressurized Water Reactors,
W74-08349 5D

KELLER, R. J.
Instrumentation in Full Scale Self-Aerated Flows (Appareils de Mesure Des Concentrations et Des Vitesses Dans un Courant Mixte d'air Et D'Eau en Grandeur Nature),
W74-08196 8B

KENNARD, W. C.
Proceedings: First Wetlands Conference, June 20, 1973,
W74-08157 2L

KENNEDY, R. S.
Microbes and Petroleum: Perspectives and Implications,
W74-08621 5B

KERNODLE, D. R.
Aquatic Organisms from Selected Sites Along the Proposed Trans-Alaska Pipeline Corridor, September 1970 to September 1972,
W74-08369 2I

KEYS, J. W. III
Clarks Fork Yellowstone River Remote Sensing Study,
W74-08386 2J

KHAZAK, V. M.
Aeration of Effluents in Aeration Tanks (Aeratsiya stochnykh vod v aerotenkakh-vytesnitelyakh),
W74-08413 5D

KIBE, M. M.
Soil Potassium Forms in Relation to Agroclimatic Conditions in Maharashtra,
W74-08378 2G

KILCULLEN, B. M.
The Measurement of the Heat of Reaction Between Proteins and Montmorillonite by Microcalorimetry,
W74-08243 5B

Surface Water Pollution Contract Studies: Adsorption of Complex Organic Molecules by Suspended Clay,
W74-08239 5B

KILPATRICK, F. A.
Tracer Simulation of Soluble Waste Concentration,
W74-08377 5B

KILPERT, R.
The Handling of Oil Spills,
W74-08474 5G

Petroleum Refinery Effluent Quality Control,
W74-08473 5D

KIMBLE, J. M.
Fate of Nitrate from Manure and Inorganic Nitrogen in A Clay Soil Cropped to Continuous Corn,
W74-08321 5B

KINJO, T.
Effect of Phosphate Salts as Saturating Solutions in Cation-Exchange Capacity Determinations,
W74-08285 2G

KINNEY, P. J.
Hydrocarbon Biodegradation in Alaskan Waters,
W74-08627 5B

KINNEY, R. A.
A Parametric Study of Water Resource Variables in a Delta Region of South Louisiana...Bayou Lafourche Volume I - Technical Discussion, Volume II - Appendices,
W74-08289 5B

KITANO, Y.
Distribution of Fluoride in Waters of Tokyo Bay,
W74-08549 5B

KITTREDGE, J. S.
Sublethal Effects of the Water Soluble Component of Oil: Chemical Communication in the Marine Environment,
W74-08636 5C

KLEPPER, B.
Water Relations and Growth of Cotton in Drying Soil,
W74-08272 2G

KLYEN, L. E.
A Vessel for Collecting Subsurface Water Samples from Geothermal Drillholes,
W74-08366 4B

KLYUEVA, V. A.
Some Results of Water Purification at Viscose Rayon Factories (Nekotorye itogi raboty vodoochistnykh sooruzhennu predpriyatu viskoznykh volokon),
W74-08429 5D

KNEESE, A. V.
Water Pollution: Economic Aspects and Research Needs,
W74-08525 5G

KNIGHT, A. L.
Surface-Water Availability, Colbert County, Alabama
W74-08187 4A

KNIGHT, H. G.
The Deep Seabed Hard Mineral Resources Act--A Negative View,
W74-08658 6E

KOLPACK, R. L.
Microbial Decomposition Patterns Using Crude Oil,
W74-08617 5B

KOMORI, R.
Brine Concentration by Electrodialysis. Phase II,
W74-08501 3A

KONDUR, L. V.
Nourishment of Rutilus rutilus aralensis morpha fragmiteti Berg. of the Kayrakkum Water Reservoir, (In Russian),
W74-08663 2H

KONOVALOV, S. M.
Structure of Oncorhynchus nerka (Walb.) Isolated Population of the Azabachye Lake, (In Russian),
W74-08548 2H

KOPFLER, F. C.
The Accumulation of Organic and Inorganic Mercury Compounds by the Eastern Oyster (Crassostrea virginica),
W74-08346 5C

KORSH, L. E.
Sanitary-Microbiological Investigations in Preventing Infections of Bacterial and Viral Etiology, (In Russian),
W74-08692 5C

KOSOWSKI, Z. V.
Control of Mine Drainage from Coal Mine Mineral Wastes: Phase II. Pollution Abatement and Monitoring,
W74-08661 5G

KOZACHENKO, R. YA.
The Effect of Mineral Waters of the Kvasy Spa on Some Indices of Cholesterol and Sialic Acid Metabolism, (In Russian),
W74-08686 5C

KRAMER, G. R.
Predicting Reaeration Coefficients for Polluted Estuary,
W74-08307 5B

KRATZL, K.
Model Studies on Reactions Occurring in Oxidations of Lignin with Molecular Oxygen in Alkaline Media,
W74-08359 5B

KREIS, R. D.
Beef Cattle Feedlot Site Selection for Environmental Protection,
W74-08156 5G

KREMEN, S. S.
Reverse Osmosis Membrane Filters for Seawater Pretreatment,
W74-08334 3A

KRISHNAN, P.
System Optimization for Pulp and Paper Industrial Wastewater Treatment Design,
W74-08418 5D

KRITIKOS, H.
Suspended Solids Analysis Using ERTS-A Data,
W74-08301 2J

KRUNCHAK, M. M.
Determination of the Alkalinity of Mill Effluents (Opredelenie shchelochnosti stochnykh vod),
W74-08411 5A

KUHNLE, J. A.
Absorption of Mercuric Cation by Tannins in Agricultural Residues,
W74-08314 5G

KURTZ, L. T.
Chemical Distribution of Residual Fertilizer Nitrogen in Soil as Revealed by Nitrogen-15 Studies,
W74-08332 5B

Recovery of N15-Labeled Fertilizers in Field Experiments,
W74-08315 5B

LADMIRAL, D.
Pollution Abatement at the Venizel Mill of La Rochette-Cenpa (Lutte anti-pollution a l'usine de Venizel de la Rochette-Cenpa),
W74-08416 5D

LAITINEN, H. A.
Electroanalytical Studies of Methylmercury in Aqueous Solution,
W74-08362 5A

LAMONT, W. E.
Laboratory Flotation Studies of Tennessee Phosphates in the Presence of Slimes,
W74-08588 5D

LAND, L. F.
Appraisal of the Water Resources of Eastern Palm Beach County, Florida,
W74-08445 4B

LANDERS, H.
Average Weekly Rainfall and Probabilities During the Planting-Growing-Harvesting Period in South Carolina,
W74-08295 2B

LANDIS, E. K.
Solubility of 1,1,2,2-Tetrabromoethane in Water as a Function of Temperature,
W74-08589 5B

LAPRISE, J. P.
Towards an Objective Analysis of the Seasonal Thermocline,
W74-08691 2E

LARNER, D. C.
Woody Phreatophytes Along the Colorado River From Southeast Runnels County to the Headwaters in Borden County, Texas,
W74-08371 3B

LAROCK, P. A.
Alkane Degradation in Beach Sands,
W74-08629 5B

The Relative Changes in n-Alkane Composition in Surface Water Slicks,
W74-08633 5B

LAUDENCIA, P. N.
Improvement of Soil Cover for Water Conservation, Prevention of Sedimentation and Pollution Control in the Philippines,
W74-08481 5G

LAURENT, E. A.
Definition of Critical Coastal Areas and Approaches to Standards for Management,
W74-08532 2L

LAW, A. G.
Stochastic Analysis of Groundwater Level Time Series in the Western United States,
W74-08368 2F

LAWRENCE, R. W.
Development of a Reverse Osmosis Module for Wash Water Recycling in a Space Environment at 165 deg F,
W74-08344 5D

LAZA, R. W.
Permeability of High Ash Papermill Sludge,
W74-08425 5D

LECLERC, G.
Determination of the Discharge Policy for Existing Reservoir Networks,
W74-08513 4A

LECLERC, H.
The Counting of Aerobic Actinomycetes in Water Samples (Denombrement des Actinomycetes Aerobies De L'eau),
W74-08220 5A

LEFOR, M. W.
The Connecticut Tidal Wetlands Survey,
W74-08158 6E

Proceedings: First Wetlands Conference, June 20, 1973,
W74-08157 2L

LEGGETT, G. E.
Controlling Soil Crusting with Phosphoric Acid to Enhance Seedling Emergence,
W74-08279 3F

LEJEUNE, P.
Examples of the Use of the 'Seclar' Decanter in Treating Paper Industry Effluents (Exemples d'application du decanteur 'Seclar' au traitement d'effluents de l'industrie papetiere),
W74-08419 5D

LEMMEL, D. E.
Automated Method for Ortho-, Ortho-plus Hydrolyzable and Total Phosphate in Surface and Wastewaters,
W74-08208 5A

LENT, P. C.
Application of ERTS-1 Imagery to the Study of Caribou Movements and Winter Dispersal in Relation to Prevailing Snowcover,
W74-08602 2C

LEOPOLD, L. B.
Some Rates of Geomorphological Processes,
W74-08304 2J

LESAN, F. K.
Development of High-Pressure Spiral Membrane Elements for Seawater Desalination,
W74-08336 3A

LEWANDOWSKI, R.
Determination of Nitrate in Water with a New Construction of Ion-Selective Electrode,
W74-08420 5A

LEWIS, T. E.
Definition of Critical Coastal Areas and Approaches to Standards for Management,
W74-08532 2L

LIEBERMAN, J. E.
Summary of Environmental Monitoring at Philadelphia, 1958-1971,
W74-08648 5B

LILLEHAMMER, A.
An Investigation of the Food of One- to Four-Month-Old Salmon Fry (Salmo salar L.) in the Suldalslagen, West Norway,
W74-08679 2I

Notes on the Feeding Relationships of Trout (Salmo trutta L.) and Salmon (Salmo salar L.) in the River Suldalslagen, West Norway,
W74-08680 2I

LIM, CHEONG CHUP
Water Resources Development in West Malaysia,
W74-08463 3B

LIN, S. S.
Soil Moisture Profile Under Steady Infiltration,
W74-08273 2G

LINES, G. C.
Water Availability, Coosa County, Alabama,
W74-08188 4A

LIU, D. L. S.
Microbial Degradation of Crude Oil and the Various Hydrocarbon Derivatives,
W74-08620 5B

LOCKWOOD, P.
Microbes and Petroleum: Perspectives and Implications,
W74-08621 5B

LOF, G. O. G.
Supply Curve for Thermal Efficiency,
W74-08509 6A

LOKHNINA, M. I.
Some Results of Water Purification at Viscose Rayon Factories (Nekotorye itogi raboty vodoochistnykh sooruzhennii predpriyatii viskoznykh volokon),
W74-08429 5D

LOMAS, I.
Evaporation from Bare Soil in a Coastal Environment,
W74-08305 2D

LONSKY, W.
Model Studies on Reactions Occurring in Oxidations of Lignin with Molecular Oxygen in Alkaline Media,
W74-08359 5B

LOUCKS, D. P.
The Combined Use of Optimization and Simulation Models in River Basin Planning.,
W74-08512 4A

LOVTSEVICH, E. L.
Sanitary-Microbiological Investigations in Preventing Infections of Bacterial and Viral Etiology, (In Russian),
W74-08692 5C

LUEHR, H. P.
Comparison of Numerical Methods Solving Flow Through Porous Media (Ein Vergleich Von Numerischen Verfahren Zur Loesung Von Sickerstroemungen),
W74-08194 2G

LUESCHER, O.
An Experimental Irradiation Facility for the Sterilization of Sewage Sludge (Eine Versuchsbestrahlungsanlage Zur Hygienisierung Von Klaerschlamm),
W74-08198 5D

LUK'YANOVA, O. I.
Purification of Sulfite Mill Effluents from Lignosulfonates (Ochistka promstokov sulfitno-tsellyuloznogo proizvodstva ot lignosul'fonatov),
W74-08412 5D

MACDONALD, S.
Studies of the Helminth Fauna of Norway, XXVI: The Distribution of Cyathocephalus Truncatus (Pallas) in the Intestine of Brown Trout (Salmo Trutta L.),
W74-08699 2I

MACK, F. K.
Water from the Coastal Plain Aquifers in the Washington, D.C., Metropolitan Area,
W74-08597 4B

MADUAKOR, H. O.
Hydrolysis and Availability of Pyrophosphate in Tropical Soils,
W74-08498 2G

MAHMOOD, K.
Sediment Routing in Irrigation Canal Systems,
W74-08385 2J

MAHON, H. I.
Design and Construction of a Large Brackish Water Desalination Module,
W74-08343 3A

Development of a One-Pass Hollow Fiber Seawater Desalination Module Having a Capacity of 2500-3000 GPD,
W74-08342 3A

High Rejection Hollow Fiber Membranes for Desalination of Sea Water,
W74-08502 3A

MAJ, M.
Determination of Nitrate in Water with a New Construction of Ion-Selective Electrode,
W74-08420 5A

MAJOR, D. C.
Multiobjective Redesign of the Big Walnut Project,
W74-08515 4A

MAJOR, T. J.
Water-Level Records for the Northern High Plains of Colorado, 1970-74,
W74-08381 4B

MALINA, J. F. JR.
Virus Removal by Diatomaceous-Earth Filtration - Part I,
W74-08215 5F

MALONEY, F. E.
A Model Water Use Act for a Riparian State--The Florida Experience,
W74-08545 6E

MALPAS, J. F.
Disinfection of Water Using Chlorine Dioxide,
W74-08253 5D

MANN, L. D.
Increased Denitrification in Soils by Additions of Sulfur as an Energy Source,
W74-08322 5B

MARKIN, G. P.
Residues of Mirex and Other Chlorinated Pesticides in Commercially Raised Catfish,
W74-08347 5C

MARKOVA, N.
Operation of Pilot Plant Equipment for Purification of Effluents from the Stefan Kiradzhiev Pulp and Paper Mill in Novi Krichim (Syzlavane rezhim na rabota na poluproizvodstvena prechistvatelna stantsiya za promishleni otpadychni v odi ot KTsKh 'Stefan Kiradzhiev' gr. Novi Krichim),
W74-08417 5D

MARKS, D. H.
Determination of the Discharge Policy for Existing Reservoir Networks,
W74-08513 4A

Multiobjective Analysis in Water Resource Planning,
W74-08514 4A

Systems Planning Design: Case Studies in Modeling, Optimization, and Evaluation,
W74-08506 6A

MARSHALL, R. M.
Woody Phreatophytes Along the Colorado River From Southeast Runnels County to the Headwaters in Borden County, Texas,
W74-08371 3B

MASSARO, E. J.
Cadmium Uptake and Time Dependent Alterations in Tissue Levels in the White Catfish Ictalurus catus (Pisces: Ictaluridae),
W74-08348 5C

MASSEY, J. K.
Degradation of Crude Oil by Yeasts and its Effects on Lesbistes reticulatus,
W74-08639 5C

MASTERS, H. E.
Water Pollution and Associated Effects from Street Salting,
W74-08306 5B

MATOCHA, J. E.
Recycling and Recovery of Nitrogen, Phosphorus, and Potassium by Coastal Bermudagrass: I. Effect of Sources and Rates of Nitrogen Under a Clipping System,
W74-08327 5B

Recycling and Recovery of Nitrogen, Phosphorus, and Potassium by Coastal Bermudagrass: II. Under Grazing Conditions with Two Stocking Rates,
W74-08328 5B

MAY, A.
Electrophoresis and Coagulation Studies of Some Florida Phosphate Slimes,
W74-08591 5D

MAZUR, T.
Free-Living Amoebae Isolated from Waters Frequented by People in the Vicinity of Poznan: Poland: Experimental Studies in Mice on the Pathogenicity of the Isolates,
W74-08687 5C

MAZZARELLA, S.
Problems Arising from Over Exploitation of the Natural Water Reservoir in the Urban District of Milan (I Problemi Posti Dal Sovrasfruttamento Idrico Del Serbatoio Naturale Nella Conurbazione Milanese),
W74-08354 4B

MCCLUSKEY, D. S.
The Connecticut Tidal Wetlands Survey,
W74-08159 6E

MCCOLL, C. N.
Pollution Control of Discharges into Rivers, Streams and Sea,
W74-08469 5G

MCCREADY, R. M.
Absorption of Mercuric Cation by Tannins in Agricultural Residues,
W74-08314 5G

MCDOUGALL, J.
Modeling Snowmelt Runoff in an Arctic Coastal Plain,
W74-08233 2C

MCDUFF, D. P.
Plant Expanded for Advanced Waste Treatment,
W74-08223 5D

MCGRATTAN, R.
Summary of Environmental Monitoring at Philadelphia, 1958-1971,
W74-08648 5B

MCGUIRE, J. F. III.
Estimation of Outdoor Recreational Values,
W74-08392 6B

MCHENRY, J. R.
Vertical Distribution of Fallout Cesium-137 in Cultivated Soils,
W74-08644 5B

MCILHENNY, W. F.
Brine Concentration by Electrodialysis, Phase I,
W74-08500 3A

Brine Concentration by Electrodialysis, Phase II,
W74-08501 3A

MCINTOSH, J. L.
Fate of Nitrate from Manure and Inorganic Nitrogen in A Clay Soil Cropped to Continuous Corn,
W74-08321 5B

MCNAIR, E. C. JR.
Galveston Bay Hurricane Surge Study: Report 1. Effects of Proposed Barriers on Hurricane Surge Heights--Appendix A, Calibration Tests,
W74-08586 8B

MCPHATE, A. J.
A Parametric Study of Water Resource Variables in a Delta Region of South Louisiana...Bayou Lafourche Volume I - Technical Discussion, Volume II - Appendices,
W74-08289 5B

MECHALAS, B. J.
Microbial Decomposition Patterns Using Crude Oil,
W74-08617 5B

MEIMAN, J. R.
Hydrologic Effects of Patch Cutting of Lodgepole Pine,
W74-08603 4C

MENDELSON, R. E.
Riverfront Development: The Politics of Master Planning,
W74-08495 3D

MENDIETA, H. B.
Reconnaissance of the Chemical Quality of Surface Waters of the Rio Grande Basin, Texas,
W74-08373 5B

MERCIER, J. A.
Model Study of the Dilution of Soluble Liquids Discharge from Tankers,
W74-08451 5B

MESENGISSER, M. J.
The Automatic Filter Press FPAKM (Die Auotomatische Filterpress FPAKM),
W74-08217 5D

MEYERS, S. P.
The Impact of Oil on Marshland Microbial Ecosystems,
W74-08631 5C

The Microbial Degradation of Oil Pollutants,
W74-08609 5B

MEYERS, T. J.
Microbial Decomposition Patterns Using Crude Oil,
W74-08617 5B

MIGET, R.
Bacterial Seeding to Enhance Biodegradation of Oil Slicks,
W74-08641 5B

MIKOLAJ, P.
Determination of Oil Loss Rates from a High Seas Oil Containment Barrier,
W74-08290 5G

MILLER, D. W.
Water Atlas of the United States,
W74-08668 7C

MINTON, G. R.
Primary Sludges Produced by the Addition of Lime to Raw Waste Water,
W74-08224 5D

MISHRA, K. C.
Retention and Release of Applied Molybdenum to Soils Under Permanent Water-Logged Condition,
W74-08209 2G

MISRA, S. G.
Retention and Release of Applied Molybdenum to Soils Under Permanent Water-Logged Condition,
W74-08209 2G

MITCHEL, R.
Inhibition of Bacterial Chemoreception by Hydrocarbons,
W74-08638 5C

MITKOVA, V. V.
Replacement of the Anthracite Sublayer in Anion-Exchange Filters of Water Purification Equipment (Zamena antratsitovogo podsloya v anionitovykh fil'trakh vodoochistnykh ustanovok),
W74-08407 5D

MIYAKE, T.
Brine Concentration by Electrodialysis, Phase I,
W74-08500 3A

MOELLER, U. J.
New Methods to Dispose of Used Metalworking Emulsions, (Neue Verfahren Zur Beseitigung Gebraughter Metall-Bearbeitungs-Emulsionen),
W74-08247 5D

MOETSCH, H.
An Experimental Irradiation Facility for the Sterilization of Sewage Sludge (Eine Versuchsbestrahlungsanlage Zur Hygienisierung Von Klaerschlamm),
W74-08198 5D

MOLINE, R. T.
The Citizen and Water Management: An Atlas of Water Attitudes in Southern Minnesota,
W74-08288 6B

MOORE, B. D.
Virus Removal by Diatomaceous-Earth Filtration - Part 1,
W74-08215 5F

MOORE, T. C. JR.
Mineralogy of Surface Sediments from the Panama Basin, Eastern Equatorial Pacific,
W74-08298 2J

MORAVEC, F.
Studies on the Development of the Nematode Rhabdochona (Filochona) ergensi Moravec, 1968,
W74-08684 2I

MOREL-SEYTOUX, H. J.
Two-Phase Flows in Porous Media,
W74-08303 2F

MORENO, C.
Food Niche of Graus Nigra Philippi (Osteichthyes, Labridae),
W74-08526 2I

MORGELI, B.
Process of Physical-Chemical Purification for Waste Waters from Paper and Board Mills (Procede de nettoyage chimico-physique pour les restes d'eaux usees des fabriques de papier et carton),
W74-08410 5D

MORITA, R. Y.
Heterotrophic Potential for Amino Acid Uptake in a Naturally Eutrophic Lake,
W74-08678 5C

MOTHES, P. M.
Brackish Water Desalting, Testing and Evaluation Procedures with Mobile Test Facility,
W74-08335 3A

MUNZ, W.
Relief Concept Concerning Mixed Sewers (Entlastungs-Konzeptionen im Mischsystem),
W74-08246 5D

MURAHARI, V.
Flow Characteristics of Sloping Channel Jumps,
W74-08387 8B

MURKES, J.
Reverse Osmosis and Ultrafiltration - A Survey of Auxiliary Apparatuses Available in this Field (Umgekehrte Osmose und Ultrafiltration - Ein Ueberblick Ueber die auf Diesem Gebiet Verfuegbaren Apparativen Hilfsmittel),
W74-08218 5D

MUSHAK, P.
Quantitative Measurements of Inorganic Mercury and Organomercurials in Water and Biological Media by Gas-Liquid Chromatography,
W74-08415 5A

MYERS, L. E.
Uniform Irrigation with Low-Pressure Trickle Systems,
W74-08323 3F

NACE, R. L.
Environmental Hazards of Large-Scale Developments,
W74-08601 6G

NADEAU, R. J.
Federal Policy Towards Wetlands,
W74-08170 5G

NALLURI, C.
Turbulence Characteristics in a Smooth Open Channel of Circular Cross-Section (Caracteristiques de la Turbulence au Sein d'un Ecoulement a Surface Libre En Conduite Lisse De Section Circulaire,
W74-08192 8B

NAUMAN, J. W.
Aquatic Organisms from Selected Sites Along the Proposed Trans-Alaska Pipeline Corridor, September 1970 to September 1972,
W74-08369 2I

NEGHABAT, F.
A Cofferdam Design Optimization,
W74-08511 8A

NELSON, D. W.
A Simple Digestion Procedure for Estimation of Total Nitrogen in Soils and Sediments,
W74-08324 5B

NELSON, J. D. JR.
Microbial Ecology and the Problem of Petroleum Degradation in Chesapeake Bay.
W74-08628 5B

NELSON, L. B.
Agricultural Chemicals in Relation to Environmental Quality: Chemical Fertilizers, Present and Future,
W74-08325 5B

NIAUSSAT, P.
Microbiological Comparison Between a Few Aquatic Mediums, (In French),
W74-08669 5C

NIELSON, D. R.
Direct Measurement of Water Movement in the Zone of Aeration.
W74-08256 2G

NIERING, W. A.
The Ecological Role of Inland Wetlands,
W74-08164 2L

NIKOLAEV, V. N.
Natural Forage Reserve of Turkmen SSR and Ways of its Improvement to Develop Sheep-Raising, (In Russian),
W74-08547 3F

NOBUNAKA, M.
The Friction Factors of Oscillating Pipe Flows,
W74-08259 8B

NORRIS, P. J.
Aims of Water Pollution Control,
W74-08470 5G

NORTON, L. B.
Test and Evaluation of Oil Pollution Abatement Devices for Shipboard Use, Phase 1,
W74-08450 5G

NORTON, W.
Modeling Snowmelt Runoff in an Arctic Coastal Plain,
W74-08233 2C

NOVAK, P.
Turbulence Characteristics in a Smooth Open Channel of Circular Cross-Section (Caracteristiques de la Turbulence au Sein d'un Ecoulement a Surface Libre En Conduite Lisse De Section Circulaire,
W74-08192 8B

NOWAK, A.
Pollution Abatement in Effluents from Constructional Fiberboard Manufacture (Z badan nad redukcja obcizenia sciekow w przemysle plyt pilsniowych),
W74-08426 3E

NUTTER, L. J.
Hydrogeology of Antietam Creek Basin,
W74-08607 2F

Well Yields in the Bedrock Aquifers of Maryland,
W74-08446 4B

O'REAR, D. M.
Surface-Water Availability, Colbert County, Alabama.
W74-08187 4A

Surface-Water Availability, Limestone County, Alabama,
W74-08189 4A

O'REILLY, D. E.
Self-Diffusion Coefficients and Rotational Correlation Times in Polar Liquids. VI. Water,
W74-08439 1A

O'SULLIVAN, M. J.
Simulation of Water Quality in Tarawera River,
W74-08308 5B

OBERBECK, V. R.
Limnological Studies and Remote Sensing of the Upper Truckee River Sediment Plume in Lake Tahoe, California-Nevada,
W74-08302 2J

OFFERMAN, E. E.
The Soil Conservation and Its Role in Wetland Management for Connecticut,
W74-08169 6E

OGATA, G.
Salinity-Ozone Interactions on Pinto Bean: Integrated Response to Ozone Concentration and Duration,
W74-08330 3C

OKUN, D. A.
Planning for Water Reuse,
W74-08465 5D

OLSSON, T. A.
Economic Optimization of the Avco Crystallization Process,
W74-08337 3A

OSBURN, Q. W.
Automated Method for Ortho-, Ortho-plus Hydrolyzable and Total Phosphate in Surface and Wastewaters,
W74-08208 5A

PAERL, H. W.
Limnological Studies and Remote Sensing of the Upper Truckee River Sediment Plume in Lake Tahoe, California-Nevada,
W74-08302 2J

PAINTAL, A. S.
Time of Concentration--A Kinematic Wave Approach,
W74-08593 2E

PAINTER, R. B.
The Potential Application of Satellites in River Regulation,
W74-08206 4A

PALUCH, J.
The Gas-Chromatographic Determination of Some Lignin Compounds in Surface Waters (Die gaschromatographische Bestimmung einiger Ligninverbindungen in Oberflaechengewaessern),
W74-08433 5A

PAPADOPULOS, S. S.
Water from the Coastal Plain Aquifers in the Washington, D.C., Metropolitan Area,
W74-08597 4B

PARAMASIVAM, R.
Bituminous Coal - A Substitute for Anthracite Filter Media in Two-Layer Filtration of Water,
W74-08350 5F

PARENT, R. G.
Field Test Evaluation of the High Temperature Electrodialysis Process at Webster, S.D.,
W74-08345 3A

PARR, J. F.
Chemical and Biochemical Considations for Maximizing the Efficiency of Fertilizer Nitrogen,
W74-08326 5B

PARR, W. H. JR.
Optimum Escapement Studies of Chignik Sockeye Salmon,
W74-08176 8I

PASKALEV, M.
Operation of Pilot Plant Equipment for Purification of Effluents from the Stefan Kiradzhiev Pulp and Paper Mill in Novi Krichim (Syzlavane rezhim na rabota na poluproizvodstvena prechistvatelna stantsiya za promishleni otpadychni v odi ot KTsKh 'Stefan Kiradzhiev' gr. Novi Krichim),
W74-08417 5D

PATTERSON, C.
Activated Sludge Disposal in a Subarctic Environment,
W74-08443 5E

PATTERSON, R. J.
Waste Disposal Systems from a Groundwater Hydrology and Pollution Point of View,
W74-08594 5E

PAUL, J. L.
The Use of Questionnaires in Collecting Information for Urban Flood Control Planning,
W74-08151 6F

PAULSON, R. W.
The Use of ERTS-1 for Relaying Hydrologic Data in the Delaware River Basin,
W74-08583 7B

PAUSZEK, F. H.
Digest of the 1972 Catalog of Information on Water Data,
W74-08600 10D

PEACE, R. R.
An Appraisal of the Groundwater Resources of the Upper Cape Fear River Basin, North Carolina,
W74-08605 4B

PERHAC, R. M.
Water Transport of Heavy Metals in Solution and by Different Sizes of Particulate Solids,
W74-08238 5B

PERRINI, F.
Test and Evaluation of Oil Pollution Abatement Devices for Shipboard Use, Phase 1,
W74-08450 5G

PERRY, J. J.
Studies on the Degradation of Petroleum by Filamentous Fungi,
W74-08619 5B

PETERSON, J. P.
Enhanced Dispersion in Drag Reducing Open Channel Flow,
W74-08390 5B

PFLUGER, A. E.
Woody Phreatophytes Along the Colorado River From Southeast Runnels County to the Headwaters in Borden County, Texas,
W74-08371 3B

PHAN, THE TRAN
Toxicity Control of Industrial Wastewaters and Pesticide-Polluted Waters in Vietnam,
W74-08480 5C

PHILLIPS, C. R.
Radiological Survey of New London Harbor, Thames River, Conn., and Environs,
W74-08645 5B

PICKERING, G. A.
Outlet Works, Warm Springs Dam, Dry Creek, Russian River Basin, Sonoma County, California,
W74-08584 8A

PIERSON, H. G. W.
Countercurrent Washing Turns the Tide Against Rising Effluent Costs,
W74-08228 5D

PILINSKAYA, N. F.
Purification of Sulfite Mill Effluents from Lignosulfonates (Ochistka promstokov sulfitno-tsellyuloznogo proizvodstva ot lignosul'fonatov),
W74-08412 5D

PINKERTON, J. W.
The Sevier County Water Plan,
W74-08493 6D

PINSKAYA, KH. M.
Replacement of the Anthracite Sublayer in Anion-Exchange Filters of Water Purification Equipment (Zamena antratsitovogo podsloya v anionitovykh fil'trakh vodoochistnykh ustanovok),
W74-08407 5D

POTTER, A. L.
Absorption of Mercuric Cation by Tannins in Agricultural Residues,
W74-08314 5G

POWELL, C. E. JR.
Range Extensions of Corbicula manilensis (Philippi) in the Atlantic Drainage of the United States,
W74-08685 2I

POWELL, H. E.
Recovery of Phosphates and Metals from Phosphate Sludge by Solvent Extraction,
W74-08590 5D

PRATT, P. F.
Effect of Phosphate Salts as Saturating Solutions in Cation-Exchange Capacity Determinations,
W74-08285 2G

Effects of Straw, Calcium Chloride, and Submergence on a Sodic Soil,
W74-08274 2G

PRESTON, H. A.
Automated Flow-Recording System for Field Drainage Monitoring--Direct Data Compilation of Surface and Subsurface Drain Flow,
W74-08267 4A

PRESTON, J. R.
The Control of Wastewater and Oil Discharges to the Sea with Particular Regard to Studies Recently Carried Out in Singapore's Southern Coastal Waters,
W74-08472 5G

PRITCHARD, P. H.
Microbial Degradation of Oil and Hydrocarbons in Continuous Culture,
W74-08615 5B

PURCHAS, D. B.
Media Filtration in Effluent and Waste Water Treatment,
W74-08432 5D

PUTTASWAMYGOWDA, B. S.
Effects of Straw, Calcium Chloride, and Submergence on a Sodic Soil,
W74-08274 2G

QUICK, M. C.
Mechanism for Streamflow Meandering,
W74-08388 8B

RAGAN, R. M.
Investigations of the Response of an Unconfined Aquifer to Localized Recharge,
W74-08234 2F

RAISCH, J. W.
Utah Environmental Problems and Legislative Response: II, Legislative Response,
W74-08535 5G

RAJARATNAM, N.
Flow Characteristics of Sloping Channel Jumps,
W74-08387 8B

RAKOSH, L.
A 6000 Gallon/Ton Fine Paper Machine Water System,
W74-08424 5D

RAMSDEN, I.
Cost Effectiveness in Sewage Treatment,
W74-08263 5D

RASMUSSEN, F.
Environmental Law--Water Pollution--Conflict Between Refuse Act Permit Program and National Environmental Policy Act,
W74-08550 5G

RATASUK, S.
Water Pollution in Thailand,
W74-08483 5G

REBINDER, P. A.
Purification of Sulfite Mill Effluents from Lignosulfonates (Ochistka promstokov sulfitno-tsellyuloznogo proizvodstva ot lignosul'fonatov),
W74-08412 5D

REID, V. M.
Anaerobic Biological Stabilization of Sanitary Landfill Leachate,
W74-08448 5D

REMY ANNIKOVA, T. N.
Natural Nidi of Cutaneous Leishmaniasis in the Zone of the Kara Kum Canal (4th Stage) and Their Epidemic Significance, (In Russian),
W74-08696 5B

RICHARDS, R. C.
Limnological Studies and Remote Sensing of the Upper Truckee River Sediment Plume in Lake Tahoe, California-Nevada,
W74-08302 2J

RICHARDSON, A. J.
Reflectance Discrimination of Cotton and Corn at Four Growth Stages,
W74-08269 3F

RIEDINGER, A. B.
Development of Large Spiral Membrane Reverse Osmosis Elements for Low-Cost Water Purification and Reclamation,
W74-08338 3A

RIPPLE, C. D.
Radial Particle-Size Segregation During Packing of Particulates into Cylindrical Containers,
W74-08447 2J

RITCHIE, J. C.
Vertical Distribution of Fallout Cesium-137 in Cultivated Soils,
W74-08644 5B

ROBBINS, C. W.
Controlling Soil Crusting with Phosphoric Acid to Enhance Seedling Emergence,
W74-08279 3F

ROBERTS, G. L.
Mineralogy of Surface Sediments from the Panama Basin, Eastern Equatorial Pacific,
W74-08298 2J

ROBERTSON, B.
Hydrocarbon Biodegradation in Alaskan Waters,
W74-08627 5B

ROBINSON, M. C.
Some Acute Effects of Low-Boiling Petroleum Fractions on the Cellular Structure of Fish Gills Under Field Conditions,
W74-08637 5C

ROCH, K.
Determination of the Activity of Nitrifying Bacteria in Surface Waters by a Modified Bod-Test, (In German),
W74-08694 5B

The Share Taken by Nitrification Processes in the Biochemical Oxygen Demand (BOD) in the Water of the River Elbe, (In German),
W74-08695 5A

ROCHESTER, E. W.
Soil Moisture Profile Under Steady Infiltration,
W74-08273 2G

RODGERS, E. B.
Satellite Views of Hurricane Camille,
W74-08291 2B

RODIS, H. G.
Appraisal of the Water Resources of Eastern Palm Beach County, Florida,
W74-08445 4B

ROGOWSKI, A. S.
Transient Response of a Layered, Sloping Soil to Natural Rainfall in the Presence of a Shallow Water Table: Experimental Results,
W74-08375 2A

RONNING, O.
Lamellar Sedimentation of Fiber-Carrying Waste Waters (Lamellsedimentering av fiberholdig vann),
W74-08437 5D

ROSENBERG, N. J.
Evaporation from Bare Soil in a Coastal Environment,
W74-08305 2D

ROUQUETT, F. M. JR.
Recycling and Recovery of Nitrogen, Phosphorus, and Potassium by Coastal Bermudagrass: I. Effect of Sources and Rates of Nitrogen Under a Clipping System,
W74-08327 5B

ROUQUETTE, F. M. JR.
Recycling and Recovery of Nitrogen, Phosphorus, and Potassium by Coastal Bermudagrass: II. Under Grazing Conditions with Two Stocking Rates,
W74-08328 5B

ROWE, D. W.
Cadmium Uptake and Time Dependent Alterations in Tissue Levels in the White Catfish Ictalurus catus (Pisces: Ictaluridae),
W74-08348 5C

ROZELLE, L. T.
In-Situ Formed Condensation Polymers for Reverse Osmosis Membranes,
W74-08504 3A

RUBIN, J.
Radial Particle-Size Segregation During Packing of Particulates into Cylindrical Containers,
W74-08447 2J

RUFF, J. F.
Clarks Fork Yellowstone River Remote Sensing Study,
W74-08386 2J

RUNGE, G.
New Methods to Dispose of Used Metalworking Emulsions, (Neue Verfahren Zur Beseitigung Gebraughter Metall-Bearbeitungs-Emulsionen),
W74-08247 5D

RUSTEN, D.
Pollution of the Drammens River by the Wood-Processing Industry (Treforedlingsindustriens utslipp til Drammensvassdraget),
W74-08428 5B

RUTH, E.
Carbonate Compensation Depth: Relation to Carbonate Solubility in Ocean Waters,
W74-08582 2K

RUTHERFORD, J. C.
Simulation of Water Quality in Tarawera River,
W74-08308 5B

RZAEV, G. A.
The Effect of Soil Moisture on the Free Amino Acid Level in Winter Wheat, (In Russian),
W74-08541 3F

SAFFER, M. J.
A Computer Model for Predicting Nitrate and Other Solutes of Agricultural Drain Water,
W74-08280 5B

SAGER, R. A.
Galveston Bay Hurricane Surge Study: Report 1. Effects of Proposed Barriers on Hurricane Surge Heights--Appendix A, Calibration Tests,
W74-08586 8B

SAKHAROVA, N. I.
Changes of the Number of Bacterial Cells of Different Morphological Groups in the Water and Bottom Deposits of the Khakon Reservoir as a Function of the Intensity of Development of Blue-Green Algae, (In Ukrainian),
W74-08505 5C

SAKKAS, J. G.
Hydrodynamics of Surface Irrigation-Advance Phase,
W74-08384 8B

SALTONSTALL, C. W. JR.
Development of a Reverse Osmosis Module for Wash Water Recycling in a Space Environment at 165 deg F,
W74-08344 5D

SASTRY, G.
Irrigation Number--A New Technique to Evaluate Irrigation Advance Distance,
W74-08266 3F

SCHALSCHA, E. B.
Effect of Phosphate Salts as Saturating Solutions in Cation-Exchange Capacity Determinations,
W74-08285 2G

SCHNEIDER, J. J.
Appraisal of the Water Resources of Eastern Palm Beach County, Florida,
W74-08445 4B

SCHNEIDER, L.
Pinch Valves Take Hold on the Industry,
W74-08363 8A

SCHRODER, L. J.
Use of Hydrochemistry for Interpreting Ground-Water Flow Systems in Central Nevada,
W74-08453 2F

SCHURMANN, G.
An Experimental Irradiation Facility for the Sterilization of Sewage Sludge (Eine Versuchsbestrahlungsanlage Zur Hygienisierung Von Klaerschlamm),
W74-08198 5D

SCOTT, J. C.
Water Availability, Coosa County, Alabama,
W74-08188 4A

SEGINER, I.
Evaporation from Bare Soil in a Coastal Environment,
W74-08305 2D

SEIDL, R. H.
Pulp Industry and Environmental Protection (Zellstoff-Industrie und Umweltschutz),
W74-08436 5D

SEKARAJASEKARAN, A.
Water Pollution and Environmental Health,
W74-08479 5G

SELIG, E. I.
Effluent Charges on Air and Water pollution,
W74-08524 5G

SEMENOV, V. P.
Determination of the Alkalinity of Mill Effluents (Opredelenie shchelochnosti stochnykh vod),
W74-08411 5A

SENG, GOH KIAM
Water Resources Development in West Malaysia,
W74-08463 3B

SEPPOVAARA, O.
The Toxicity of Sulphate Pulp Bleaching Effluents,
W74-08403 5C

SERRANO, J. F.
Available Water in Some Great Groups of Mozambique Soils,
W74-08313 2G

SETHURAMAN, V.
Improving the Accuracy of Point-Gauge Measurement in High-Velocity Flows (Amelioration de la Precision de la Pointe de Mesure Dans Les Ecoulements Rapids),
W74-08195 7B

SHAFER, G. H.
Ground-Water Resources of Duval County, Texas,
W74-08372 4B

SHAFFER, F. B.
Floods in the Vicinity of Crete, Nebraska,
W74-08444 7C

SHANNON, E. E.
Utilization of Industrial Wastes and Waste By-Products for Phosphorus Removal: An Inventory and Assessment,
W74-08394 5D

SHAPIRO, E. S.
Some Results of Water Purification at Viscose Rayon Factories (Nekotorye itogi raboty vodoochistnykh sooruzhennii predpriyatii viskoznykh volokon),
W74-08429 5D

SHARP, J. J.
Observations on Hydraulic Jumps at Rounded Step,
W74-08391 8B

SHENK, W. E.
Satellite Views of Hurricane Camille,
W74-08291 2B

SHIH, C. S.
System Optimization for Pulp and Paper Industrial Wastewater Treatment Design,
W74-08418 5D

SHIROTA, A.
Indications of the Relationship Between Phyto-Plankton Distribution and Phosphate Levels,
W74-08476 5C

SHMIDT, L. I.
Aeration of Effluents in Aeration Tanks (Aeratsiya stochnykh vod v aerotenkakh-vytesnitelyakh),
W74-08413 5D

SHMUKLARSKY, M. J.
Environmental Radioactivity in Illinois, 1970,
W74-08646 5B

SHUYLER, L. R.
Beef Cattle Feedlot Site Selection for Environmental Protection,
W74-08156 5G

SHWER, M.
Rippon Squashes Central Waste Treatment Precedent,
W74-08213 5E

SILVERMAN, B. A.
Fog Modification--A Technology Assessment,
W74-08177 3B

SINGH, P.
Determination of Water Intake Rate of Advance,
W74-08275 3F

SKELTON, J.
Estimating Low-Flow Frequency for Perennial Missouri Ozarks Streams,
W74-08599 4A

SKINNER, M. M.
Clarks Fork Yellowstone River Remote Sensing Study,
W74-08386 2J

SKRIVAN, J. A.
Digital-Model Study of Ground-Water Hydrology, Columbia Basin Irrigation Project Area, Washington,
W74-08382 2F

SMILES, D. E.
Infiltration into a Swelling Material,
W74-08230 2G

SMITH, A. D.
Movement of Nitrate Nitrogen in Some Grassland Soils of Southern Alberta,
W74-08329 5B

SMITH, D. W.
Ground Water Quality Effects on Domestic Water Utilization,
W74-08287 5B

SMITH, H.
Suspended Solids Analysis Using ERTS-A Data,
W74-08301 2J

SMITH, L. L.
Recovery of Phosphates and Metals from Phosphate Sludge by Solvent Extraction,
W74-08590 5D

SMITH, N. D.
Sedimentology and Bar Formation in the Upper Kicking Horse River, A Braided Outwash Stream,
W74-08297 2J

SOLI, G.
Marine Hydrocarbonoclastic Bacteria: Types and Range of Oil Degradation,
W74-08623 5B

SOLOMON, D.
Environmental Research and Highways,
W74-08251 5B

SOLOV'EVA, E. S.
Purification of Sulfite Mill Effluents from Lignosulfonates (Ochistka promstokov sulfitno-tsellyuloznogo proizvodstva ot lignosul'fonatov),
W74-08412 5D

SOMMERFELDT, T. G.
Movement of Nitrate Nitrogen in Some Grassland Soils of Southern Alberta,
W74-08329 5B

SOMMERS, L. E.
A Simple Digestion Procedure for Estimation of Total Nitrogen in Soils and Sediments,
W74-08324 5B

SPRINGER, A. M.
Cellulosic Deposits in Benthal Environments: Occurrence, Evolution, and Decomposition,
W74-08423 5B

SPRUIELL, C. E. JR.
Laboratory Flotation Studies of Tennessee Phosphates in the Presence of Slimes,
W74-08588 5D

SPURLOCK, B. O.
Microbes and Petroleum: Perspectives and Implications,
W74-08621 5B

SRIMOERNI DOELHOMID, W. S.
Rational Use of Water,
W74-08466 6B

STACKHOUSE, R. B.
Development of High-Pressure Spiral Membrane Elements for Seawater Desalination,
W74-08336 3A

STANGRET, S.
The Gas-Chromatographic Determination of Some Lignin Compounds in Surface Waters (Die gaschromatographische Bestimmung einiger Ligninverbindungen in Oberflaechengewaessern),
W74-08433 5A

STANKOWSKI, S. J.
A Summary of Peak Stages and Discharges for the Flood of August 1973 in New Jersey,
W74-08374 2E

STARK, R. M.
A Cofferdam Design Optimization,
W74-08511 8A

STARR, T. J.
Microbial Degradation of Oil and Hydrocarbons in Continuous Culture,
W74-08615 5B

STEIMLE, S. E.
Potable-Water Supply by Means of Upflow Filtration (L'Eau Claire Process),
W74-08210 5F

STENHOUSE, M. H.
The Calibration and Use of a Conical Hot Film Anemometer Probe in Recirculating Water Flow,
W74-08222 2E

STEVENS, J. B.
Technical and Economic Issues in the Water Quality Management of Yaquina Bay,
W74-08672 2L

STEVENSON, F. J.
Chemical Distribution of Residual Fertilizer Nitrogen in Soil as Revealed by Nitrogen-15 Studies,
W74-08332 5B

STOEVENER, H. H.
Technical and Economic Issues in the Water Quality Management of Yaquina Bay,
W74-08672 2L

STOLZY, L. H.
Increased Denitrification in Soils by Additions of Sulfur as an Energy Source,
W74-08322 5B

STOY, R. L.
The Calibration and Use of a Conical Hot Film Anemometer Probe in Recirculating Water Flow,
W74-08222 2E

STRAKEY, J. P. JR.
Analyses of Tars, Chars, Gases, and Water Found in Effluents from the Synthane Process,
W74-08592 5A

STRELKOFF, T.
Hydrodynamics of Surface Irrigation-Advance Phase,
W74-08384 8B

STRUZESKI, E. J. JR.
Water Pollution and Associated Effects from Street Salting,
W74-08306 5B

STUBBLEFIELD, F. E.
Improved Control of Radioactive Wastes,
W74-08255 5D

STUMM, W.
Concepts of Pollution and Its Control,
W74-08422 5G

STUMM-ZOLLINGER, E.
Concepts of Pollution and Its Control,
W74-08422 5G

SUESS, A.
An Experimental Irradiation Facility for the Sterilization of Sewage Sludge (Eine Versuchsbestrahlungsanlage Zur Hygienisierung Von Klaerschlamm),
W74-08198 5D

SUFFERN, S.
Inland Wetlands from the Administrators Viewpoint--Based on Experiences with Connecticut's Inland Wetlands and Water Courses Act,
W74-08168 6E

SUGAYA, T.
Treatment System Handles Flexo Ink and Starch Waste in Single Operation,
W74-08409 5D

SUKHACHEVA, I. F.
Certain Problems of the Sanitary State of Upper Reaches of the Saratov Water Reservoir, (In Russian),
W74-08698 5B

SWANSON, N. P.
A Programmed Sampler for Runoff and Bedloads,
W74-08361 5A

SWENSON, F. A.
Rates of Salt Solution in the Permian Basin,
W74-08608 2K

SWENSON, R. W.
Municipal Water Preference Statutes: The Texas Wagstaff Act,
W74-08546 6E

SWISSHELM, R. V. JR.
Low-Flow Characteristics of Kentucy Streams,
W74-08173 7C

SZOSTAK, R. M.
Evaluation of Ion Exchange Processes for Treatment of Mine Drainage Waters,
W74-08341 5D

TACK, E.
The Fish of the South Westphalian Highland Including the Moehne Dam and Ruhr,
W74-08681 2I

TAFURI, A. N.
Water Pollution and Associated Effects from Street Salting,
W74-08306 5B

TAKAHASHI, F. T.
Sublethal Effects of the Water Soluble Component of Oil: Chemical Communication in the Marine Environment,
W74-08636 5C

TALAEVA, YU. G.
Sanitary-Microbiological Investigations in Preventing Infections of Bacterial and Viral Etiology, (In Russian),
W74-08692 5C

TAN, W. P. S.
The Slop Oil Problem in Singapore,
W74-08471 5G

TANAKA, H. H.
Digital-Model Study of Ground-Water Hydrology, Columbia Basin Irrigation Project Area, Washington,
W74-08382 2F

TANNIAN, F. X.
Water and Sewer Supply Decisions: A Case Study of the Washington Suburban Sanitary Commission,
W74-08497 5G

TAYLOR, E.
Letchworth Water Pollution Control Works,
W74-08260 5D

TAYLOR, H. M.
Water Relations and Growth of Cotton in Drying Soil,
W74-08272 2G

TENG, SENG KEH
Research on the Culture of Certain Common Marine Organisms in Singapore Waters,
W74-08477 3F

TERICHOW, O.
Electrophoresis and Coagulation Studies of Some Florida Phosphate Slimes,
W74-08591 5D

THAM, AH KOW
Research on the Culture of Certain Common Marine Organisms in Singapore Waters,
W74-08477 3F

THAMAN, R. R.
Determination of Oil Loss Rates from a High Seas Oil Containment Barrier,
W74-08290 5G

THOMAS, R. H.
Municipal Wastewater Reclamation and Reuse,
W74-08461 5D

THOMAS, W. O. JR.
Floodflows from Small Drainage Areas in Oklahoma: Progress Report and Data Compilation,
W74-08292 2E

TIDBALL, R. A.
Development of a Reverse Osmosis Module for Wash Water Recycling in a Space Environment at 165 deg F,
W74-08344 5D

TIN, N. S.
Development of Water Supply in Vietnam,
W74-08460 5G

TINSLEY, P. S.
Investigations of the Response of an Unconfined Aquifer to Localized Recharge,
W74-08234 2F

TO, CHANG MAN
Research on the Culture of Certain Common Marine Organisms in Singapore Waters,
W74-08477 3F

TODD, D. K.
Salt-Water Intrusion and Its Control,
W74-08662 5B

TRAXLER, R. W.
Bacterial Degradation of Petroleum Materials in Low Temperature Marine Environments,
W74-08626 5B

TREILLE, P.
Recent Developments in Treatment of Papermaking Effluents in France (Developpements recents du traitement des effluents de papeterie en France),
W74-08402 5D

TRESCOTT, P. C.
Water from the Coastal Plain Aquifers in the Washington, D.C., Metropolitan Area,
W74-08597 4B

TRIPLETT, G. B. JR.
Concepts of Conservation Tillage Systems Using Surface Mulches,
W74-08277 3F

TROISE, F. L.
Water Atlas of the United States,
W74-08668 7C

TRUESDELL, A. H.
WATEQ, A Computer Program for Calculating Chemical Equilibria of Natural Waters,
W74-08606 2K

UGLITSKIKH, A. V.
Aeration of Effluents in Aeration Tanks (Aeratsiya stochnykh vod v aerotenkakhvytesnitelyakh),
W74-08413 5D

USHIJIMA, T. M.
Floods in Punaluu-Hauula Area, Oahu, Hawaii,
W74-08310 7C

UTTORMARK, P. D.
Applications of Growth and Sorption Algal Assays,
W74-08154 5C

VAISMAN, L. M.
Replacement of the Anthracite Sublayer in Anion-Exchange Filters of Water Purification Equipment (Zamena antratsitovogo podsloya v anionitovykh fil'trakh vodoochistnykh ustanovok),
W74-08407 5D

VAN DER LEEDEN, F.
Water Atlas of the United States,
W74-08668 7C

VAN DER LINDEN, A. C.
Bacterial Degradation of Cyclohexane Participation of a Co-Oxidation Reaction,
W74-08244 5B

VAN LOON, J. C.
Heavy Metals in Agricultural Lands Receiving Chemical Sewage Sludges,
W74-08397 5E

VANINA, N. I.
Replacement of the Anthracite Sublayer in Anion-Exchange Filters of Water Purification Equipment (Zamena antratsitovogo podsloya v anionitovykh fil'trakh vodoochistnykh ustanovok),
W74-08407 5D

VARNEY, K. E.
Fate of Nitrate from Manure and Inorganic Nitrogen in A Clay Soil Cropped to Continuous Corn,
W74-08321 5B

VEGAS, P. L.
A Detailed Procedure for the Use of Small-Scale Photography in Land Use Classification,
W74-08299 4A

VELNICH, A. J.
A Summary of Peak Stages and Discharges for the Flood of August 1973 in New Jersey,
W74-08374 2E

VICINI, L.
Waste Water Problems of the Textile Industry. Part I. Oxygen Demand of Printing Paste Thickeners. (Problemi inerenti le acque di scarico nell'industria tessile. Io. La domanda di ossigeno di addensanti da stampa),
W74-08421 5B

WAGNER, V. G.
How Safe are Sewers for Construction and Maintenance Crews,
W74-08440 5G

WAISS, A. C. JR.
Absorption of Mercuric Cation by Tannins in Agricultural Residues,
W74-08314 5G

WALKER, J. D.
Hydrocarbon Utilization by Cladosporium resinae,
W74-08613 5B

Microbial Ecology and the Problem of Petroleum Degradation in Chesapeake Bay,
W74-08628 5B

WALLACE, D. A.
Modleing of Land Runoff Effects on Dissolved Oxygen,
W74-08316 5B

WALSH, F.
Inhibition of Bacterial Chemoreception by Hydrocarbons,
W74-08638 5C

WALTER, C. L.
Problems and SCS Specifications for Low Head PVC Pipelines,
W74-08278 8E

WALTZ, F. A.
Monitoring Flood Damage with Satellite Imagery,
W74-08294 4A

WARD, D. B.
Plant Expanded for Advanced Waste Treatment,
W74-08223 5D

WARD, P. R. B.
Measurement of Dye Concentrations by Photography,
W74-08376 2E

Transverse Dispersion in Ocillatory Channel Flow,
W74-08389 5B

WATSON, I. C.
Manual for Calculation of Conventional Water Treatment Costs,
W74-08333 3A

WEBER, R. B.
Oxygenation System for Accelerated Sewage Treatment,
W74-08207 5D

WEINSTEIN, A. I.
Fog Modification--A Technology Assessment,
W74-08177 3B

WELLER, G.
Survey of the Seasonal Snow Cover in Alaska,
W74-08179 2C

WELLS, G. W.
Definition of Reverse Osmosis Pump Requirements for Space Vehicle Requirements,
W74-08340 8C

WESTERMAN, R. L.
Recovery of N15-Labeled Fertilizers in Field Experiments,
W74-08315 5B

WHITEHURST, C. A.
A Parametric Study of Water Resource Variables in a Delta Region of South Louisiana...Bayou Lafourche Volume I - Technical Discussion, Volume II - Appendices,
W74-08289 5B

WHITTEMORE, R. C.
An Evaluation of the Adsorptive Properties of Fly Ash and Bark-Derived Activated Char,
W74-08435 5D

WIGHT, W. W.
Development of Large Spiral Membrane Reverse Osmosis Elements for Low-Cost Water Purification and Reclamation,
W74-08338 3A

WILEY, M. E.
Absorption of Mercuric Cation by Tannins in Agricultural Residues,
W74-08314 5G

WILKINSON, R. R.
Definition of Critical Coastal Areas and Approaches to Standards for Mafiagement,
W74-08532 2L

WILLIS, R.
Optimization of the Assimilative Waste Capacity of the Unsaturated and Saturated Zones of an Unconfined Aquifer System,
W74-08152 5B

WILLMON, J. R.
Surface-Water Availability, Limestone County, Alabama,
W74-08189 4A

WILMOTH, R. C.
Application of Reverse Osmosis to Acid Mine Drainage Treatment,
W74-08155 5D

WIMBERLY, E. T.
Quality of Surface Water in the Vicinity of Oil Exploration Sites, Big Cypress Area, South Florida,
W74-08596 5A

WINANT, W. M.
Automated Flow-Recording System for Field Drainage Monitoring--Direct Data Compilation of Surface and Subsurface Drain Flow,
W74-08267 4A

WINDHAM, S. T.
Radiological Survey of New London Harbor, Thames River, Conn., and Environs,
W74-08645 5B

WISAKSONO, W.
Sea Pollution--Some Aspects and the Need to Fight It,
W74-08485 5B

WISNER, W. M.
Rainfall Frequency Atlas for Missouri,
W74-08174 7C

WITTMUSS, H. D.
Concepts of Conservation Tillage Systems Using Surface Mulches,
W74-08277 3F

WRIGLEY, R. C.
Limnological Studies and Remote Sensing of the Upper Truckee River Sediment Plume in Lake Tahoe, California-Nevada,
W74-08302 2J

WU, M.
Model Study of the Dilution of Soluble Liquids Discharge from Tankers,
W74-08451 5B

YAMAGUCHI, S.
Neurological Changes in Cats Following Long-Term Diet of Mercury Contaminated Tuna,
W74-08200 5C

YANG, SWEE LING
Research on the Culture of Certain Common Marine Organisms in Singapore Waters,
W74-08477 3F

YEH, W. K.
Microbial Degradation of Aromatic Hydrocarbons,
W74-08614 5B

YEH, W. W-G.
Probabilistic Models in the Design and Operation of a Multi-Purpose Reservoir System,
W74-08153 4A

YORINKS, L.
Suspended Solids Analysis Using ERTS-A Data,
W74-08301 2J

YOTSUKURA, N.
Tracer Simulation of Soluble Waste Concentration,
W74-08377 5B

YOUNG, R. A.
Microbes and Petroleum: Perspectives and Implications,
W74-08621 5B

ZANG, R. B.
Sludge Incineration and Afterburning,
W74-08441 5D

ZARNEGAR, P.
Quantitative Measurements of Inorganic Mercury and Organomercurials in Water and Biological Media by Gas-Liquid Chromatography,
W74-08415 5A

ZAV'YALOV, V. G.
Aeration of Effluents in Aeration Tanks (Aeratsiya stochnykh vod v aerotenkakh-vytesnitelyakh),
W74-08413 5D

ZENONE, C.
Geology and Water Resources of the Girdwood-Alyeska Area, Alaska,
W74-08595 4B

ZHUKOVA, I. V.
Determination of the Alkalinity of Mill Effluents (Opredelenie shchelochnosti stochnykh vod),
W74-08411 5A

ZIELINSKI, P. B.
Enhanced Dispersion in Drag Reducing Open Channel Flow,
W74-08390 5B

ZOBELL, C. E.
Bacterial Degradation of Mineral Oils at Low Temperatures,
W74-08625 5B

Microbial Degradation of Oil: Present Status, Problems, and Perspectives,
W74-08611 5B

ZSOLNAY, A.
Determination of Total Hydrocarbons in Sea Water at the Microgram Level with a Flow Calorimeter,
W74-08430 5A

ORGANIZATIONAL INDEX

ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA, PA.
Range Extensions of Corbicula manilensis (Philippi) in the Atlantic Drainage of the United States,
W74-08685 2I

ADVISORY COMMITTEE TO THE STATE LAND BOARD, SALEM, ORE.
Submerged and Submersible Lands of Oregon.
W74-08516 6E

AGRICULTURAL RESEARCH SERVICE, BATON ROUGE, LA.
Chemical and Biochemical Considations for Maximizing the Efficiency of Fertilizer Nitrogen,
W74-08326 5B

AGRICULTURAL RESEARCH SERVICE, BERKELEY, CALIF. WESTERN REGIONAL RESEARCH LAB.
Absorption of Mercuric Cation by Tannins in Agricultural Residues,
W74-08314 5G

AGRICULTURAL RESEARCH SERVICE, FORT COLLINS, COLO.
Objectives of Irrigation Management Committee,
W74-08264 3F

AGRICULTURAL RESEARCH SERVICE, KIMBERLY IDAHO. SNAKE RIVER CONSERVATION RESEARCH CENTER.
Controlling Soil Crusting with Phosphoric Acid to Enhance Seedling Emergence,
W74-08279 3F

AGRICULTURAL RESEARCH SERVICE, LINCOLN, NEB.
A Programmed Sampler for Runoff and Bedloads,
W74-08361 5A

AGRICULTURAL RESEARCH SERVICE, OXFORD, MISS. SEDIMENTATION LAB.
Vertical Distribution of Fallout Cesium-137 in Cultivated Soils,
W74-08644 5B

AGRICULTURAL RESEARCH SERVICE, PHOENIX, ARIZ. WATER CONSERVATION LAB.
Uniform Irrigation with Low-Pressure Trickle Systems,
W74-08323 3F

AGRICULTURAL RESEARCH SERVICE, RIVERSIDE, CALIF. SALINITY LAB.
Salinity-Ozone Interactions on Pinto Bean: Integrated Response to Ozone Concentration and Duration,
W74-08330 3C

AGRICULTURAL RESEARCH SERVICE, SIDNEY, MONT.
Saline-Seep Development in Dryland Soils of Northeastern Montana,
W74-08300 3C

AGRICULTURAL RESEARCH SERVICE, SOUTH BURLINGTON, VT.
Automated Flow-Recording System for Field Drainage Monitoring--Direct Data Compilation of Surface and Subsurface Drain Flow,
W74-08267 4A

AGRICULTURAL RESEARCH SERVICE, UNIVERSITY PARK, PA. NORTHEAST WATERSHED RESEARCH CENTER.
Transient Response of a Layered, Sloping Soil to Natural Rainfall in the Presence of a Shallow Water Table: Experimental Results,
W74-08375 2A

AGRICULTURAL RESEARCH SERVICE, WESLACO, TEX.
Reflectance Discrimination of Cotton and Corn at Four Growth Stages,
W74-08269 3F

AIR FORCE CAMBRIDGE RESEARCH LABS., BEDFORD, MASS.
Fog Modification--A Technology Assessment,
W74-08177 3B

AKADEMIYA NAUK SSSR, VLADIVOSTOK. INSTITUT MORSKOGO BIOLOGII.
Structure of Oncorhynchus nerka (Walb.) Isolated Population of the Azabachye Lake, (In Russian),
W74-08548 2H

AKADEMIYA NAUK TADZHIKSKOI SSR, DUSHANBE. INSTITUT ZOOLOGII I PARAZITOLOGII.
Nourishment of Rutilus rutilus aralensis morpha fragmiteti Berg. of the Kayrakkum Water Reservoir, (In Russian),
W74-08663 2H

AKADEMIYA NAUK TURKMENSKOI SSR, ASHKHABAD. INSTITUT ZOOLOGII I PARAZITOLOGII.
Natural Nidi of Cutaneous Leishmaniasis in the Zone of the Kara Kum Canal (4th Stage) and Their Epidemic Significance, (In Russian),
W74-08696 5B

ALASKA UNIV., COLLEGE.
Application of ERTS-1 Imagery to the Study of Caribou Movements and Winter Dispersal in Relation to Prevailing Snowcover,
W74-08602 2C

ALASKA UNIV., COLLEGE. GEOPHYSICAL INST.
Survey of the Seasonal Snow Cover in Alaska,
W74-08179 2C

ALASKA UNIV., COLLEGE. INST. OF MARINE SCIENCES.
Hydrocarbon Biodegradation in Alaskan Waters,
W74-08627 5B

ALASKA UNIV., COLLEGE. INST. OF WATER RESOURCES.
Modeling Snowmelt Runoff in an Arctic Coastal Plain,
W74-08233 2C

ALBERTA UNIV., EDMONTON. DEPT. OF CIVIL ENGINEERING.
Flow Characteristics of Sloping Channel Jumps,
W74-08387 8B

ALFA-LAVAL A.B., TUMBA (SWEDEN).
Reverse Osmosis and Ultrafiltration - A Survey of Auxiliary Apparatuses Available in this Field (Umgekehrte Osmose und Ultrafiltration - Ein Ueberblick Ueber die auf Diesem Gebiet Verfuegbaren Apparativen Hilfsmittel),
W74-08218 5D

AMERICAN-ISRAELI PAPER MILLS LTD., HADERA (ISRAEL).
A 6000 Gallon/Ton Fine Paper Machine Water System,
W74-08424 5D

AMERICAN SOCIETY FOR TESTING AND MATERIALS, PHILADELPHIA, PA.
Biological Methods for the Assessment of Water Quality. A Symposium Presented at the Seventy-Fifth Annual Meeting, June 26-29, 1972.
W74-08675 5A

AMERICAN SOCIETY OF CIVIL ENGINEERING, NEW YORK. COMMITTEE ON OPERATION AND MAINTENANCE OF IRRIGATION AND DRAINAGE SYSTEMS.
Operation and Maintenance of Irrigation and Drainage Systems: Section III--Operation.
W74-08318 4A

ANGLIAN WATER AUTHORITY (ENGLAND). LINCOLNSHIRE SEWAGE DIV.
Cost Effectiveness in Sewage Treatment,
W74-08263 5D

APPLIED SCIENTIFIC RESEARCH CORP., OF THAILAND, BANGKOK. ENVIRONMENTAL AND ECOLOGICAL RESEARCH INST.
Water Pollution in Thailand,
W74-08483 5G

ARGONNE NATIONAL LAB., ILL.
Self-Diffusion Coefficients and Rotational Correlation Times in Polar Liquids. VI. Water,
W74-08439 1A

ARIZONA UNIV., TUCSON. DEPT. OF SOILS, WATER AND ENGINEERING.
A Computer Model for Predicting Nitrate and Other Solutes of Agricultural Drain Water,
W74-08280 5B

ARMY ENGINEER DISTRICT, CHARLESTON. S.C.
Flood Plain Information; Grants Creek - Town Creek, City of Salisbury, North Carolina.
W74-08490 4A

ARMY ENGINEER DISTRICT, JACKSONVILLE, FLA.
Port Everglades Harbor, Broward County, Florida (Final Environmental Statement).
W74-08518 8A

ARMY ENGINEER DISTRICT,NEW YORK.
Spur Channel to Astoria Waterfront, East River, New York (Final Environmental Statement).
W74-08519 8A

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS. HYDRAULICS LAB.
Outlet Works, Warm Springs Dam, Dry Creek, Russian River Basin, Sonoma County, California,
W74-08584 8A

Selective Withdrawal from Man-Made Lakes,
W74-08585 4A

Galveston Bay Hurricane Surge Study: Report 1. Effects of Proposed Barriers on Hurricane Surge Heights--Appendix A, Calibration Tests,
W74-08586 8B

ARMY WAR COLL., CARLISLE BARRACKS, PA.
New Laws: Clean Waters in the Next Decade,
W74-08542 5G

ATOMIC ENERGY COMMISSION, BETHESDA, MD.
Improved Control of Radioactive Wastes,
W74-08255 5D

AUBURN UNIV. ALA. DEPT. OF AGRICULTURAL ENGINEERING.
Soil Moisture Profile Under Steady Infiltration,
W74-08273 2G

AUBURN UNIV., ALA. DEPT. OF BOTANY AND MICROBIOLOGY.
Water Relations and Growth of Cotton in Drying Soil,
W74-08272 2G

AUBURN UNIV., ALA. WATER RESOURCES RESEARCH INST.
Ninth Annual Report, Fiscal Year 1973,.
W74-08232 9D

AUCKLAND UNIV. (NEW ZEALAND). SCHOOL OF ENGINEERING.
Simulation of Water Quality in Tarawera River,
W74-08308 5B

AVCO SYSTEMS DIV., WILMINGTON, MASS.
Economic Optimization of the Avco Crystallization Process,
W74-08337 3A

BAYERISCHE LANDESANSTALT FUER BODENKULTER, PFLANZENBAU UND PFLANZENSCHUTZ, MUNICH (WEST GERMANY).
An Experimental Irradiation Facility for the Sterilization of Sewage Sludge (Eine Versuchsbestrahlungsanlage Zur Hygienisierung Von Klaerschlamm),
W74-08198 5D

BHABHA ATOMIC RESEARCH CENTRE, BOMBAY (INDIA). HEALTH PHYSICS DIV.
Recipient Capacity to Limit Discharge of Pollutants to Receiving Waters,
W74-08351 5B

BINNIE AND PARTNERS, LONDON (ENGLAND).
Aims of Water Pollution Control,
W74-08470 5G

BIOLOGISCHE ANSTALT HELGOLAND, (WEST GERMANY).
Distribution and Abundance of Oil-Oxidizing Bacteria in the North Sea,
W74-08622 5B

BITTINGER (M.W.) AND ASSOCIATES, INC., FORT COLLINS, COLO.
Interstate and International Aquifers,
W74-08276 6E

BOARD OF WATER SUPPLY, HONOLULU, HAWAII.
Honolulu Board of Water Supply Annual Report for the Year Ended June 30, 1973.
W74-08492 5G

BOLIVAR TREATMENT WORKS (SOUTH AUSTRALIA).
Automatic Process Control of Sewage Treatment Works,
W74-08212 5D

BOWNE (SIDNEY B.) AND SON, MINEOLA, N.Y.
Nitrate Removed at Water Treatment Plant,
W74-08317 5F

BP REFINERY SINGAPORE PTY. LTD.
Pollution Control of Discharges into Rivers, Streams and Sea,
W74-08469 5G

BRACKETT (F.W.) AND CO., LTD., COLCHESTER (ENGLAND).
Solids Separation from Industrial Waters and Effluents: Screening and Straining,
W74-08393 5D

BRITISH COLUMBIA UNIV., VANCOUVER. DEPT. OF CIVIL ENGINEERING.
Mechanism for Streamflow Meandering,
W74-08388 8B

BRITISH COLUMBIS UNIV., VANCOUVER. DEPT. OF CIVIL ENGINEERING.
Transverse Dispersion in Ocillatory Channel Flow,
W74-08389 5B

BRITISH STEEL CORP., (SHEFFIELD) (ENGLAND). STRIP MILLS DIV.
A Bibliography on the Pollution Aspects of Coke Ovens,
W74-08183 5B

BROWN AND CALDWELL, SAN FRANCISCO, CALIF.
Automation Comes to L.A.,
W74-08225 5D

BUREAU OF MINES, PITTSBURGH, PA. PITTSBURGH ENERGY RESEARCH CENTER.
Analyses of Tars, Chars, Gases, and Water Found in Effluents from the Synthane Process,
W74-08592 5A

BUREAU OF MINES, ROLLA, MO. ROLLA METALLURGY RESEARCH CENTER.
Recovery of Phosphates and Metals from Phosphate Sludge by Solvent Extraction,
W74-08590 5D

BUREAU OF MINES, TUSCALOOSA, ALA. TUSCALOOSA METALLURGY RESEARCH CENTER.
Laboratory Flotation Studies of Tennessee Phosphates in the Presence of Slimes,
W74-08588 5D

BUREAU OF MINES, TUSCALOOSA, ALA. TUSCALOOSA METALLURGY RESEARCH LAB.
Solubility of 1,1,2,2-Tetrabromoethane in Water as a Function of Temperature,
W74-08589 5B

Electrophoresis and Coagulation Studies of Some Florida Phosphate Slimes,
W74-08591 5D

BURNS AND ROE CONSTRUCTION CORP., PARAMUS, N.J.
Brackish Water Desalting, Testing and Evaluation Procedures with Mobile Test Facility,
W74-08335 3A

Brackish Water Desalting Testing and Field Evaluation with Reverse Osmosis and Electrodialysis Pilot Plants,
W74-08339 3A

BURNS AND ROE, INC., PARAMUS, N.J.
Evaluation of Ion Exchange Processes for Treatment of Mine Drainage Waters,
W74-08341 5D

CALIFORNIA UNIV., BERKELEY. DEPT. OF CIVIL ENGINEERING.
Measurement of Dye Concentrations by Photography,
W74-08376 2E

Salt-Water Intrusion and Its Control,
W74-08662 5B

CALIFORNIA UNIV., BERKELEY. NAVAL BIOMEDICAL RESEARCH LAB.
Considerations in Application of Microorganisms to the Environment for Degradation of Petroleum Products,
W74-08618 5B

Hydrocarbons of Suspected Pollutant Origin in Aquatic Organisms of San Francisco Bay Methods and Preliminary Results,
W74-08630 5B

CALIFORNIA UNIV., DAVIS. COLL. OF AGRICULTURAL AND ENVIRONMENTAL SCIENCES.
Direct Measurement of Water Movement in the Zone of Aeration,
W74-08256 2G

CALIFORNIA UNIV., DAVIS. DEPT. OF WATER SCIENCE AND CIVIL ENGINEERING.
Hydrodynamics of Surface Irrigation-Advance Phase,
W74-08384 8B

CALIFORNIA UNIV., DAVIS. INST. OF ECOLOGY.
Limnological Studies and Remote Sensing of the Upper Truckee River Sediment Plume in Lake Tahoe, California-Nevada,
W74-08302 2J

CALIFORNIA UNIV., LOS ANGELES. DEPT. OF GEOLOGY.
Carbonate Compensation Depth: Relation to Carbonate Solubility in Ocean Waters,
W74-08582 2K

CALIFORNIA UNIV., RIVERSIDE. DEPT. OF SOIL SCIENCE AND AGRICULTURAL ENGINEERING.
Effects of Straw, Calcium Chloride, and Submergence on a Sodic Soil,
W74-08274 2G

Increased Denitrification in Soils by Additions of Sulfur as an Energy Source,
W74-08322 5B

CALIFORNIA UNIV., SANTA BARBARA.
Determination of Oil Loss Rates from a High Seas Oil Containment Barrier,
W74-08290 5G

CAMP, DRESSER AND MCKEE, BOSTON, MASS.
All Costs Must be Counted . . . ,
W74-08211 5D

CAMP, DRESSER AND MCKEE INTERNATIONAL, INC., BOSTON, MASS.
Municipal Wastewater Reclamation and Reuse,
W74-08461 5D

CANADA CENTRE FOR INLAND WATERS, BURLINGTON (ONTARIO).
Microbial Degradation of Crude Oil and the Various Hydrocarbon Derivatives,
W74-08620 5B

CAPRICORN INDUSTRIAL SERVICES, LTD., LONDON (ENGLAND).
Small Balls Repeal Smell,
W74-08201 5D

CENTRAL PUBLIC HEALTH ENGINEERING RESEARCH INST., NAGPUR (INDIA).
Bituminous Coal - A Substitute for Anthracite Filter Media in Two-Layer Filtration of Water,
W74-08350 5F

CESKOSLOVENSKA AKADEMIE VED, PRAGUE. PARAZITOLOGICKY USTAV.
Studies on the Development of the Nematode Rhabdochona (Filochona) ergensi Moravec, 1968,
W74-08684 2I

CHILE UNIV., SANTIAGO.
Effect of Phosphate Salts as Saturating Solutions in Cation-Exchange Capacity Determinations,
W74-08285 2G

CHILE UNIV., SANTIAGO. LABORATORIO DE HIDROBIOLOGIA.
Food Niche of Graus Nigra Philippi (Osteichthyes, Labridae),
W74-08526 2I

CLEMSON UNIV., S.C. DEPT. OF CHEMICAL ENGINEERING.
Enhanced Dispersion in Drag Reducing Open Channel Flow,
W74-08390 5B

COAST GUARD, WASHINGTON, D.C. NAVAL ENGINEERING DIV.
Test and Evaluation of Oil Pollution Abatement Devices for Shipboard Use, Phase 1,
W74-08450 5G

COLLEGE OF AGRICULTURE, DAPOLI(INDIA).
Soil Potassium Forms in Relation to Agroclimatic Conditions in Maharashtra,
W74-08378 2G

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF CIVIL ENGINEERING.
Two-Phase Flows in Porous Media,
W74-08303 2F

Stochastic Analysis of Groundwater Level Time Series in the Western United States,
W74-08368 2F

Sediment Routing in Irrigation Canal Systems,
W74-08385 2J

Clarks Fork Yellowstone River Remote Sensing Study,
W74-08386 2J

COMMITTÉE ON PUBLIC WORKS (US-SENATE).
Environmental Policies as a Congressional Requirement for Social Efficacy,
W74-08539 6E

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, CANBERRA (AUSTRALIA).
Infiltration into a Swelling Material,
W74-08230 2G

CONNECTICUT AGRICULTURAL EXPERIMENT STATION, NEW HAVEN.
Inland Wetland Soils,
W74-08160 2G

Insects (Chrysops Flies) in Connecticut Salt Marshes,
W74-08166 2L

CONNECTICUT COLL., NEW LONDON. DEPT. OF BOTANY.
The Ecological Role of Inland Wetlands,
W74-08164 2L

CONNECTICUT DEPT. OF ENVIRONMENTAL PROTECTION, HARTFORD.
Inland Wetlands from the Administrators Viewpoint--Based on Experiences with Connecticut's Inland Wetlands and Water Courses Act,
W74-08168 6E

CONNECTICUT INLAND WETLANDS PROJECT, MIDDLETOWN.
The Connecticut Tidal Wetlands Survey,
W74-08159 6E

CONNECTICUT UNIV., STORRS. DEPT. OF GEOLOGY.
Inland Wetlands and Ground Water in Eastern Connecticut,
W74-08162 2F

CONNECTICUT UNIV., STORRS. DEPT. OF GEOLOGY AND GEOGRAPHY.
Wetland Geology,
W74-08161 2L

CONNECTICUT UNIV., STORRS. INST. OF WATER RESOURCES.
Proceedings: First Wetlands Conference, June 20, 1973,
W74-08157 2L

Panel Review and Commentary,
W74-08172 6E

CONNECTICUT UNIV., STORRS. SYSTEMATIC AND EVOLUTIONARY BIOLOGY SECTION.
The Connecticut Tidal Wetlands Survey,
W74-08158 6E

CONSERVATION FOUNDATION, WASHINGTON, D.C.
Coastal Ecosystems. Ecological Considerations for Management of the Coastal Zone,
W74-08642 2L

CONSOLIDATION COAL CO., PINCKNEYVILLE, ILL. MIDWESTERN DIV.
Control of Mine Drainage from Coal Mine Mineral Wastes: Phase II. Pollution Abatement and Monitoring,
W74-08661 5G

CONTROL SYSTEMS RESEARCH, INC., ARLINGTON, VA.
Manual for Calculation of Conventional Water Treatment Costs,
W74-08333 3A

CORPS OF ENGINEERS, LOUISVILLE, KY.
Final Environmental Statement, West Terre Haute Levee, Wabash River, Indiana, Wabash River Basin.
W74-08660 8D

CORPS OF ENGINEERS, PORTLAND, OREG.
The National Shoreline Study,
W74-08671 2L

CULP WESNER CULP - CLEAN WATER CONSULTANTS, CORONA DEL MAR, CALIF.
Advanced Waste Treatment Process Selection, Part Two,
W74-08245 5D

DANIEL, MANN, JOHNSON, AND MENDENHALL, LOS ANGELES, CALIF.
Best Effluent the Goal,
W74-08214 5D

DATATRONIC SYSTEMS CORP., PANORAMA CITY, CALIF.
Environmental Impact Statements.
W74-08517 6G

DAYTON UNIV., OHIO. DEPT. OF BIOLOGY.
Hydrocarbon Utilization by Cladosporium resinae,
W74-08613 5B

DELAWARE UNIV., NEWARK. DEPT. OF CIVIL ENGINEERING; AND BELL TELEPHONE LABS., MURRAY HILL, N.J.
A Cofferdam Design Optimization.
W74-08511 8A

DEP. CHEM., TOKYO METROP. UNIV., SETAGAYA, TOKYO JAP. TOKYO METROPOLITAN UNIV. (JAPAN). DEPT. OF CHEMISTRY.
Chemical Composition and Molecular Weight Distribution of Dissolved Organic Matter Produced by Bacterial Degradation of Green Algae,
W74-08494 5C

DEPARTMENT OF AGRICULTURAL, LETHBRIDGE (ALBERTA). RESEARCH STATION.
Movement of Nitrate Nitrogen in Some Grassland Soils of Southern Alberta,
W74-08329 5B

DEPARTMENT OF AGRICULTURE, LETHBRIDGE (ALBERTA). RESEARCH STATION.
Crop Cooling with Sprinklers,
W74-08271 3F

DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH, WAIRAKEI (NEW ZEALAND). CHEMISTRY DIV.
A Vessel for Collecting Subsurface Water Samples from Geothermal Drillholes,
W74-08366 4B

DEPT. OF TULANE UNIV., NEW ORLEANS, LA. DEPT. OF CIVIL ENGINEERING.
Potable-Water Supply by Means of Upflow Filtration (L'Eau Claire Process),
W74-08210 5F

DESERT INST., ASHKHABAD (USSR).
Natural Forage Reserve of Turkmen SSR and Ways of its Improvement to Develop Sheep-Raising, (In Russian),
W74-08547 3F

DORR-OLIVER, INC., STAMFORD, CONN.
Sludge Incineration and Afterburning,
W74-08441 5D

DORR-OLIVER, LTD., CROYDON (ENGLAND).
Role of Ultrafiltration in Industrial Effluent Problems,
W74-08408 5D

DOW CHEMICAL CO., FREEPORT, TEX. TEXAS DIV.
Brine Concentration by Electrodialysis, Phase I,
W74-08500 3A

DOW CHEMICAL CO., MIDLAND, MICH.
Brine Concentration by Electrodialysis, Phase II,
W74-08501 3A

DOW CHEMICAL CO., WALNUT CREEK, CALIF.
Development of a One-Pass Hollow Fiber Seawater Desalination Module Having a Capacity of 2500-3000 GPD,
W74-08342 3A

Design and Construction of a Large Brackish Water Desalination Module,
W74-08343 3A

High Rejection Hollow Fiber Membranes for Desalination of Sea Water,
W74-08502 3A

DRAINAGE AND IRRIGATION DEPT., KUALA LUMPUR, (MALAYSIA).
Water Resources Development in West Malaysia,
W74-08463 3B

DUPONT DE NEMOURS (E.I.) AND CO., AIKEN, S.C.
Environmental Effect of a Complex Nuclear Facility,
W74-08254 5D

EDISON WATER QUALITY RESEARCH LAB., EDISON, N.J.
Runoff of Oils from Rural Roads Treated to Suppress Dust,
W74-08236 5B

EIDGENOESSISCHE ANSTALT FUER WASSERVERSORGUNG, ABWASSERREINIGUNG UND GEWAESSERSCHUTZ, ZURICH (SWITZERLAND).
Concepts of Pollution and Its Control,
W74-08422 5G

Water Quality and Water Pollution Control in Switzerland,
W74-08697 5G

ENVIRONGENICS SYSTEMS CO., EL MONTE, CALIF.
Development of a Reverse Osmosis Module for Wash Water Recycling in a Space Environment at 165 deg F,
W74-08344 5D

ENVIRONMENTAL LAW INST., WASHINGTON, D.C.
Effluent Charges on Air and Water pollution,
W74-08524 5G

ENVIRONMENTAL PROTECTION AGENCY, DAUPHIN ISLAND, ALA. GULF COAST WATER SUPPLY RESEARCH, LAB.
The Accumulation of Organic and Inorganic Mercury Compounds by the Eastern Oyster (Crassostrea virginica),
W74-08346 5C

ENVIRONMENTAL PROTECTION AGENCY, DENVER, COLO. REGION VIII.
Utah Environmental Problems and Legislative Response: II, Legislative Response,
W74-08535 5G

ENVIRONMENTAL PROTECTION AGENCY, EDISON, N.J.
Water Pollution and Associated Effects from Street Salting,
W74-08306 5B

ENVIRONMENTAL PROTECTION AGENCY, EDISON, N.J. FEDERAL WATER PROGRAMS.
Federal Policy Towards Wetlands,
W74-08170 5G

ENVIRONMENTAL PROTECTION AGENCY, GULF BREEZE, FLA. GULF BREEZE ENVIRONMENTAL RESEARCH LAB.
Estuarine Microbes and Organochlorine Pesticides (A Brief Review),
W74-08634 5B

ENVIRONMENTAL PROTECTION AGENCY, RIVESVILLE, W. VA., CROWN MINE DRAINAGE CONTROL FIELD SITE.
Application of Reverse Osmosis to Acid Mine Drainage Treatment,
W74-08155 5D

ENVIRONMENTAL PROTECTION AGENCY, SAN FRANCISCO, CALIF. REGION IX.
Richardson Bay Effluent Dilution Study--A Working Paper.
W74-08604 5B

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C.
Ground Water Pollution From Subsurface Excavations: Part III. More on Pollution from Wells.
W74-08184 5B

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. APPLIED SCIENCE AND TECHNOLOGY BRANCH.
Project of the Agricultural and Marine Pollution Control Section, March 1973,
W74-08237 5G

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. DIV. OF WATER QUALITY AND NON-POINT SOURCE CONTROL.
Identification and Control of Pollution from Salt Water Intrusion.
W74-08293 5B

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. OFFICE OF AIR AND WATER PROGRAM.
Ground Water Pollution from Subsurface Excavations.
W74-08185 5

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. OFFICE OF AIR AND WATER PROGRAMS.
The Control of Pollution From Hydrographic Modifications.
W74-08186 5G

ENVIRONMENTAL PROTECTION SERVICE, OTTAWA (ONTARIO).
Utilization of Industrial Wastes and Waste By-Products for Phosphorus Removal: An Inventory and Assessment,
W74-08394 5D

ESSO AG FORSCHUNGSZENTRUM, HAMBURG (WEST GERMANY).
New Methods to Dispose of Used Metalworking Emulsions, (Neue Verfahren Zur Beseitigung Gebraughter Metall-Bearbeitungs-Emulsionen),
W74-08247 5D

ESSO RESEARCH AND ENGINEERING CO., LINDEN, N.J.
Petroleum Refinery Effluent Quality Control,
W74-08473 5D

The Handling of Oil Spills,
W74-08474 5G

ESTACION EXPERIMENTAL REGIONAL AGROPECUARIA, ANGUIL (ARGENTINA).
Utilization Patterns of the Deep Water by a Weeping Lovegrass Crop (Eragrostis curvula Nees), in a Regosol Soil of the Pampean Semiarid Region, (In Spanish),
W74-08682 2I

EXETER UNIV., (ENGLAND). DEPT. OF CHEMISTRY.
Potentiostatic Coulometric Determination of Vanadium, Vanadium-Manganese and Vanadium-Iron Mixtures and the Influence of Chromium on the Process,
W74-08674 5A

FEDERAL WATER POLLUTION CONTROL ADMINISTRATION, WASHINGTON, D.C.
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W74-08529 5G

Report on the Second Session of the Conference in the Matter of Pollution of the South Platte River Basin.
W74-08530 5G

FINNISH PULP AND PAPER RESEARCH INST., HELSINKI.
The Toxicity of Sulphate Pulp Bleaching Effluents,
W74-08403 5C

FLORIDA BUREAU OF LAND PLANNING, TALLAHASSEE.
Boundary and Land Development Regulation Recommendations for the Big Cypress Area of Critical State Concern.
W74-08543 4A

FLORIDA STATE UNIV., TALLAHASSEE. DEPT. OF OCEANOGRAPHY.
Alkane Degradation in Beach Sands,
W74-08629 5B

The Relative Changes in n-Alkane Composition in Surface Water Slicks,
W74-08633 5B

FLORIDA UNIV., GAINESVILLE.
Estimation of Outdoor Recreational Values,
W74-08392 6B

FLORIDA UNIV., GAINESVILLE. DEPT. OF SOIL SCIENCE.
Concentrations of Nitrogen, Phosphorus, Potassium, and Total Soluble Salts in Soil Solution Samples from Fertilized and Unfertilized Histosols,
W74-08319 5B

FLORIDA UNIV., GAINESVILLE. SCHOOL OF LAW.
A Model Water Use Act for a Riparian State--The Florida Experience,
W74-08545 6E

FMC CORP., ENGLEWOOD, COLO. DIV. OF ENVIRONMENTAL EQUIPMENT.
Oxygenation System for Accelerated Sewage Treatment,
W74-08207 5D

GARY-HOBART WATER CORP., GARY, IND.
The Pros and Cons of Automated Filters,
W74-08226 5D

GENERAL ATOMIC CO., SAN DIEGO, CALIF.
Reverse Osmosis Membrane Filters for Seawater Pretreatment,
W74-08334 3A

GEOLOGICAL SURVEY, ALBANY, N.Y.
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W74-08380 2F

GEOLOGICAL SURVEY, ANCHORAGE, ALASKA.
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W74-08180 4A

Aquatic Organisms from Selected Sites Along the Proposed Trans-Alaska Pipeline Corridor, September 1970 to September 1972,
W74-08369 2I

Geology and Water Resources of the Girdwood-Alyeska Area, Alaska,
W74-08595 4B

GEOLOGICAL SURVEY, AUSTIN, TEX.
Woody Phreatophytes Along the Colorado River From Southeast Runnels County to the Headwaters in Borden County, Texas,
W74-08371 3B

Ground-Water Resources of Duval County, Texas,
W74-08372 4B

Reconnaissance of the Chemical Quality of Surface Waters of the Rio Grande Basin, Texas,
W74-08373 5B

GEOLOGICAL SURVEY, CHEYENNE, WYO.
Records of Water Wells, Springs, Oil- and Gas-Test Holes, and Chemical Analyses of Water for the Madison Limestone and Equivalent Rocks in the Powder River Basin and Adjacent Areas, Northeastern Wyoming,
W74-08296 4B

GEOLOGICAL SURVEY, DENVER, COLO.
Water-Level Records for the Northern High Plains of Colorado, 1970-74,
W74-08381 4B

Rates of Salt Solution in the Permian Basin,
W74-08608 2K

GEOLOGICAL SURVEY, HARRISBURG, PA.
The Use of ERTS-1 for Relaying Hydrologic Data in the Delaware River Basin,
W74-08583 7B

GEOLOGICAL SURVEY, HARTFORD, CONN. WATER RESOURCES DIV.
Wetland Hydrology,
W74-08163 2L

GEOLOGICAL SURVEY, LINCOLN, NEBR.
Groundwater Levels in Nebraska, 1973,
W74-08367 4B

GEOLOGICAL SURVEY, MENLO PARK, CALIF.
A Simply Constructed and Adjustable Mercury Vapor Cell Mount,
W74-08379 7B

Radial Particle-Size Segregation During Packing of Particulates into Cylindrical Containers,
W74-08447 2J

Digital Simulation of the Effects of Urbanization on Runoff in the Upper Santa Ana Valley, California,
W74-08598 4C

WATEQ, A Computer Program for Calculating Chemical Equilibria of Natural Waters,
W74-08606 2K

GEOLOGICAL SURVEY, OKLAHOMA CITY, OKLA.
Floodflows from Small Drainage Areas in Oklahoma: Progress Report and Data Compilation,
W74-08292 2E

GEOLOGICAL SURVEY, PARKVILLE, MD.
Well Yields in the Bedrock Aquifers of Maryland,
W74-08446 4B

Hydrogeology of Antietam Creek Basin,
W74-08607 2F

GEOLOGICAL SURVEY, RALEIGH, N.C.
Environmental Hazards of Large-Scale Developments,
W74-08601 6G

An Appraisal of the Groundwater Resources of the Upper Cape Fear River Basin, North Carolina,
W74-08605 4B

GEOLOGICAL SURVEY, RESTON, VA. OFFICE OF WATER DATA COORDINATION.
Digest of the 1972 Catalog of Information on Water Data,
W74-08600 10D

GEOLOGICAL SURVEY, ROLLA, MO.
Estimating Low-Flow Frequency for Perennial Missouri Ozarks Streams,
W74-08599 4A

GEOLOGICAL SURVEY, TACOMA, WASH.
Generalization of Spawning and Rearing Discharges for Several Pacific Salmon Species in Western Washington,
W74-08370 2I

Digital-Model Study of Ground-Water Hydrology, Columbia Basin Irrigation Project Area, Washington,
W74-08382 2F

GEOLOGICAL SURVEY, TALLAHASSEE, FLA.
Appraisal of the Water Resources of Eastern Palm Beach County, Florida,
W74-08445 4B

Quality of Surface Water in the Vicinity of Oil Exploration Sites, Big Cypress Area, South Florida,
W74-08596 5A

GEOLOGICAL SURVEY, TRENTON, N.J.
A Summary of Peak Stages and Discharges for the Flood of August 1973 in New Jersey,
W74-08374 2E

GEOLOGICAL SURVEY, TUSCALOOSA, ALA.
Surface-Water Availability, Colbert County, Alabama.
W74-08187 4A

Water Availability, Coosa County, Alabama,
W74-08188 4A

Surface-Water Availability, Limestone County, Alabama,
W74-08189 4A

Surface-Water Availability, Etowah County, Alabama,
W74-08190 4A

Floods in Alabama--Magnitude and Frequency Based on Data Through September 30, 1971,
W74-08587 2E

GEOLOGICAL SURVEY, UNIVERSITY, ALA.
A Plan for the Improvement of the Low Flow Data Network in Alabama,
W74-08175 7A

GEOLOGICAL SURVEY, WASHINGTON, D.C.
Low-Flow Characteristics of Kentucy Streams,
W74-08173 7C

Some Rates of Geomorphological Processes,
W74-08304 2J

Floods in Punaluu-Hauula Area, Oahu, Hawaii,
W74-08310 7C

Floods in the Vicinity of Crete, Nebraska,
W74-08444 7C

Water from the Coastal Plain Aquifers in the Washington, D.C., Metropolitan Area,
W74-08597 4B

GEOLOGICAL SURVEY, WASHINGTON, D.C. WATER RESOURCES DIV.
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W74-08377 5B

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W74-08151 6F

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W74-08610 5B

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W74-08639 5C

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W74-08621 5B

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W74-08635 5B

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W74-08434 5C

GIBBS AND HILL, INC., NEW YORK, N.Y.
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W74-08215 5F

GOTENBURG UNIV. (SWEDEN). DEPT. OF ANALYTICAL CHEMISTRY.
Simple Apparatus for On-Site Continuous Liquid-Liquid Extraction of Organic Compounds from Natural Waters,
W74-08414 5A

GULF ENVIRONMENTAL SYSTEMS CO., SAN DIEGO, CALIF.
Development of High-Pressure Spiral Membrane Elements for Seawater Desalination,
W74-08336 3A

GULF GENERAL ATOMIC CO., SAN DIEGO, CALIF.
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W74-08338 3A

GUSTAVUS ADOLPHUS COLL. ST. PETER, MINN. DEPT. OF GEOGRAPHY.
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W74-08288 6B

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W74-08694 5B

The Share Taken by Nitrification Processes in the Biochemical Oxygen Demand (BOD) in the Water of the River Elbe, (In German),
W74-08695 5A

HAMPTON TOWNSHIP WATER POLLUTION CONTROL PLANT, ALLISON PARK, PA.
Automatic Waste Sludge Sampler,
W74-08442 5A

HARVARD UNIV., CAMBRIDGE, MASS. LAB. OF APPLIED MICROBIOLOGY.
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W74-08638 5C

HERCULES RESEARCH CENTER, WILMINGTON, DEL.
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W74-08362 5A

HILL, INGMAN, CHASE AND CO., SEATTLE, WASH.
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W74-08443 5E

HOWARD, NEEDLES, TAMMEN AND BERGENDOFF, INC., INDIANAPOLIS, IND.
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W74-08440 5G

HYDRO-QUEBEC, MONTREAL.
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W74-08513 4A

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W74-08286 5B

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W74-08499 3A

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W74-08297 2J

ILLINOIS UNIV., URBANA. DEPT. OF AGRONOMY.
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W74-08315 5B

ILLINOIS UNIV., URBANA. INST. OF GOVERNMENT AND PUBLIC AFFAIRS.
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W74-08495 3D

INDIAN INST. OF TECH., KANPUR. DEPT. OF CIVIL ENGINEERING.
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W74-08266 3F

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INDONESIAN PETROLEUM INST., DJAKARTA.
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W74-08485 5B

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W74-08206 4A

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W74-08313 2G

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W74-08221 5A

INTERNATIONAL BOUNDARY AND WATER COMMISSION, EL PASO, TEX.
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W74-08521 8A

INTERNATIONAL BUSINESS MACHINES CORP., CHARLOTTE, N.C.
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W74-08222 2E

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W74-08498 2G

IONICS, INC., WATERTOWN, MASS.
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W74-08345 3A

JAPAN CORRUGATED BOARD AND BOX INST., TOKYO.
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W74-08409 5D

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W74-08209 2G

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W74-08514 4A

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W74-08496 6C

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W74-08258 2G

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W74-08316 5B

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W74-08196 8B

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W74-08449 5D

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W74-08430 5A

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W74-08244 5B

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W74-08681 2I

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W74-08631 5C

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W74-08658 6E

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W74-08623 5B

NEBRASKA UNIV., LINCOLN. DEPT. OF AGRICULTURAL ENGINEERING.
Animal Waste Utilization for Pollution Abatement Technology and Economics. Phase II.
W74-08231 5D

Concepts of Conservation Tillage Systems Using Surface Mulches,
W74-08277 3F

NEVADA UNIV., LAS VEGAS. DESERT RESEARCH INST.
Use of Hydrochemistry for Interpreting Ground-Water Flow Systems in Central Nevada,
W74-08453 2F

NEW ENGLAND DIV. CORPS OF ENGINEERS, WALTHAM, MASS.
Operation and Maintenance of New Bedford Hurricane Barrier (Final Environmental Statement).
W74-08520 8D

NEW HAMPSHIRE UNIV., DURHAM. INST. OF NATURAL AND ENVIRONMENTAL RESOURCES.
Adsorption Studies at Solid-Solution Interfaces,
W74-08240 5B

Effect of Exchange Cations on Adsorption of Lysozyme and Ovalbumin by Smectite,
W74-08241 5B

Effect of Salt Content of Equilibrium-Solution on Formation and Stability of Smectite-Protein Complexes,
W74-08242 5B

NEW HAMPSHIRE UNIV., DURHAM. WATER RESOURCES RESEARCH CENTER.
The Measurement of the Heat of Reaction Between Proteins and Montmorillonite by Microcalorimetry,
W74-08243 5B

NEW MEXICO UNIV., ALBUQUERQUE. ERIC H. WANG CIVIL ENGINEERING RESEARCH FACILITY.
Predicting Reaeration Coefficients for Polluted Estuary,
W74-08307 5B

NEW YORK STATE DEPT. OF ENVIRONMENTAL CONSERVATION, ALBANY. BUREAU OF RADIOLOGICAL POLLUTION CONTROL.
Radioactivity in New York State Surface Water, July-December 1971.
W74-08654 5B

NEWCASTLE-UPON-TYNE UNIV. (ENGLAND).
Turbulence Characteristics in a Smooth Open Channel of Circular Cross-Section (Caracteristiques de la Turbulence au Sein d'un Ecoulement a Surface Libre En Conduite Lisse De Section Circulaire,
W74-08192 8B

NORTH CAROLINA STATE UNIV., RALEIGH. DEPT. OF AGRICULTURAL ENGINEERING.
Computer Simulation of Crop Production - Potential and Hazards,
W74-08331 3F

NORTH CAROLINA STATE UNIV., RALEIGH. DEPT. OF MICROBIOLOGY.
Studies on the Degradation of Petroleum by Filamentous Fungi,
W74-08619 5B

NORTH CAROLINA UNIV., CHAPEL HILL. DEPT. OF ENVIRONMENTAL SCIENCES AND ENGINEERING.
Planning for Water Reuse,
W74-08465 5D

NORTH CAROLINA UNIV., CHAPEL HILL. DEPT. OF PATHOLOGY.
Quantitative Measurements of Inorganic Mercury and Organomercurials in Water and Biological Media by Gas-Liquid Chromatography,
W74-08415 5A

NORTH STAR RESEARCH AND DEVELOPMENT INST., MINNEAPOLIS, MINN.
In-Situ Formed Condensation Polymers for Reverse Osmosis Membranes,
W74-08504 3A

NORTHEAST UTILITIES SERVICE CO., HARTFORD, CONN. ENVIRONMENTAL PLANNING COORDINATION.
Industrial Aspects of Wetland Uses,
W74-08171 6E

NORWEGIAN PULP AND PAPER RESEARCH INST., OSLO.
Lamellar Sedimentation of Fiber-Carrying Waste Waters (Lamellsedimentering av fiberholdig vann),
W74-08437 5D

ODESSA INST. FOR HEALTH RESORT THERAPY (USSR).
The Effect of Mineral Waters of the Kvasy Spa on Some Indices of Cholesterol and Sialic Acid Metabolism, (In Russian),
W74-08686 5C

OFFICE OF RADIATION PROGRAMS, LAS VEGAS, NEV.
Tritium Surveillance System, October-December 1972.
W74-08650 5B

OFFICE OF RADIATION PROGRAMS, WASHINGTON, D.C.
Radiological Survey of New London Harbor, Thames River, Conn., and Environs,
W74-08645 5B

State Environmental Radioactivity Surveillance Programs, 1972,
W74-08647 5B

OFFICE OF RADIATION PROGRAMS, WASHINGTON, D.C. FIELD OPERATIONS DIV.
Environmental Radioactivity in Illinois, 1970,
W74-08646 5B

OKAYAMA UNIV. (JAPAN). DEPT. OF MECHANICAL ENGINEERING.
The Friction Factors of Oscillating Pipe Flows,
W74-08259 8B

OKLAHOMA STATE UNIV., STILLWATER. DEPT. OF BIOCHEMISTRY.
Production and Characterization of Emulsifying Factors from Hydrocarbonoclastic Yeast and Bacteria,
W74-08632 5B

OREGON STATE DEPT. OF ENVIRONMENTAL QUALITY, PORTLAND.
Difficulties Ahead for Oregon Regarding Estuary Regulations, Control and Protection,
W74-08670 2L

OREGON STATE UNIV., CORVALLIS. DEPT. OF AGRICULTURAL ECONOMICS.
Technical and Economic Issues in the Water Quality Management of Yaquina Bay,
W74-08672 2L

OREGON STATE UNIV., CORVALLIS. DEPT. OF MICROBIOLOGY.; AND OREGON STATE UNIV., CORVALLIS. SCHOOL OF OCEANOGRAPHY.
Heterotrophic Potential for Amino Acid Uptake in a Naturally Eutrophic Lake,
W74-08678 5C

OREGON STATE UNIV., CORVALLIS. DEPT. OF ZOOLOGY.
Sublethal Effects of the Water Soluble Component of Oil: Chemical Communication in the Marine Environment,
W74-08636 5C

OREGON STATE UNIV., CORVALLIS. SCHOOL OF OCEANOGRAPHY.
Mineralogy of Surface Sediments from the Panama Basin, Eastern Equatorial Pacific,
W74-08298 2J

ORGANIZATION PENNWALT LTD., CAMBERLEY (ENGLAND).
Centrifugal Dewatering of Secondary Waste Sludges,
W74-08431 5D

PANT COLL. OF TECHNOLOGY PANTNAGAR (INDIA).
Determination of Water Intake Rate of Advance,
W74-08275 3F

PEAT, MARWICK, MITCHELL AND CO., WASHINGTON, D.C.
Economics of Inland Water Transport,
W74-08508 4A

PENNSYLVANIA AGRICULTURAL EXPERIMENT STATION, UNIVERSITY PARK.
A New Approach to Soil Testing: II. Ionic Equilibria Involving H, K, Ca, Mg, Mn, Fe, Cu, Zn, Na, P, and S,
W74-08281 2G

PENNSYLVANIA UNIV., PHILADELPHIA. MOORE SCHOOL OF ELECTRICAL ENGINEERING.
Suspended Solids Analysis Using ERTS-A Data,
W74-08301 2J

PHILADELPHIA PUBLIC HEALTH DEPT., PA. DIV. OF OCCUPATIONAL AND RADIOLOGICAL HEALTH.
Summary of Environmental Monitoring at Philadelphia, 1958-1971,
W74-08648 5B

PIERSON AND CO., LTD., MANCHESTER (ENGLAND).
Countercurrent Washing Turns the Tide Against Rising Effluent Costs,
W74-08228 5D

POITERS UNIV. (FRANCE). UNITE D'ENSEIGNMENT ET DE RECHERCHE DE MEDICINE ET PHARMACIE.
Microbiological Comparison Between a Few Aquatic Mediums, (In French),
W74-08669 5C

POLISH ACADEMY OF SCIENCES, WARSAW.
Preliminary Papers for UNESCO-IBP Symposium on Productivity Problems of Freshwaters.
W74-08673 5C

POLISH ACADEMY OF SCIENCES, ZABRZE. ZAKLAD BADAN NAUKOWYCH GORNOSLASKIEGO OKREGU PRZEMYSLOWEGO.
The Gas-Chromatographic Determination of Some Lignin Compounds in Surface Waters (Die gaschromatographische Bestimmung einiger Ligninverbindungen in Oberflaechengewaessern),
W74-08433 5A

POLLUTECH POLLUTION ADVISORY SERVICES LTD., OAKVILLE (ONTARIO).
Nutrient Control in Sewage Lagoons.
W74-08395 5D

Chemical Dosage Control for Phosphorus Removal.
W74-08400 5D

PORT OF SINGAPORE AUTHORITY.
Sea Pollution in Singapore,
W74-08475 5B

PROCTOR AND GAMBLE CO., CINCINNATI, OHIO. IVORYDALE TECHNICAL CENTER.
Automated Method for Ortho-, Ortho-plus Hydrolyzable and Total Phosphate in Surface and Wastewaters,
W74-08208 5A

PURDUE UNIV., LAFAYETTE, IND. DEPT. OF AGRONOMY.
A Simple Digestion Procedure for Estimation of Total Nitrogen in Soils and Sediments,
W74-08324 5B

QUEBEC MINISTERE DE L'INDUSTRIE ET DU COMMERCE. SERVICE RECHERCHE ET DIRECTION PECHES MARITIMES.
Towards an Objective Analysis of the Seasonal Thermocline,
W74-08691 2E

RED VALVE CO., INC., CARNEGIE, PA.
Pinch Valves Take Hold on the Industry,
W74-08363 8A

RESOURCES FOR THE FUTURE, WASHINGTON, D.C.
Water Pollution: Economic Aspects and Research Needs,
W74-08525 5G

RHODE ISLAND UNIV., KINGSTON. DEPT. OF PLANT PATHOLOGY-ENTOMOLOGY.
Bacterial Degradation of Petroleum Materials in Low Temperature Marine Environments,
W74-08626 5B

ROBERT S. KERR ENVIRONMENTAL RESEARCH LAB, ADA, OKLA. NATIONAL ANIMAL FEEDLOT WASTES RESEARCH PROGRAM.
Beef Cattle Feedlot Site Selection for Environmental Protection,
W74-08156 5G

RUTGERS-THE STATE UNIV., NEW BRUNSWICK, N.J. DEPT. OF BIOCHEMISTRY AND MICROBIOLOGY.
Biodegradation of Oil in Seawater: Limiting Factors and Artificial Stimulation,
W74-08624 5B

Effects of Some Commercial Oil Herders, Dispersants and Bacterial Inocula on Biodegradation of Oil in Seawater,
W74-08640 5C

SCANDINAVIAN PULP, PAPER AND BOARD TESTING COMMITTEE, STOCKHOLM (SWEDEN).
Phosphorus in Waste Water.
W74-08438 5A

SCRIPPS INSTITUTION OF OCEANOGRAPHY, LA JOLLA, CALIF.
The Surprise Factor in Marine Pollution Studies,
W74-08252 5B

Microbial Degradation of Oil: Present Status, Problems, and Perspectives,
W74-08611 5B

Bacterial Degradation of Mineral Oils at Low Temperatures,
W74-08625 5B

SIMON FRASER UNIV., BURNABY (BRITISH COLUMBIA). DEPT. OF GEOGRAPHY.
The Development of Meanders in Natural River-Channels,
W74-08357 2E

SINGAPORE DEPT. OF PUBLIC WORKS. DRAINAGE AND MARINE BRANCH.
Flood Control and Water Conservation Works in Bukit Timah Catchment, Singapore,
W74-08456 4A

Hydrological Activities in Singapore,
W74-08457 7C

SINGAPORE DEPT. OF PUBLIC WORKS. SEWERAGE BRANCH.
The Reuse of Sewage Effluent for Industrial Purposes in Singapore,
W74-08458 5D

Sewerage; Sewage Treatment and Disposal in Singapore,
W74-08467 5D

SINGAPORE INST. OF STANDARDS AND INDUSTRIAL RESEARCH.
Disposal of Industrial Trade Effluents from the Food Industries,
W74-08468 5D

SINGAPORE METEOROLOGICAL SERVICE.
Some Factors Affecting the Annual Railfall of Singapore,
W74-08459 2B

SINGAPORE PRIMARY PRODUCTION DEPT.
Indications of the Relationship Between Phyto-Plankton Distribution and Phosphate Levels,
W74-08476 5C

SINGAPORE PUBLIC UTILITIES. WATER PLANNING UNIT.
Groundwater investigations in Singapore,
W74-08455 4B

SINGAPORE UNIV. DEPT. OF ZOOLOGY.
Development of Blue-Green Algal Blooms in Non-Alkaline Waters,
W74-08478 5C

SINGAPORE UNIV. FISHERIES BIOLOGY UNIT.
Research on the Culture of Certain Common Marine Organisms in Singapore Waters,
W74-08477 3F

SKIDWAY INST. OF OCEANOGRAPHY, SAVANNAH, GA.
Research to Determine the Environmental Response to the Deposition of Spoil on Salt Marshes Using Diked and Undiked Techniques.
W74-08677 5C

SOCIETE ALSTHOM, PARIS (FRANCE). TECHNIQUES DES FLUIDES.
Examples of the Use of the 'Seclar' Decanter in Treating Paper Industry Effluents (Exemples d'application du decanteur 'Seclar' au traitement d'effluents de l'industrie papetiere),
W74-08419 5D

SOIL CONSERVATION SERVICE, BOZEMAN, MONT.
Problems and SCS Specifications for Low Head PVC Pipelines,
W74-08278 8B

SOIL CONSERVATION SERVICE, STORRS, CONN.
The Soil Conservation and Its Role in Wetland Management for Connecticut,
W74-08169 6E

SOUTH CAROLINA WILDLIFE AND MARINE RESOURCES DEPT., CHARLESTON.
Definition of Critical Coastal Areas and Approaches to Standards for Management,
W74-08532 2L

SOUTH DAKOTA STATE UNIV., BROOKINGS. REMOTE SENSING INST.
Monitoring Flood Damage with Satellite Imagery,
W74-08294 4A

SOUTHEASTERN MASSACHUSETTS UNIV., NORTH DARTMOUTH. DEPT. OF BIOLOGY.
The Use of the Dilution Water Effect as a Water Quality Criterion,
W74-08356 5A

STANFORD UNIV., CALIF. GRADUATE SCHOOL OF BUSINESS.
Supply Curve for Thermal Efficiency,
W74-08509 6A

STATE UNIV. COLL., BROCKPORT, N.Y. DEPT. OF BIOLOGICAL SCIENCES.
Microbial Degradation of Oil and Hydrocarbons in Continuous Culture,
W74-08615 5B

STATE UNIV. OF NEW YORK, BUFFALO. DEPT. OF BIOCHEMISTRY.
Cadmium Uptake and Time Dependent Alterations in Tissue Levels in the White Catfish Ictalurus catus (Pisces: Ictaluridae),
W74-08348 5C

STAZIONE SPERIMENTALE PER LA CELLULOSA, CARTA E FIBRE TESSILI VEGETALI ED ARTIFICIALI, MILAN (ITALY). LABORATORIO ANALISI DELLE ACQUE.
Waste Water Problems of the Textile Industry. Part I. Oxygen Demand of Printing Paste Thickeners. (Problemi inerenti le acque di scarico nell'industria tessile. Io. La domanda di ossigeno di addensanti da stampa),
W74-08421 5B

STEVENS INST. OF TECH., HOBOKEN, N.J. DAVIDSON LAB.
Model Study of the Dilution of Soluble Liquids Discharge from Tankers,
W74-08451 5B

SWEDISH WATER AND AIR POLLUTION RESEARCH LAB., GOTEBORG.
Air-Borne Acid,
W74-08689 5A

TECHNION--ISRAEL INST. OF TECH., HAIFA. LOWDERMILK FACULTY OF AGRICULTURAL ENGINEERING.
Evaporation from Bare Soil in a Coastal Environment,
W74-08305 2D

TENNESSEE DEPT. OF CONSERVATION, NASHVILLE. DIV. OF WATER RESOURCES.
The Sevier County Water Plan,
W74-08493 6D

TENNESSEE UNIV., KNOXVILLE. DEPT. OF GEOLOGY.
Water Transport of Heavy Metals in Solution and by Different Sizes of Particulate Solids,
W74-08238 5B

TENNESSEE VALLEY AUTHORITY, MUSCLE SHOALS, ALA. DIV. OF AGRICULTURAL AND CHEMICAL DEVELOPMENT.
Agricultural Chemicals in Relation to Environmental Quality: Chemical Fertilizers, Present and Future,
W74-08325 5B

TEXAS A AND M UNIV., COLLEGE STATION. DEPT. OF BIOLOGY.
The Brackish Water Clam Rangia Cuneata as Indicator of Ecological Effects of Salinity Changes in Coastal Waters,
W74-08676 5C

TEXAS A AND M UNIV., COLLEGE STATION. DEPT. OF INDUSTRIAL ENGINEERING.
System Optimization for Pulp and Paper Industrial Wastewater Treatment Design,
W74-08418 5D

TEXAS A AND M UNIV., OVERTON. AGRICULTURAL RESEARCH AND EXTENSION CENTER.
Recycling and Recovery of Nitrogen, Phosphorus, and Potassium by Coastal Bermudagrass: I. Effect of Sources and Rates of Nitrogen Under a Clipping System,
W74-08327 5B

Recycling and Recovery of Nitrogen, Phosphorus, and Potassium by Coastal Bermudagrass: II. Under Grazing Conditions with Two Stocking Rates,
W74-08328 5B

TEXAS LAW INST. OF COASTAL AND MARINE RESOURCES, HOUSTON.
Final Report Analyzing Coastal and Marine Law to Develop an Authority for Coastal Zone Management,
W74-08544 6E

TEXAS UNIV., AUSTIN. DEPT. OF MICROBIOLOGY.
Microbial Degradation of Aromatic Hydrocarbons,
W74-08614 5B

TEXAS UNIV., PORT ARANSAS. MARINE SCIENCE INST.
Utilization of Crude Oil Hydrocarbons by Mixed Cultures of Marine Bacteria,
W74-08616 5B

Bacterial Seeding to Enhance Biodegradation of Oil Slicks,
W74-08641 5B

TEXAS WESLEYAN COLL., FORT WORTH. DIV. OF SCIENCE.
Some Acute Effects of Low-Boiling Petroleum Fractions on the Cellular Structure of Fish Gills Under Field Conditions,
W74-08637 5C

TORONTO UNIV. (ONTARIO). INST. OF ENVIRONMENTAL SCIENCES AND ENGINEERING.
Design and Performance Criteria for Settling Tanks for the Removal of Physical-Chemical Flocs,
W74-08396 5D

Heavy Metals in Agricultural Lands Receiving Chemical Sewage Sludges,
W74-08397 5E

UKRAINSKII NAUCHNO-ISSLEDOVATELSKII INSTITUT BUMAGI, KIEV.
Replacement of the Anthracite Sublayer in Anion-Exchange Filters of Water Purification Equipment (Zamena antratsitovogo podsloya v anionitovykh fil'trakh vodoochistnykh ustanovok),
W74-08407 5D

UNIV. OF ALASKA COLLEGE. INST. OF WATER RESOURCES.
Ground Water Quality Effects on Domestic Water Utilization,
W74-08287 5B

UNIV., OF CALIFORNIA, LOS ANGELES. DEPT. OF ENGINEERING SYSTEMS.
Probabilistic Models in the Design and Operation of a Multi-Purpose Reservoir System,
W74-08153 4A

UNIV., OF CALIFORNIA, LOS ANGELES. SCHOOL OF ENGINEERING AND APPLIED SCIENCE.
Optimization of the Assimilative Waste Capacity of the Unsaturated and Saturated Zones of an Unconfined Aquifer System,
W74-08152 5B

UNIVERSAL OIL PRODUCTS CO., DEARBORN HEIGHTS, MICH. WOLVERINE TUBE DIV.
Development of a Production Technique for Porous Stainless Steel Tubes,
W74-08503 8G

UNIVERSITY COLL. OF NORTH WALES, MENAI BRIDGE. MARINE SCIENCE LABS.
A Threnody Concerning the Biodegradation of Oil in Natural Waters,
W74-08612 5B

UNIVERSITY OF SOUTHERN CALIFORNIA, LOS ANGELES. DEPT. OF CIVIL ENGINEERING.
Discharge and Travel Time for Ground-Water Conduits,
W74-08383 8B

UNIVERSITY OF SOUTHERN CALIFORNIA, LOS ANGELES. ENVIRONMENTAL GEOLOGY PROGRAM.
Microbial Decomposition Patterns Using Crude Oil,
W74-08617 5B

UPPSALA UNIV. (SWEDEN). DEPT. OF METEOROLOGY.
Residence Time of Sulfurous Air Pollutants from a Local Source During Precipitation,
W74-08690 5A

URS FORREST AND COTTON, INC., DALLAS, TEXAS.
Plant Expanded for Advanced Waste Treatment,
W74-08223 5D

UTAH STATE UNIV., LOGAN. DEPT. OF AGRICULTURAL AND IRRIGATION ENGINEERING.
Drainage Observations in Latin America,
W74-08268 4A

UTAH UNIV., SALT LAKE CITY. COLL. OF LAW.
Municipal Water Preference Statutes: The Texas Wagstaff Act,
W74-08546 6E

UTAH WATER RESEARCH LAB., LOGAN.
Analysis of Water Reuse Alternatives in an Integrated Urban and Agricultural Area,
W74-08510 5D

VATTENBYGGNADSBYRAN LTD., STOCKHOLM (SWEDEN).
Swedish Techniques to Combat Pollution,
W74-08353 5D

VERMONT UNIV., BURLINGTON. DEPT. OF PLANT AND SOIL SCIENCE.
Fate of Nitrate from Manure and Inorganic Nitrogen in A Clay Soil Cropped to Continuous Corn,
W74-08321 5B

VIENNA UNIV. (AUSTRIA). INSTITUT FUER ANORGANISCHE CHEMIE.
Model Studies on Reactions Occurring in Oxidations of Lignin with Molecular Oxygen in Alkaline Media,
W74-08359 5B

VIRGINIA UNIV., CHARLOTTESVILLE.
Water and Sewer Supply Decisions: A Case Study of the Washington Suburban Sanitary Commission,
W74-08497 5G

VSESOYUZNYI NAUCHNO-ISSLEDOVATELSKII INSTITUT ISKUSSTVENNOGO VOLOKNA, LENINGRAD (USSR). LENINGRADSKII FILIAL.
Some Results of Water Purification at Viscose Rayon Factories (Nekotorye itogi raboty vodoochistnykh sooruzhennii predpriyatii viskoznykh volokon),
W74-08429 5D

VSESOYUZNYI-NAUCHNYI PLANOVII OTDEL BUMAZHNOI PROMYSHLENNOST (USSR).
Determination of the Alkalinity of Mill Effluents (Opredelenie shchelochnosti stochnykh vod),
W74-08411 5A

Aeration of Effluents in Aeration Tanks (Aeratsiya stochnykh vod v aerotenkakh-vytesnitelyakh),
W74-08413 5D

VTN, ORLANDO, FLA.
Effective Use of High Water Table Areas for Sanitary Landfill.
W74-08486 5E

WALLACE AND TIERNAN, INC., SAN FRANCISCO, CALIF.
Disinfection of Water Using Chlorine Dioxide.
W74-08253 5D

WARSAW UNIV. (POLAND). INST. OF FUNDAMENTAL PROBLEMS IN CHEMISTRY.
Determination of Nitrate in Water with a New Construction of Ion-Selective Electrode.
W74-08420 5A

WASHINGTON STATE DEPT. OF FISHERIES, OLYMPIA. MANAGEMENT AND RESEARCH DIV.
1971 Puget Sound Fall Chinook Salmon Tagging Study,
W74-08452 8I

WASHINGTON STATE DEPT. OF SOCIAL AND HEALTH SERVICES, OLYMPIA.
Radioactivity in Washington Surface Water July 1970-June 1971.
W74-08653 5B

WASHINGTON UNIV., SEATTLE. DEPT. OF CIVIL ENGINEERING.
Primary Sludges Produced by the Addition of Lime to Raw Waste Water.
W74-08224 5D

WASHINGTON UNIV., SEATTLE. FISHERIES RESEARCH INST.
Optimum Escapement Studies of Chignik Sockeye Salmon,
W74-08176 8I

WATER RESOURCES COUNCIL, WASHINGTON, D.C.
Water Resources Council Report on the Pearl River Comprehensive Basin Study Mississippi and Louisiana.
W74-08522 4A

WATERLOO UNIV. (ONTARIO). RESEARCH INST.
Integration of Physico-Chemical and Biological Waste-Water Treatment Processes.
W74-08399 5D

WATSON (J. D. AND D. M.), LONDON (ENGLAND).
The Control of Wastewater and Oil Discharges to the Sea with Particular Regard to Studies Recently Carried Out in Singapore's Southern Coastal Waters.
W74-08472 5G

WESTERN ELECTRIC CO., INC., NEW YORK, N.Y.
Some Useful Ideas on Waste Water Reduction.
W74-08355 5D

WESTINGHOUSE ELECTRIC CORP., PITTSBURGH, PA.
Applications of Waste Processing Systems for Pressurized Water Reactors,
W74-08349 5D

WISCONSIN UNIV., MADISON.
Applications of Growth and Sorption Algal Assays,
W74-08154 5C

WISCONSIN UNIV., MADISON, DEPT. OF PATHOLOGY.
Neurological Changes in Cats Following Long-Term Diet of Mercury Contaminated Tuna,
W74-08200 5C

WISCONSIN UNIV., MADISON, DEPT. OF PATHOLOGY.

WISCONSIN UNIV., MADISON. SEA GRANT COLLEGE PROGRAM.
Our Great Lakes.
W74-08531 2H

YALE UNIV., NEW HAVEN, CONN. DEPT. OF BIOLOGY.
Ecological History of Wetlands,
W74-08165 2L

ZOOLOGISK MUSEUM, OSLO (NORWAY).
An Investigation of the Food of One- to Four-Month-Old Salmon Fry (Salmo salar L.) in the Suldalslagen, West Norway,
W74-08679 2I

Notes on the Feeding Relationships of Trout (Salmo trutta L.) and Salmon (Salmo salar L.) in the River Suldalslagen, West Norway,
W74-08680 2I

Studies of the Helminth Fauna of Norway, XXVI: The Distribution of Cyathocephalus Truncatus (Pallas) in the Intestine of Brown Trout (Salmo Trutta L.),
W74-08699 2I

ACCESSION NUMBER INDEX

W74-08151 6F
W74-08152 5B
W74-08153 4A
W74-08154 5C
W74-08155 5D
W74-08156 5G
W74-08157 2L
W74-08158 6E
W74-08159 6E
W74-08160 2G
W74-08161 2L
W74-08162 2F
W74-08163 2L
W74-08164 2L
W74-08165 2L
W74-08166 2L
W74-08167 6E
W74-08168 6E
W74-08169 6E
W74-08170 5G
W74-08171 6E
W74-08172 6E
W74-08173 7C
W74-08174 7C
W74-08175 7A
W74-08176 8I
W74-08177 3B
W74-08178 4D
W74-08179 2C
W74-08180 4A
W74-08181 5B
W74-08182 2I
W74-08183 5B
W74-08184 5B
W74-08185 5
W74-08186 5G
W74-08187 4A
W74-08188 4A
W74-08189 4A
W74-08190 4A
W74-08191 2G
W74-08192 8B
W74-08193 8A
W74-08194 2G
W74-08195 7B
W74-08196 8B
W74-08197 8A
W74-08198 5D
W74-08199 5D
W74-08200 5C
W74-08201 5D
W74-08202 5D
W74-08203 5G
W74-08204 5G
W74-08205 5F
W74-08206 4A
W74-08207 5D
W74-08208 5A
W74-08209 2G
W74-08210 5F
W74-08211 5D
W74-08212 5D
W74-08213 5E
W74-08214 5D
W74-08215 5F
W74-08216 8A
W74-08217 5D
W74-08218 5D
W74-08219 5A
W74-08220 5A
W74-08221 5A
W74-08222 2E
W74-08223 5D
W74-08224 5D
W74-08225 5D
W74-08226 5D
W74-08227 5D
W74-08228 5D
W74-08229 5D
W74-08230 2G
W74-08231 5D
W74-08232 9D
W74-08233 2C
W74-08234 2F
W74-08235 10C
W74-08236 5B
W74-08237 5G
W74-08238 5B
W74-08239 5B
W74-08240 5B
W74-08241 5B
W74-08242 5B
W74-08243 5B
W74-08244 5B
W74-08245 5D
W74-08246 5D
W74-08247 5D
W74-08248 5D
W74-08249 8A
W74-08250 8A
W74-08251 5B
W74-08252 5B
W74-08253 5D
W74-08254 5D
W74-08255 5D
W74-08256 2G
W74-08257 4C
W74-08258 2G
W74-08259 8B
W74-08260 5D
W74-08261 5D
W74-08262 5D
W74-08263 5D
W74-08264 3F
W74-08265 3F
W74-08266 3F
W74-08267 4A
W74-08268 4A
W74-08269 3F
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W74-08272 2G
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W74-08274 2G
W74-08275 3F
W74-08276 6E
W74-08277 3F
W74-08278 8B
W74-08279 3F
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W74-08286 5B
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W74-08288 6B
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W74-08294 4A
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W74-08299 4A
W74-08300 3C
W74-08301 2J
W74-08302 2J
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W74-08311 10A
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W74-08459 2B
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W74-08466 6B
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W74-08651 5B
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W74-08656 5B
W74-08657 6E
W74-08658 6E
W74-08659 6E
W74-08660 8D
W74-08661 5G
W74-08662 5B
W74-08663 2H
W74-08664 5D
W74-08665 1A
W74-08666 1B
W74-08667 1B
W74-08668 7C
W74-08669 5C
W74-08670 2L
W74-08671 2L
W74-08672 2L
W74-08673 5C
W74-08674 5A
W74-08675 5A
W74-08676 5C
W74-08677 5C
W74-08678 5C
W74-08679 2I
W74-08680 2I
W74-08681 2I
W74-08682 2I
W74-08683 2H
W74-08684 2I
W74-08685 2I
W74-08686 5C
W74-08687 5C
W74-08688 3F
W74-08689 5A
W74-08690 5A
W74-08691 2E
W74-08692 5C
W74-08693 5A
W74-08694 5B
W74-08695 5A
W74-08696 5B
W74-08697 5G
W74-08698 5B
W74-08699 2I
W74-08700 2G

ABSTRACT SOURCES

Source	Accession Number	Total
A. Centers of Competence		
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Battelle Memorial Institute, Methods for Chemical and Biological Identification of Pollutants	W74-08674 -- 08677	4
Colorado State University, Irrigation Return Flow Quality	W74-08264 -- 08285 08312 08314 -- 08332	42
Cornell University, Policy Models for Water Resources Systems	W74-08506 -- 08515	10
Franklin Institute (FIRL), Municipal Wastewater Treatment Technology	W74-08191 -- 08208 08210 -- 08230 08244 -- 08257 08259 -- 08263 08286 08346 -- 08365	79
Institute of Paper Chemistry, Water Pollution from Pulp and Paper Industry	W74-08393 -- 08433 08435 -- 08443 08664 -- 08668	55
University of Florida, Eastern U.S. Water Law	W74-08516 -- 08525 08527 -- 08540 08542 -- 08546 08550 -- 08581 08650 -- 08660	72
University of North Carolina, Metropolitan Water Resources Planning and Management	W74-08486 -- 08493 08495 -- 08497	11
University of Wisconsin, Eutrophication	W74-08154, 08673	2
University of Wisconsin, Water Resources Economics	W74-08670 -- 08672	3
U.S. Geological Survey, Hydrology	W74-08156 08158 -- 08181 08183 -- 08190 08231 -- 08243 08290 -- 08311 08366 -- 08377 08379 -- 08391 08444 -- 08485 08582 -- 08608 08661 -- 08662	164
B. State Water Resources Research Institutes		
Alaska Institute for Water Research	W74-08287	1
California Water Resources Center	W74-08152 -- 08153	2
Connecticut Institute of Water Resources	W74-08157	1
Florida Water Resources Research Center	W74-08392	1
Minnesota Water Resources Research Center	W74-08288	1

ABSTRACT SOURCES

Source	Accession Number	Total
C. Other		
BioSciences Information Service	W74-08182, 08209 08258, 08313 08378, 08434 08494, 08498 08505, 08526 08541 08547 -- 08549 08663, 08669 08679 -- 08700	38
Environmental Protection Agency	W74-08155, 08678	2
National Oceanic and Atmospheric Administration	W74-08609 -- 08643	35
Office of Saline Water	W74-08333 -- 08345 08499 -- 08504	19
Office of Water Resources Research	W74-08151, 08289	2

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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

6 WATER RESOURCES PLANNING

7 RESOURCES DATA

8 ENGINEERING WORKS

9 MANPOWER, GRANTS, AND FACILITIES

10 SCIENTIFIC AND TECHNICAL INFORMATION

INDEXES

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

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